VARNEY'S MIDWIFERY

FOURTH EDITION

HELEN VARNEY
JAN M. KRIEBS
CAROLYN L. GEGOR

VARNEY'S MIDWIFERY

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FOURTH EDITION

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A rededication to the students, practitioners, and profession of midwifery; and to the women, mothers, babies, and families who receive health care from all those who study this book.

Helen Varney

For the mentors, midwives, and mothers who have shared with me their knowledge of midwifery and birth; and for David, my partner in everything I do.

Jan M. Kriebs

To Lisa L. Paine, CNM, DrPH, my midwifery mentor and friend, and to all those whose wisdom and vision inspires us to go further and to give more than we ever knew was possible to care for mothers and babies; and to Andy, my husband and soul mate, with whom so many dreams have come true.

Carolyn L. Gegor

Dedication to the Third Edition
In honor and memory of my beloved parents, Helene Hahn Varney and Theodore Roosevelt Varney.

Dedication to the Second Edition
In tribute to Therese Dondero and all other Certified Nurse-Midwives whose masterly contributions to our profession were tragically curtailed because of untimely death.

Dedication to the First Edition
For my students, peers, and colleagues; the profession of nurse-midwifery; and the women, mothers, babies, and families who receive health care from those who study this book.

Holy Births and Howling Babies

In my backyard there are nuns who live in a shaded brick building
next to the St. Stanislaus church and elementary school.
Together we rise before the sun is in the sky.
Behind the kitchen curtain, in the damp haze of morning,
I watch them walk in shades of blue robe.
They glide in white sneakers across the parking lot.
They are cool, calm, brisk.

Some day, I'll go see them
I'll ask for some lesson on prayer.
Because the thing is . . . I pray now.
Not *Dear God Almighty!*
Just slow, easy, quiet thoughts.

I pray when my patience is worn.
When my shoulders ache.
When my own voice becomes tiring to my ears.

I pray when my heart sits heavy with stories and faces of women.
A prayer for the 32 week babe.
A prayer for the lady with the skinny, squawking twins.
A prayer for the woman without a mother, or a lover, or a friend.
I pray when my cold hands run across a pregnant belly
and I feel a kick from the inside.

I pray for all my babies, *Be good to your mama.*
I pray for all my mothers, *Be strong, be good to this baby.*
I pray secretly and I pray slowly.

I pray for us, the midwives and almost-midwives.
I pray that we make the right decisions.
And I pray for those of us who make bad decisions.
Decisions we regret with outcomes we can't change.

I pray that we learn from our mistakes.
That with age comes wisdom.
I pray deeply and I pray completely.
For all of the hands and all of the bellies.
I pray for holy births and howling babies.

Dana Quealy, CNM, MSN

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Part IV Antepartal Care

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Preface to the Fourth Edition

This is a textbook written for all midwives. Midwives worldwide have a primary focus on pregnancy and birth in all types of settings. International concern for safe motherhood and the health and well-being of women builds on this core of midwifery. In the United States, the practice of midwifery encompasses the health care of women from puberty through senescence and from normal to high-risk, and the collaborative care of the medically or obstetrically complicated. To be with and provide care to women in all settings requires an extensive and in-depth knowledge base and skill competency. This book was written to provide both the student and the practitioner with the underlying theory, procedural know-how, and elaboration on the Hallmarks of Midwifery that enables the midwife to function with knowledge, safety, and caring in all settings. The book thus reflects a balance of art and science, a blend of spirituality and evidence-based care, and a commitment to being "with woman".

The book once again expanded with the fourth edition to provide more comprehensive coverage of the scope of practice of midwifery as the primary health care of women from puberty through senescence. Clinical content expansion is reflected in new chapters on Cultural Competence in Midwifery Practice, Primary Care and Midwifery, Nutrition in Women's Health, Common Diagnoses in Women's Gynecological Health, and Pharmacology and Midwifery. Other new chapters reflect increased comprehensiveness of material previously found in chapters such as Chronic Infectious Diseases, Complications of Gestational Age Assessment and the Postdate Pregnancy, Fetal Assessment in Labor, and Infant Feeding. A new chapter on International Midwifery and Safe Motherhood bespeaks acknowledgment of the role midwives have internationally in promoting and safeguarding the health and well-being of women. Two previous chapters were completely rewritten and retitled by new authors as Health Issues of Lesbian and Bisexual Women and Birth in the Home or Birth Center. Four new skills chapters were essential additions supplementing our clinical practice: Endometrial Biopsy, Sterile Water Papules, Hands and Knees Birth Position Hand Maneuvers, and Squatting or Supported Squat Birth Position Hand Maneuvers. Although Norplant has been removed from the market, the removal procedure was retained as there are still women who have the implants. All chapters, references, and bibliographies were meticulously scrutinized and comprehensively updated to reflect both expansion and evidence-based changes in our practice.

The book has more than doubled in size (a combination of page size and number of pages) since first published in 1980. The number of chapters has increased from 57 to 82. The preface and acknowledgments to each of the previous editions are included for historical purposes.

As with earlier editions, the comments and suggestions of readers are encouraged.

Finally, the fourth edition is the last edition of this book that I will author. The continuity and future of this book has been ensured by the two coauthors with whom I worked on this edition and who henceforth will be the authors of the book. They not only meet but exceed my requirements of having compatible clinical and educational philosophy with that upon which this book is structured, imposing expertise in clinical practice, exquisite writing and editorial talent, and absolute integrity in their work.

Helen Varney Burst
New Haven, Connecticut

Acknowledgments

The fourth edition has been a time of transition from a book with a single author to a book with three co-authors and preparing for two co-authors in the future. This enabled Helen Varney (HV) to take Jan Kriebs (JK) and Carolyn Gegor (CG) through the endless details and decisions of the entire process of book publishing from contract through writing, working with contributing authors, editing, copyediting, page proofs, front matter, permissions, art work, marketing, and relations with all the helpful people at Jones and Bartlett Publishers.

We want to thank all the contributing authors, some of whom comprehensively updated their chapters and others who authored new chapters which assured expansion of the book to cover all facets of the scope of our practice. All wrote magnificently and we are so proud and pleased to have them sharing their knowledge and expertise in this book that represents our profession. Five contributing authors responded with commitment and grace to personal requests for help in meeting formidable deadlines relatively late in the process and to them we are especially grateful: Mary Brucker, Karin Cadwell and Cindy Turner-Maffei, Bill McCool, and Carol Wood.

Each of us had the support of family, friends, and colleagues, without whom the book would never have been completed. HV expresses heartfelt gratitude to Margaret-Ann Corbett, CNM, MS, JD who has supported, encouraged, and enabled me to write the book through all four editions. In the end, it was Margaret-Ann who convinced me that I had to write the book one last time in order to facilitate an effective and fair transition. She then provided me with knowledgeable and wise counsel throughout, and the time, space, and sanity that I needed to do the work. Margaret-Ann's contributions to the book through the years defy an adequate thank you. I am also grateful to my brother and sister-in-law, T. William Varney, BS, CPA and Laura E. Varney, PhD for providing back-up dog walking and meals in Maine, and who gave of themselves and respected my need for time; to Catherine L. Gilliss, RN, DNSc, FAAN, Dean of the Yale University School of Nursing, for supportive understanding; and to my friends, family, and colleagues who sacrificed time together over and over again in order for me to work on the book.

JK expresses gratitude to my current and former partners at the University of Maryland: Carolyn L. Gegor, CNM, MS, FACNM, Mary E. Curran, CNM, MPH, Lisa McCullum, CNM, MSN, MPH, Jenifer Fahey, CNM, MSN, MPH, Rachel K. Payne, CNM, MS, IBCLC, Jennifer Kaye, CNM, MSN, and to Linda Sparks, our administrative secretary, all of whom made space in our practice for this book to grow. I am also grateful to Carol Snapp, CNM, MSN, who willingly reviewed and commented on material for me, and to Tekoa King, CNM, MPH and Lisa Summers, CNM, DrPH for their continual support this last year. Finally, I owe a great debt to my family: David, Rob, and Juniper, each of whom contributed time out of our lives so I could learn how to write a book, and then do it. Many thanks to each of these and all the other midwives and friends who believed I could do this.

Although my name (CG) appears as co-author, it is truly the work and love and support of so many people that has made this possible. I have to start with my husband, Andy, and daughters, Stacey and Brittany, whose love and support have sustained me and continue to make my life glow. I am grateful to my parents, Gordon and Sylvia Pearson who have always believed in me. The path that led me to this book began at Johns Hopkins under the mentoring of Lisa L. Paine, CNM, DrPH, FACNM and Timothy R. B. Johnson, MD who showed me the value of teaching, writing and mentoring as a means of improving the care for many women and babies, far beyond those I could actually care for myself. The midwives with whom I practiced: Lisa Summers, CNM, DrPH, Aileen MacLaren, CNM, DrPH, Jan Kriebs, CNM, MSN, FACNM, Emily DeFerrari, CNM, Mary Curran, CNM, MPH, Lisa McCullum, CNM, MSN, MPH, Jenifer Fahey, CNM, MSN, MPH and Rachel Payne, CNM, MS,

IBCLC have all taught me so much and were supportive of creating opportunities to care for women as well as to teach midwives, nurses, medical students, and residents the ways of midwifery. Linda Sparks has always provided invaluable administrative support. Thank you to each one.

We wish to express special thanks to the incredible team at Jones and Bartlett Publishers. First and foremost, we thank Penny Glynn, RN, ANP, PhD our editor who simultaneously cajoled and cared for us while unfailingly facilitating our efforts to get this book done; Karen Zuck, associate editor, who was always helpful but particularly invaluable with the permissions; Amy Rose, production editor, who was always open to author ideas and helpfully clear about what could and could not be done, Jenny McIsaac, production assistant, who carefully reviewed all the work and had endless essential questions and exhortations; Stephanie Magean, copyeditor, whose willingness to be simpatico with the author makes working with a copyeditor a pleasant experience; Joy Stark-Vancs, associate marketing manager, who sees involvement of authors as critical in the marketing process; and although not as directly involved in this edition, it was good to know that we had the continuing interest and support of Clayton Jones, CEO. Underlying their efforts is the philosophy of Jones and Bartlett to involve authors in all stages of production. This results in a real working relationship and partnership.

A number of people helped with specific aspects of the book. There were those who were helpful in offering suggestions, acting as a sounding board, and contributing information at just the right times: Mary Curran, CNM, MPH, Kathryn Kravetz, SNM, MSN, Lisa McCullum, CNM, MSN, MPH, Lisa Paine, CNM, DrPH, FACNM and Johanna K. Rizzardini, CNM, MSN. As with each edition of the book, Phyllis Long, CNM, MPH wrote helpfully, this time with commentary from students at the Institute of Midwifery, Women, and Health that raised our consciousness in the use of words. Proofreading was done by the co-authors and by Margaret-Ann Corbett, CNM, MS, JD, who did the majority of this work, Donna Diers, RN, PhD, FAAN, who saved the day at one critical point, Teresa Marsico, CNM, MEd, FACNM, and T. William Varney, BS, CPA. Grateful thanks to each. Margaret-Ann and Donna have the distinction of having done proofreading for all four editions of the book.

Carolyn Gegor and Jan Kriebs are indebted to Helen Varney Burst for giving us the honor, opportunity, and mentoring to participate in this book. Thank you for entrusting us with the profound responsibility to further the art and science of midwifery through this book.

Finally, we wish to thank all of the midwifery students with whom we have worked during our professional lives. It is from our students that we have learned, been stimulated, and renewed our commitment to midwifery and to the constant search for knowledge.

HVB
JK
CG

Preface to the Third Edition

The third edition of this book marks a time of change and expansion in the profession. This change and expansion is reflected in the title and in the size of the book. The change in the title from *Nurse-Midwifery* to *Midwifery* reflects the recent actions of the American College of Nurse-Midwives and the ACNM Certification Council, which assumed responsibility for setting the standard for the practice of midwifery in the United States through the credentialing mechanisms of accreditation and national certification of both nurse-midwives and non-nurse-midwives.

The practice of midwifery in the United States has expanded and now entails the provision of primary care to women from puberty through senescence, including the maternity cycle and primary care of the well newborn. Thus, this edition of the book involved extensive rewriting, with significant changes in wording, the expansion of existing chapters, and the addition of several new chapters of content as well as the updating that largely comprises a revision. All chapters and bibliographies have been critically scrutinized and updated. Content has been expanded, added, or deleted as indicated.

What was Part IV on Management of the Interconceptional Period in the first and second editions has been renamed Health Care of Women and appears as Part II in the third edition. Many of the new chapters are in this section. This section also contains a chapter on primary care, which includes new and expanded material on the definition of primary health care of women; basic gynecologic care with an emphasis on the diagnosis and treatment of vaginitis/cervicitis and sexually transmitted diseases; pelvic inflammatory disease; Pap smears; diethylstilbestrol (DES) exposure; toxic shock syndrome; and premenstrual syndrome. The family planning methods in this section have been updated and expanded to include more natural methods of family planning, a chapter on long-term hormonal contraception, and information on emergency postcoital contraception.

The second edition added a chapter on out-of-hospital birth settings; the third edition takes the additional step of integrating all practice settings throughout the book. The second edition was in press just before the HIV/AIDS epidemic was generally recognized. The topics of HIV/AIDS and universal precautions are integrated throughout the third edition, in addition to being covered in depth in new chapters on the health care of women with HIV/AIDS and on universal precautions. Other new chapters address the full scope of practice of the midwife: preconception care, women and exercise, gynecologic and obstetric care of lesbian and bisexual women, substance abuse, midlife health, fetal assessment, Norplant insertion and removal, inserting an intrauterine pressure catheter, attaching a fetal scalp electrode, and circumcision. Kate McHugh has totally rewritten all the chapters in Part V on Newborn Care and added a new chapter on the primary care of the newborn in the first six weeks.

All told, the book has almost doubled in size (a combination of page size and number of pages) since the first edition was published 16 years ago. The preface and acknowledgments to the first and second editions are included in the third edition. I kept them in not only for historical purposes but also because in them I articulated why this book was originally written and the educational principles and beliefs on which this book is based. As always I welcome the comments of readers, including suggestions that will enable me to better meet the needs of our students, our colleagues, ourselves, and our profession in this book.

Acknowledgments

The third edition is the product of many helping hands. I am going to run the risk of naming them because I believe that contributions should be acknowledged publicly and because the third edition is truly the effort of a large number of people who believe in the book and its contribution to our profession. I hope not to offend anyone by unintended oversight. The contribution of each was invaluable.

The third edition would not have been written were it not for my friend Margaret-Ann Corbett, CNM, MS, JD. It was Margaret-Ann who saw me through the death of both of my parents, five major surgeries, and almost two years of daily occupa-

tional therapy for my right elbow and hand since the last edition of this book. Just as I began to feel my energy returning, Margaret-Ann spoke with me quite seriously about her concerns that the book was now out of date and what this could mean to the profession that I love so much. Throughout the subsequent year and a half it has taken to write the third edition, Margaret-Ann has provided continuous support, encouragement, wise counsel, and a sane balance in my life as well as help with obtaining permissions and proofreading. I am deeply grateful for all.

The Guardian Angels of *Varney's Midwifery, Third Edition* was what I named a group of Air Force nurse-midwives at Andrews Air Force Base. In addition to Captain Nancy Lachapelle, CNM, MS, the Squadron Leader of the Guardian Angels, the core group consisted of Lieutenant Colonel Debra Erickson-Owens, CNM, MS, Lieutenant Colonel Colleen Gutierrez, CNM, MS, Lieutenant Colonel Dorothea Morris, CNM, MS, and Major David Padd, CNM, MS. Major Marsha Atkins, CNM, ND was an early member of the group prior to being transferred to another Air Force base, and Major David Kutzler, CNM, MS joined the group in time for proofreading. Nancy wrote me a letter on behalf of the group, none of whom I knew, to volunteer their services in whatever way would be helpful to get out the third edition. The timing of her letter was shortly after Margaret-Ann's motivating talk, and after ascertaining the group's expectations and altruistic motivations, I took them up on their offer. The Guardian Angels, under Nancy's tutelage, divvied up and did the painstaking work of reading the entire second edition word for word and marking it for additions, deletions, changes, and updating. They then did the leg work of library research. With each chapter they sent copies of the latest articles and book references pertinent to the topics they believed needed to be changed, updated, or added. I wrote a large part of the third edition last summer in my home far down east on the coast of Maine a long way from any university libraries for health care professionals. The writing would not have been possible without the work of the Guardian Angels. Two of them, Nancy Lachapelle and Colleen Gutierrez, also drafted new chapters that I had requested and became coauthors on them with me. The Guardian Angels were unfailingly willing, cheerful, and on-time productive. All I had to do was ask and they would respond on a moment's notice to horrendous deadlines; the last time was for proofreading. How does one say thank you to guardian angels? But thank them I do, not only for the work they did for the book but for the fun I've had in getting to know them.

There are several authors to thank for new chapters in the third edition. In previous editions the only chapters totally written by someone other than me were the chapters on the newborn. If I thought something needed to be added to the book that I didn't know how to do, I learned it so I could write about it from experience, as I did with out-of-hospital birth, uterine exploration, and manual removal of the placenta for the second edition. This was not possible for the third edition. It was clear to me that I could not claim to be an expert in all the facets of nurse-midwifery practice that needed to be included in the third edition. I sought out the experts, and each responded with alacrity to my call for help without even asking about contracts or payment; their only interest was to contribute to the profession through writing for the third edition. I thank each of them—Sue Andrews, CNM, MAT, MSN; Ann Cowlin, MA, CSM; Vivian Lowenstein, CNM, CRNP, MSN; Nancy Jo Reedy, CNM, MPH; Mary Ellen Rousseau, CNM, MS; Carolyn Gegor, CNM, MS, RDMS, and Jan Kriebs, CNM, MSN; and Christina Krutsky, CNM, MSN, Jennifer Foster, CNM, MPH, Nina Kleinberg, CNM, MSN, Anne Morris, MD, and Kathleen Singleton, RN, MPH not only for their magnificent contributions but also for their support, unhesitating willingness, and the pleasure of working with them on their chapters.

A special thank you goes to Nancy Reedy, who came to Maine to coauthor Chapter 21 on antepartal complications with me. Nancy also wrote a new chapter on substance abuse, reviewed the old chapter on intrapartal complications to suggest revisions and put me in touch with Linda Bertucci, and through it all kept saying, "Helen, just tell me what you want me to do and I will do it for you." Working with Nancy was a happy time of reliving old memories, making new ones, being productive, and knowing that the new tables in Chapter 21 would be the type midwives would copy to put in their pocket clinical notebooks.

Linda Bertucci more than lived up to Nancy's recommendation and I am grateful for Linda's revision of the section in Chapter 25 on abnormal fetal heart rates and patterns. I am also grateful to Pat Paluzzi, CNM, MPH for sharing materials and for her help in integrating content on domestic violence.

My other visitor to Maine for the purpose of writing was Kate McHugh, CNM, MSN, author of all the chapters on the newborn. Kate told me that rewriting the neonatal chapters (in contrast to revising the previously written neonatal chapters for the

second edition) gave her the wonderful feeling of writing in her own voice. And a wonderful voice it is. Thank you, Kate, for elegant writing; shared purpose, values, and experiences; and friendship throughout.

In addition to my collection of books and the work of the Guardian Angels, two other people made my writing life in Maine possible without immediate access to a library. Thanks go to Mary Brucker, CNM, DNSc, who generously shared the results of her life-long habit of clipping and filing articles by sending me her most recent article files and the references for the educational modules in the Parkland School of Nurse-Midwifery. The other thank you goes to Mary Angelotti, MLS, MS, librarian in the Yale University School of Nursing Wiedenbach Reference Room, whose helpfulness was as close as my telephone and fax machine.

It was a special treat to work with an old friend separated by distance, Carmela Cavero, CNM, MS, FACNM, as coauthor of the chapter on natural methods of family planning. I had asked Carmela to review the old chapter and tell me honestly what she thought. She did and became coauthor of the chapter, for which I am grateful.

I am deeply grateful to Barbara Decker, CNM, EdD, FACNM, Director of the Yale University School of Nursing Nurse-Midwifery Program, for her caring, unfailing support, understanding, and positive reinforcement, and to Judy Krauss, RN, MSN, FAAN, Dean of the Yale University School of Nursing, for her continuing support, thoughtfulness, good humor, and generosity of time. Special thanks are due to Yale University School of Nursing faculty member Carrie Klima, CNM, MSN, who was the official photographer and spent hours taking and retaking pictures to satisfy not only her own but my and the production editor's demanding eyes. Yale University School of Nursing faculty Heather Reynolds, CNM, MSN, Mary Ellen Rousseau, CNM, MS, and Leslie Robinson, CNM, MSN and their patients posed for Carrie's camera lens, as did Yale University School of Nursing students Candice Becker, RN, SNM, MPH, Julianne Seymour, RN, BA, MSN, and Michelle Sullivan, RN, SNM, BSN. Thanks to all.

Several other CNMs also contributed to the effort to obtain pictures and figures in the book: Mary Bradish, CNM; Connie Breece, CNM, MSN; Mary Ellen Galante, CNM, MSN; Susan Thomforde, CNM, MSN; Susan Ulrich, CNM, DrPH; and Deanne Williams, CNM, MS. Henrietta Clews, CNM, MSN, Pat Cross, and Lucille Madri, AS, contributed in circumscribed but significant ways. Grateful thanks to each.

Toward the end, when every day meant a delay in when the book would be available, I traveled with page proofs to Palm Desert, Washington, D.C., and Maine seeking help from members of the ACNM Division of Accreditation Governing Board and Board of Review as well as from the Guardian Angels, Yale University School of Nursing faculty and students, family, and friends. Proofreading was done by Mary Brucker, CNM, DNSc; Nancy Clark, CNM, PhD; Margaret-Ann Corbett, CNM, MS, JD; Barbara Decker, CNM, EdD, FACNM; Jeanne F. DeJoseph, CNM, PhD, FAAN; Donna Diers, RN, MSN, FAAN; Theresa Gesse, CNM, PhD; Lieutenant Colonel Colleen Gutierrez, CNM, MS; Betty Hilliard, CNM, PhD, FAAN, FACNM; Carrie Klima, CNM, MSN; Major David Kutzler, CNM, MS; Captain Nancy Lachapelle, CNM, MS; Teresa Marsico, CNM, MEd, FACNM; Lieutenant Colonel Dorothea Morris, CNM, MS; Kristin Murray, RN, SNM, BA; Major David Padd, CNM, MS; Nancy Jo Reedy, CNM, MPH; Kelly Riordan, RN, SNM, BA; Betty Schlatter, CNM, PhD; Elizabeth S. Sharp, CNM, DrPH, FAAN, FACNM; Lara Slattery, BA; Gwen Spears, CNM, MSN, FACNM; and John Varney, BS, MBA. A heartfelt thank you to each.

One of the joys of the third edition has been my association with Jones and Bartlett Publishers, the new publishing company for the book. Their welcoming inclusion and philosophy of involvement of the author in all stages of production; eager willingness to listen and understand the complexities of our profession; and overall class act have been deeply appreciated. I thank all with whom I have been involved at Jones and Bartlett but wish especially to thank Clayton Jones, Mary Sanger, and Jan Wall. Jones and Bartlett's philosophy was shared by Lifland et al., Bookmakers, to whom Jones and Bartlett contracted the copyediting. Special thanks to Quica Ostrander who reversed my residual horror from the second edition with her very fine comprehensive copyediting and continuing communication throughout.

Finally, I thank all those who spoke to me with comments or suggestions to improve the book. Two wrote thoughtful and specifically detailed letters: thanks to Phyllis Long, CNM, MPH and to Paula Stephens-Bibeau and the 100th graduating class from the Frontier Nursing School of Midwifery.

Truly this has been a book from the profession to the profession.

Helen Varney Burst
New Haven, Connecticut

Preface to the Second Edition

The First Edition of this book reflected the basic practice of nurse-midwifery in the United States. The Second Edition addresses the full scope of nurse-midwifery practice in the United States, thereby adding the two ends of a continuum that extends from home birth to collaborative management of high-risk patients with physicians in tertiary medical centers.

The process of addressing the full scope of nurse-midwifery practice entailed a rethinking of the philosophy and definition of nurse-midwifery. A commonly held viewpoint is that nurse-midwifery is the management of the health care of *only* normal, or essentially normal, women. A review of our history is instructive because it is quickly obvious that nurse-midwifery was never limited to "normal" or "low-risk" childbearing women. The women in the remote areas of the Kentucky mountains in 1925, or in the Madera County, California project, or in Mississippi, or in the city hospitals of New York City, or any of the number of other underserved areas where nurse-midwives have reduced perinatal and infant mortality and prematurity rates and increased birth weights, were high-risk, or at-risk, and rarely low-risk. The education of nurse-midwives has always emphasized screening for the earliest possible signs and symptoms of an existing or developing complication. The profession has unshakably believed that nurse-midwives must work in a health care system that provides for physician consultation, collaboration, and referral. Such emphasis on screening and relationships with physicians clearly reflects concerns emanating from working with at-risk or high-risk populations from the beginning of our profession in the United States.

In the days when nurse-midwives worked only with underserved, and therefore at-risk or high-risk, populations, it was assumed that the nurse-midwife managed the care of the woman as long as she was essentially normal, consulted when there was any evidence of complications, and continued to care for the woman in a collaborative relationship with the physician. It was always entirely possible that if a woman remained essentially healthy that she would never see a physician. This did not deny, however, the role of the nurse-midwife in contributing to the collaborative management of at-risk or high-risk patients if they developed complications nor the focus of the nurse-midwife upon those aspects of childbearing which are normal in any woman, regardless of how complex her obstetric care becomes.

It was not until nurse-midwifery included the private patient sector in the early 1970s that nurse-midwives began taking care of women from an essentially healthy, largely normal or low-risk population. Many of these women were seeking health care that involved them and their families in knowledgeable participatory decision making and which supported natural, normal processes. They found this in the care given by nurse-midwives. Some of them were disenchanted with technology and displeased with routine hospital maternity care. Nurse-midwives responded by being advocates for the women (both normal and complicated) who remained within the hospital health care system and by providing care to carefully screened, normal childbearing women in out-of-hospital settings.

Being able to work with a variety of populations has meant that some nurse-midwives focus on one or another of these populations and thus apply the basic practice of nurse-midwifery to either end of the continuum. Those who work solely with a middle/upper class, educated, healthy population in an out-of-hospital setting have a different world view of the practice of nurse-midwifery than those nurse-midwives who work solely with a lower socioeconomic, complicated population in a tertiary medical center. This has led at times to a sense of dichotomy or of nurse-midwives on either end of the continuum being out of harmony with either accepted practice or with our basic definition. Not true. Our history encompasses the care of women in all settings. Our focus on normal does not define or limit our patient populations; it simply defines our area of expertise regardless of the population.

This edition of *Nurse-Midwifery* thus adds the two ends of the continuum. Chapter 20 is a new

chapter which focuses on out-of-hospital birth and the responsibilities of both the consumer and the nurse-midwife in that setting. At the other end of the continuum Chapters 9 and 14 on antepartal and intrapartal complications have been completely rewritten and expanded to reflect the contribution the nurse-midwife makes to the collaborative management of complicated patients. These two chapters also add topics not included in the First Edition such as size/dates discrepancy, small-for-dates, large-for-dates, postdates, oligohydramnios, preterm labor, etc. Chapters 57 and 58 on manual removal of the placenta and intrauterine exploration were added because of recognition that these are essential skills for a nurse-midwife to know in any setting in the event of an emergency. This led to changes in Chapters 17 and 19 on the management of third and fourth stage hemorrhage.

All chapters and bibliographies have been critically scrutinized, updated, and content expanded, added or deleted as indicated. I made a deliberate last-minute decision to retain the chapter on intrauterine contraceptive devices (Chapter 31) after they were removed from the market because (1) some women we care for still have them, (2) some Certified Nurse-Midwives practice in other countries where they are still available, and (3) I believe they someday once again will be available in the United States and we need to have that knowledge. The removal of Nisentil from the market did not happen until too late to make changes in Chapter 12. The dedication, preface, and acknowledgments to the First Edition were retained for historical purposes and because the purpose of this book and the educational principles used in its writing have not changed and are articulated in the preface to the First Edition.

Once again I welcome comments from readers including suggestions "which will enable me to ever better meet the needs of our students, our colleagues, and ourselves in this book."

Acknowledgments to the Second Edition

Writing a new edition is quite different from writing the original text. The original text was based on what I knew, had practiced and taught for a number of years. I wanted, however, in the Second Edition to include some aspects of practice with which I was not as well versed. Since I refuse to write what I do not know and have not done myself, writing the Second Edition required some preparation and expansion of my own scope of practice.

I owe a debt of gratitude to four very special CNM friends who generously gave of themselves and allowed me to practice with them in their settings. With three of them I had the greatest joy and fulfillment a teacher can have: that of working with former students who now were teaching me.

My odyssey for the Second Edition began with Judy Edwards, CNM, MS, with whom I began the transition away from 20 years experience in delivery rooms in tertiary medical centers. The patients in the obstetrical practice Judy is in deliver in a Level I New Hampshire community hospital which has a nursing staff supportive of all possible alternatives and delivery positions. Judy's experienced, laid-back and honest approach provided a safe setting for me to accept the welcome challenge of learning what for me were new methods of delivery.

My education in this vein culminated with Judy Kier, CNM, MSN in her combination birth center and home birth practice, Women's Health Care Associates in Houston, Texas. Under Judy's thoughtful, analytical, and articulate tutelage I expanded my mind in the realm of alternative modalities. I also learned the basics of out-of-hospital practice. This learning is reflected in Chapter 20. A special thank you goes to Cheryl, Tom, and Ashley Marie Linn who shared their life and home birth with me and to Susan Melnikow, CNM, who completely integrated me into the experience.

Susan Wente, CNM, MPH, Director of Midwifery at Baylor Medical College/Jefferson Davis Hospital in Houston, Texas, spent precious time with me as I learned the procedures of manual removal of the placenta and intrauterine exploration (Chapters 57 and 58). What Susan has accomplished in a health care and hospital system that has the largest number of deliveries in the country is a pre-eminent model which served to remind me of the immense impact public health oriented nurse-midwifery can have.

Therese Dondero, CNM, BSN, Director of Midwifery, North Central Bronx Hospital, New York, not only shared her unique setting with me but challenged me to remember my own early teachings and to rethink, again, the philosophy, definition, and scope of practice of nurse-midwifery. She entered this soul-searching thought process with me and then joined with me in the outcome of this process by coauthoring the total rewrite and expansion of Chapters 9 and 14. She also was influential in the review and discussion of parts of Chapters 3, 15, 17, 19, 20, 57, and 58. A year and a half of driving down and up the Merritt Parkway

to accomplish this not only reinforced my enjoyment of that drive but also built a fund of shared time and thoughts with Therese which I treasure.

Kate McHugh, CNM, MSN, accepted the job of reviewing, updating, and rewriting the section on the Neonate (Chapters 21, 22, and 23). Kate is a former neonatal intensive care nurse specialist and a former Yale nurse-midwifery faculty member who taught the Neonatal Module. It was good to once again work and enjoy lively and purposeful discussion with her.

I said in the preface to the first edition that I would welcome comments and suggestions. A few wrote thoughtful and specifically detailed letters: Doris Abbott, CNM, MPH, Patricia Deibel, CNM, BSN, Helen Gabel, CNM, MSN, Mary Alice Johnson, CNM, MSN, and Phyllis Long, CNM, MSN. Into this category must also go the helpful book review written by Mary Widhalm, CNM, MS. Many other CNMs wrote or spoke to me with useful tidbits which ranged from clinical observations to missing categories in the index. Elisabeth Genley, CNM, MSN felt so strongly about the deficits of the index while a student that she became the indexer for this edition. In addition, Rochelle Kanell, CNM, MS undertook the initial critical review of Section VI (Chapter 26, 27, 28, 29, 30, and 31) to identify content that needed to be updated and added.

Samuel G. Oberlander, MD, FACOG, Assistant Clinical Professor, Department of Obstetrics-Gynecology, Albert Einstein College of Medicine, Bronx, New York, graciously reviewed the new and updated material in Chapters 9, 14, 17, 19, 57, and 58 for obstetric theoretical accuracy. Ellen Harrison, MD, Associate Director of Medicine, Montefiore-North Central Bronx Hospital Affiliation and Assistant Clinical Professor, Department of Medicine, Albert Einstein College of Medicine, Bronx, New York was critically helpful in her review of the segments on hepatitis and tuberculosis. I retain, however, full responsibility for any inaccuracies and the determination of clinical judgment presented in this book.

Friends and family again played a critical role in the writing of the book. Margaret-Ann Corbett, CNM, JD, Anne Malley-Corrinet, CNM, MS, and Jerrilyn Meyer, CNM, MS took primary care of me as a person. My parents, Theodore R. and Helene Hahn Varney, sacrificed precious time for us to be together and were unfailingly interested and encouraging.

Finally, I wish to acknowledge the editorial help of Richard Zorab, Editor in Chief, and of Elizabeth McGuire, Production Manager, at Blackwell Scientific Publications; and of Patricia Sheehan. Richard was especially supportive and facilitative when contracted copyediting proved problematic and delayed the publication of this edition by several months.

A heartfelt thank you to all.

Helen Varney Burst
New Haven, Connecticut

Preface to the First Edition

This book was written because it needed to be written. As a nurse-midwifery educator I quickly became aware of my students' frustration in trying to piece together what the practice of nurse-midwifery is from a conglomeration of American nursing and medical literature and English midwifery texts. The former was either too superficial or too much in depth with too little detail, while the latter were not always applicable to the practice of nurse-midwifery in the United States. This affected, in part, the content of this book. For example, the section on skills (Part VII) was written because the medical texts are woefully inadequate in explaining to non-physicians how to perform traditionally medical procedures. Consequently faculty in the different nurse-midwifery programs have written their own procedures or borrowed from other programs. Nurse-midwifery educators are characterized by their willingness to help each other and to share their materials with their peers. This has resulted in a sizable body of unpublished literature. What a student in any given program might actually get, however, varies considerably from program to program. The rest has been taught in the oral tradition from teacher to student, from demonstration to demonstration, from generation to generation. All have learned, and learned well, but at the price of frustration for the student and endless repetition for the teacher.

Several educational principles have guided the writing of this book. A primary one has been that learning takes place best when used. For this reason the anatomical, physiological, and psychological bases for what is being observed and the rationale for action are given together rather than in separate and discrete chapters. This has been reinforced by my belief that the nurse-midwifery management process is the core of any nurse-midwifery curriculum. I first articulated the rudiments of this process in Mississippi based in part on my observations and analyses of my own and others' thought processes when managing the care of patients. Others have since added their own interpretations. The one presented in this book is a composite drawn from many minds. Learning the nurse-midwifery management process is facilitated by basic educational principles of application and reinforcement. In turn, the design of the process is such as to foster the utilization of these basic educational principles in teaching.

This book has a definite hospital orientation, in part because this is what I know, and in part because this is where the basic education of students usually takes place. This orientation is not meant to imply any questioning of the value of out-of-hospital birth settings nor to reflect any personal reservations on my part in relation to them. Future editions of *Nurse-Midwifery* will include expanded coverage of nurse-midwifery practice in out-of-hospital birth settings, additional aspects of care during the interconceptional period, and comprehensive care of the pregnant adolescent as a specialty area.

Finally, I have designed this book so that it will be of value as a permanent reference not only to nurse-midwifery students but to all those who are involved in the care of women and of the childbearing family. I welcome comments from readers, including suggestions which will enable me to ever better meet the needs of our students, our colleagues, and ourselves in this book.

Acknowledgments to the First Edition

This book would not exist were it not for a number of helping and helpful people, some whose contributions have been highly visible and others who have been supportive in various indirect ways. There have been the many who posed for pictures, took pictures, sent pictures, sent professional literature and materials, typed, photocopied and, most of all, patiently waited. And there have been the many who have touched and shaped my life and beliefs in nurse-midwifery: from Ernestine Wiedenbach, CNM, MA, my teacher and mentor from the beginning; through nurse-midwifery faculty and staff in the institutions where I have studied; to the nurse-midwifery faculty, staff, and students at the University of Mississippi Medical Center (1969–1974); the faculty, staff, and students at the

Medical University of South Carolina (1974–1979); the faculty in the nurse-midwifery education programs I have served as a consultant; the Certified Nurse-Midwives who have shared so much with me during my terms of office as President of the American College of Nurse-Midwives; and now the faculty and students at Yale University.

There has been one person who has lived the book with me. To my friend, Margaret-Ann Corbett, CNM, MS, goes the most special acknowledgment and thank you for her never-failing encouragement, wise counsel, performance of innumerable detailed tasks, and provision of a sane counterbalance to the demands of the book.

A special acknowledgment and thank you also goes to Sally Ann Yeomans, CNM, MSN, who has given much personally and professionally out of her conviction that the book should be written. This included her assuming the Chairpersonship of the Division of Examiners of the American College of Nurse-Midwives which I held, so I would have the time to write.

A very special thank you must be said to Joy M. Brands, CNM, MPH, who rescued me and the book at one low point by volunteering to write the Neonatal section. She enlisted the aid of Mary J. Banigan, RN, PhD in that project and the results are Chapters 20, 21, and 22. They were assisted in their endeavors by Sally Ann Yeomans.

A number of professionals reviewed parts of the book. Foremost among these is Henry A. Thiede, MD, FACOG, Professor and Chairman, Department of Obstetrics-Gynecology, The University of Rochester School of Medicine and Dentistry and Strong Memorial Hospital. He reviewed the entire book for medical accuracy always with ready willingness and a prompt response. Alfred W. Brann, Jr., MD, FAAP and Linda Book, MD, FAAP, reviewed the section on the Management of the Newborn. Agnes Higgins, CM, BSc, PDT, FRSH, LLD, Executive Director of the Montreal Diet Dispensary, reviewed Chapter 8. Helen E. Browne, CNM, ScD (Hon.), CBE, Aileen Hogan, CNM, MA, Ruth Lubic, CNM, PhD, Agnes Reinders, CNM, MS in NEd., and Ernestine Wiedenbach, CNM, MA, reviewed parts of the first two chapters. Margaret-Ann Corbett, CNM, MS, and Linda Wheeler, CNM, EdD reviewed other chapters throughout the book. All reviewers undertook this work at my request as personal favors and I whole-heartedly thank them all, while assuming full responsibility for any inaccuracies which may exist.

I learned a great deal about the arts from Betty Goodwin, Chief, Section of Illustration and Design, Division of Audiovisual Production, Medical University of South Carolina, who drew the original illustrations in this book, and from John Watts Clark, ARPS, Supervisor of Photograph Department, Medical University of South Carolina, the photographer who took most of the original photographs in this book. Their helpfulness and pleasant ways made my learning what is entailed in their respective fields a most enjoyable experience.

I have known several editors throughout the process of writing this book. A special thank you goes to Christopher Campbell and Martha White Tenney of Blackwell Scientific Publications, Inc., and to Eleanor Mora. Without Chris and Marty urging and helping me through the last stages of production, the book would have stopped at the point of an edited manuscript. Special thanks must be given to Donna Diers, RN, MSN, FAAN, Dean and Professor of Yale University School of Nursing, for instigating and encouraging the contacts between Christopher Campbell and myself that led to the finalization and realization of the book.

In the end it was my local friends who enabled the book to be finished. The bulk of the six hundred pages of galleys was divided up and proofread by Joy Ruth Cohen, CNM, MSN, Margaret-Ann Corbett, CNM, MS, Anne Malley-Corrinet, CNM, MS, Donna Diers, RN, MSN, FAAN, Charlotte (Pixie) Elsberry, CNM, MSN, Elizabeth Grob, CNM, BSN, and Elizabeth Cole Rogers, CNM, MN.

Finally, not least but most, I acknowledge and thank my parents, Theodore R. and Helene Hahn Varney, who have provided both personal encouragement and financial support through the years it has taken to write this book, and in whose honor I have decided to publish this book under my maiden name.

Helen Varney Burst
New Haven, Connecticut

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PART

I

Midwifery

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CHAPTER

1

The Profession and History of Midwifery in the United States

> And it came to pass, when she was in hard labour, that the midwife said unto her, Fear not . . .
>
> *Genesis 35:17*

Midwifery is as old as the history of *Homo sapiens*. Midwives are referred to in the Book of Genesis; these Hebrew midwives are the first midwives found in literature. Fulfilling its meaning of "with woman," midwifery has survived through the centuries as birth, the renewal of life, continues through the ages.

Definitions and Practice

Midwifery is an internationally recognized profession with practitioners throughout the world. The following international definition of a midwife and her sphere of practice has been accepted by the International Confederation of Midwives, the International Federation of Gynaecology and Obstetrics, and the World Health Organization:

> A Midwife is a person who, having been regularly admitted to a midwifery educational programme, duly recognized in the country in which it is located, has successfully completed the prescribed course of studies in midwifery and has acquired the requisite qualifications to be registered and/or legally licensed to practise midwifery.
>
> She must be able to give the necessary supervision, care and advice to women during pregnancy, labour and the postpartum period, to conduct deliveries on her own responsibility and to care for the newborn and the infant. This care includes preventative measures, the detection of abnormal conditions in mother and child, the procurement of medical assistance and the execution of emergency measures in the absence of medical help. She has an important task in health counseling and education, not only for the women, but also within the family and the community. The work should involve antenatal education and preparation for parenthood and extends to certain areas of gynaecology, family planning and child care. She may practise in hospitals, clinics, health units, domiciliary conditions or in any other service. [1]

In the United States, midwifery education that meets the standards of the American College of Nurse-Midwives (ACNM) goes beyond the scope of practice considered midwifery in this international definition to include the primary health care of newborns and of women from puberty through senescence [2, 3]. The ACNM defines midwifery practice as conducted by Certified Nurse-Midwives and Certified Midwives as follows:

> The independent management of women's health care, focusing particularly on pregnancy, childbirth, the postpartum period, care of the newborn, and the family planning and gynecological needs of women. The Certified Nurse-Midwife and Certified Midwife practice within a health care system that provides for consultation, collaborative management or referral as indicated by the health

> status of the client. Certified Nurse-Midwives and Certified Midwives practice in accord with the *Standards for the Practice of Nurse-Midwifery*, as defined by the American College of Nurse-Midwives. [4]

The ACNM further states that "the education and preparation of CNMs/CMs described in the ACNM Core Competencies, qualify them to practice in a variety of settings including hospital, home and birth center" [5].

The ACNM defines a Certified Nurse-Midwife (CNM) as "an individual educated in the two disciplines of nursing and midwifery, who possesses evidence of certification according to the requirements of the American College of Nurse-Midwives" [6] and a Certified Midwife (CM) as "an individual educated in the discipline of midwifery, who possesses evidence of certification according to the requirements of the American College of Nurse-Midwives" [7].

Certification is conferred upon an individual who has met eligibility requirements for and successfully passed the national certification examination of the ACNM Certification Council, Inc. (ACC). Certification gives official recognition to an individual who has met professional standards for safe practice. This certification both protects the public and differentiates the well-educated, highly prepared ACC Certified Nurse-Midwives or ACC Certified Midwives, and their broad scope of practice, from other types of midwives.

Beliefs Characterizing Midwifery

A number of beliefs are central to midwifery practice and characterize the health care given by midwives. Collectively, these beliefs and their implementation comprise the midwifery model of care. These beliefs include facilitation of natural processes and nonintervention in these normal processes unless indicated; continuity of care; promotion and implementation of family-centered maternity care; advocacy for the woman and her rights and responsibilities; education of women for knowledgeable participation and decision making in their health care and for understanding their bodily processes; promotion of health care, disease prevention, and the reduction of maternal and infant mortality and morbidity; the role of the midwife within the community; and the contribution of the midwife within the health care system. These beliefs are further elaborated upon as Hallmarks of Midwifery in the ACNM *Core Competencies for Basic Midwifery Practice* [3].

The philosophy of the American College of Nurse-Midwives states beliefs that support and provide a base for the characteristics of health care given by nurse-midwives:

> Certified Nurse-Midwives believe that every individual has the right to safe, satisfying health care with respect for human dignity and cultural variations. We further support each person's right to self-determination, to complete information and to active participation in all aspects of care. We believe the normal processes of pregnancy and birth can be enhanced through education, health care and supportive intervention.
>
> Nurse-midwifery care is focused on the needs of the individual and family for physical care, emotional and social support and active involvement of significant others according to cultural values and personal preferences. The practice of nurse-midwifery encourages continuity of care; emphasizes safe, competent clinical management; advocates nonintervention in normal processes; and promotes health education for women throughout the childbearing cycle. This practice may extend to include gynecological care of well women throughout the life cycle. Such comprehensive health care is most effectively and efficiently provided by nurse-midwives in collaboration with other members of an interdependent health care team.
>
> The American College of Nurse-Midwives (ACNM) assumes a leadership role in the development and promotion of high quality health care for women and infants both nationally and internationally. The profession of nurse-midwifery is committed to ensuring certified nurse-midwives are provided with sound educational preparation, to expanding knowledge through research and to evaluating and revising care through quality assurance. The profession further ensures that its members adhere to the Standards of Practice for Nurse-Midwifery in accordance with the ACNM philosophy. [8]

Individual CNMs and CMs also articulate these beliefs when writing their practice or service philosophy or presenting to the public or teaching students. Nancy Fleming captured the spirit and substance of a discussion in 1993 by the ACNM Board of Directors of the elements that distinguish midwifery when she wrote *The Heart of Midwifery*:

> The heart of midwifery care for women and newborns lies more in the nature of that care than in its specific components. Midwifery practice has a firm foundation in the critical thought process and is focused on the prevention of disease and the promotion of health, taking the best from the disciplines of midwifery, nursing, public health, and medicine to provide safe, holistic care.
>
> Midwives are partners with women in the provision of health care, engaging in a dynamic reevaluation of each woman's unique health needs.
>
> Midwives would rather nurture a woman's progress with hands-on care than diagnose her problems from afar,
> . . . rather listen than lecture,
> . . . rather teach a health principle than treat an illness,
> . . . rather empower a woman to join in decision-making than decide for her,
> . . . rather urge her to speak for herself than to be her advocate,
> . . . rather instill a woman with trust in her body than demonstrate the midwife's technical proficiency
> **although midwives will do all these things when necessary.**
>
> Midwifery is a profession born of a woman's vision, nurtured in an understanding of women's developmental phases, and committed to assuring women in all populations that it is their birthright to be part of this unique care. [9]

These beliefs have had practical application throughout the history of nurse-midwifery in the United States. Through the Maternity Center Association in New York City, nurse-midwives were active in the 1930s in the provision of prenatal care and were in the forefront of the early movements in the 1940s related to family-centered maternity care, natural childbirth, preparation for childbirth and parenthood, inclusion of fathers or significant others in hospital labor and delivery rooms, and rooming-in.

Early History

The history of midwifery in the United States, for the purposes of this book, begins with the arrival of colonists in the New World. Midwives were among the first women to settle the colonies. Although surely there were midwives among the Native Americans, their history is as yet generally unknown and unresearched.

Midwives were considered vital to colonial community life and were treated with dignity. Special courtesies were extended to midwives, and arrangements were made to provide them with housing, land, food, and salary as payment for their services. This information is noted in town records and charters of the mid-seventeenth century. Midwifery was just one of many health care contributions colonial midwives made to the community. Often they also functioned as nurses who tended the sick and the dying and prepared the body after death, herbalists, and veterinarians.

During the nineteenth century, pioneer women crossed the plains in covered wagons, followed the Oregon and Sante Fe trails, settled the "Wild West," and bore children with the assistance of other women in the wagon trains, forts, or settlements who functioned as midwives in the situation [10]. Mormon history documents the honorable role and heroic functioning of midwives during their trek from Illinois to Utah in 1846 and 1847.

Despite the initial honor accorded midwives in the colonies and their importance to other segments of the population through the years, a series of factors reduced midwifery from a respected profession to one in disrepute by the early twentieth century. These factors included religious attitudes, economic demands, replacement by physicians, inadequate education, a lack of organization, an influx of immigrants, and the low status of women.

Factors Leading to Disrepute

Religious factors plagued midwives from the beginning. Most of the early midwives came from England, where in the seventeenth century the licensing of midwives took place under the auspices of the Church of England. Criteria were moralistically judgmental; they emphasized good character and granted the ability to denounce sins and to baptize. The midwives' oath included a vow to pressure the mother into naming the true father. The results of such actions were not always appreciated. On the other hand, in the Puritan communities midwives were often suspected of witchcraft, especially if a malformed baby was born.

By the early eighteenth century, compensation was not always adequate for the midwife; practic-

ing midwifery was no longer economically feasible. This was especially true in the rapidly growing towns and cities. There was no organization or authority to establish guidelines for fees.

In European society in the late eighteenth century, it was fashionable to have male midwives (physicians) for lying-in. This trend soon crossed the ocean, where physicians capitalized on it. Fox offers this analysis of the historical roots of antipathy toward the midwife:

> As the practice of medicine became highly competitive, physicians and medical students were advised that their presence at a delivery would insure the entire family as grateful patients thereafter. For example, the outspoken and highly influential Dr. Walter Channing, of Harvard, objected strongly to the practice of midwifery by women in his "Remarks on the Employment of Females as Practitioners in Midwifery," (1820) and pointed out that "Women seldom forget a practitioner who has conducted them tenderly and safely through parturition—they feel a familiarity with him, a confidence and reliance upon him which is of the most essential mutual advantage.... It is principally on this account that the practice of midwifery becomes desirable to physicians. It is this which ensures to them the permanency and security of all their other business." [11]

Male physicians thus replaced female midwives.

The eighteenth and nineteenth centuries mark a time of rapid development in medical and nursing science and of discoveries and teaching pertinent to obstetric practice. These developments included the end of the Chamberlen family secret of forceps and the refinement of these instruments, technical advances that decreased the risks involved in cesarean section, pioneering efforts in obstetric anesthesia, conquest of puerperal fever, emergence of modern nursing in the 1860s, and inclusion of obstetrics in medical practice. Physician promises of relief from pain during childbirth, the use of chloroform by Queen Victoria during childbirth in 1850, the corresponding evolution of understanding the nervous system with the development of spinal methods of analgesia and anesthesia [12], the need for women receiving obstetric analgesia and anesthesia to be in the hospital, and the lack of access to hospitals by midwives all contributed to the decreased use of midwives.

The observations and teachings of William Smellie (1697–1763), who developed teaching manikins and kept meticulous records of his patients, identified the mechanisms of labor and refuted any number of myths and misconceptions. The anatomical studies of William Hunter (1718–1783) included discoveries pertaining to the lymphatic system, placental circulation, and pregnant uterus. William Shippen, Jr. (1736–1808), the first lecturer on obstetrics, and Samuel Bard (1742–1821), author of the first American textbook on obstetrics, are credited with promoting obstetrical teaching in the United States. All made measurable contributions to the science and art of obstetrics.

These developments, new knowledge, and teachings were not accessible to the midwife because of the relative isolation of midwives from one another and the lack of schools, national organizations, journals, legal recognition, or other means of communication among midwives. Any one of these structures would have provided a channel for learning. Without them, the knowledge and practice of the midwife became sadly out-of-date while medicine advanced and modern nursing began.

The Industrial Revolution at the end of the nineteenth century brought an influx of immigrants from a number of European countries who formed pockets of cultural communities within cities. Each such community had its own midwives who came from the "old country." The vast majority were well-prepared midwives in their own country [13] but had the combined problems of not speaking English and not having access to the existing health care system. Their African-American counterparts in the rural South also could not gain access to the health care system and were poorly educated because of racism. These "granny" midwives frequently passed the practice of midwifery from mother to daughter, learned through experience, and relied heavily on patience, home remedies, and prayer, as these were the only resources available to them and the women they served. Lack of licensure, organization, and formal education programs also contributed to preventing both the urban immigrant midwives and the black rural South midwives from being a part of the official health care system.

The low status of women in general at the beginning of the twentieth century affected the work of midwives. Norma Swenson, in her analysis of social factors affecting the history of midwifery in the United States, makes the following comments:

> But the final and I think more significant point was that the status of women at the turn of the century was at a particularly low ebb. At that point in time women were regarded as economically exploitable but at the same time socially and politically incompetent, in the sense that they were perceived as being unfit to exercise good judgment concerning their own affairs or the affairs of others, and in fact were legally prevented from doing so. Paternal domination of home and society was at an all-time high.
>
> It was then in this kind of atmosphere that midwives were outlawed and women were, therefore, in effect blamed for the appalling conditions under which mothers and babies died at that time, when in fact women were powerless to control social conditions, and coped as midwives as well as they could with circumstances which were largely the product of a man-made industrial and social revolution. [14]

These events and social factors combined by the end of the nineteenth century to create a system of health care education and service to which the descendants of the midwives in the colonies, the urban ethnic immigrant midwives, the African American rural midwives in the South, and the Native American midwives could not have access.

The Early Twentieth Century

The first two decades of the twentieth century are notable for the recognition of woefully inadequate maternity care and subsequent actions taken to improve this care and for the establishment of two organizations: the Children's Bureau in Washington, D.C. and the Maternity Center Association in New York City. Both of these agencies have had an immense influence on the development of maternal-infant health care and of nurse-midwifery.

In 1906, a study was made of maternal and infant mortality in New York City. The study, attributed to the New York City Health Department, stated that more than 40 percent of deliveries were attended by approximately 3000 "incompetent and ignorant" midwives. Although the midwives were no more responsible than the physicians for the high maternal and infant mortality rates at that time, they bore the brunt of the blame. In reality, other factors of obstetrical care contributed to maternal and infant mortality at that time:

1. The hospital was not viewed as a setting for obstetrical care, so few hospital resources were available for treatment of emergencies or complications arising during childbirth in the home (where the vast majority of deliveries took place).
2. The study of obstetrics was not an identified essential component of medical education, except in isolated teaching institutions.
3. The practice of obstetrics was virtually limited to the intrapartal and postpartal periods.
4. Few state laws applied to the licensure and regulation of midwives.
5. No organized system of education for midwives existed.

Progress in improving care was slow. In 1915, the registration of births was a requirement in only ten states. It was not until 1935 that the registration of births became mandatory in every state.

The Children's Bureau

In 1903, Lillian Wald, a nurse and founder of Henry Street Settlement and Visiting Nurse Association in New York City, suggested the formation of a federal children's bureau. President Theodore Roosevelt recommended a bill to establish such a bureau in 1909, but it was 1912 before the U.S. Congress passed a bill, which President Taft signed, establishing the Children's Bureau.

The first act of the Children's Bureau was to conduct a study of infant deaths, which, according to available statistics, produced an infant mortality rate of approximately 124 per 1000 live births. It is to the Children's Bureau's credit that in analyzing the data from its first study, the organization identified the inescapable link between infant health and maternal health during the maternity cycle. The Children's Bureau then conducted studies of maternal mortality and conclusively established the importance of early and continuous prenatal care in reducing both maternal and infant mortality. Thanks to this information, the idea of prenatal care gained respectability and the concept of health care throughout the intraconceptional period began to grow.

The Maternity Center Association

In 1915, the New York City health commissioner made another study of maternal and infant mortality. The findings of this study, which again demon-

strated the connection between mortality and lack of prenatal care, led to the formation of a plan whereby the city was zoned and a maternity center was established in each zone. The first such maternity center opened in 1917. The need for central organization quickly became evident, and the Maternity Center Association (MCA) was established in 1918. By 1920, MCA had 30 maternity centers in New York City. From this network grew MCA's first endeavors in developing teaching materials and educational exhibits for use by individuals and agencies. In 1921, the association decided to concentrate its efforts on a demonstration of providing complete maternity care in one district and to cease the scattered efforts being carried out in its many centers, although some of the other clinics were still maintained for a while longer. This decision was based on the belief that most nursing agencies and hospitals caring for families were now giving sufficient emphasis to prenatal care in their health care services.

In the meantime, MCA and the Henry Street Visiting Nurse Association collaborated on a study that illustrated the value of specialized maternity care within a generalized public health nursing program. Subsequently, MCA embarked on an intensive educational program in maternity care for the public and for professional health personnel, especially physicians and public health nurses.

MCA eventually expanded its efforts beyond New York City; it endeavored to supply information about the need for maternity care to expectant parents throughout the United States. Mother's Day was dedicated to this endeavor for several years, with an emphasis on saving mothers' lives. The mayors of cities made Mother's Day proclamations regarding saving mothers' lives, and ministers preached their Mother's Day sermons on the subject, using packets of educational materials sent by MCA.

On the basis of their demonstration of providing complete maternity care, their collaboration with the Henry Street Visiting Nurse Association, and a study of maternity care in other countries, MCA concluded that there was a need to prepare nurses to do normal obstetrics and discussed opening a school of nurse-midwifery. This idea was temporarily thwarted in the early 1920s by bitter opposition from both medicine and nursing and by a lack of cooperation from city officials.

The "Midwife Problem"

In the early twentieth century, there was a debate over what was known as the "midwife problem." The factors mentioned earlier as contributing to the disrepute of midwifery converged between 1912 and 1914 to turn the licensing and practice of midwives into a heated issue. During this time, medical schools began to include obstetrics in their curricula, and obstetrics became an established medical specialty by 1930. Obstetric care began to move out of the home into the hospital, and laws were passed to regulate the practice of the indigenous midwives. A heated debate ensued.

On one side of the debate were a majority who believed that all midwifery should be abolished; on the other side were those who believed midwives could perform a valuable function. The former feared the status midwives would gain if they achieved legal recognition and promoted the idea that improving the practice of midwives was an impossible task. Those in favor felt midwifery was practical given proper training, licensing, and supervision.

Two significant events took place while the debate raged. The first event grew out of reality. Some states had already passed laws granting legal recognition to midwives and including requirements and specifications aimed at control of their practice. These laws were passed in an effort to reduce high mortality rates, as it was evident that the medical profession could not assume the entire task of obstetric care. In the South, licensure, education, and supervision of African American midwives was facilitated by the Sheppard-Towner Act from 1921 to 1929 [15]. This legislation assigned money, administered through the Children's Bureau, for providing better maternal-infant care. Included in the Act was the specification that public health nurses should be employed for the instruction of untrained midwives.

As a result of these laws to regulate midwifery practice, several midwifery schools were established. The best known of these schools were the Bellevue School of Midwifery in New York City and the Preston Retreat Hospital in Philadelphia. The Bellevue School of Midwifery, designed to instruct indigenous midwives in meeting requirements for practice, operated from 1911 until 1935, when it was closed by order of the New York City commissioner of hospitals, a physician. In his opinion, changing social and medical standards rendered the school superfluous and an unnecessary expense to the city. To support his action, he cited a decrease in the number of midwives as deliveries in hospitals had increased to 81 percent of all births in New York City [16]. The Preston Retreat was a mater-

nity hospital founded in 1836. In 1916, a practical nurse education program was started, and in 1923 a course in midwifery was started that eventually had both practical nurses and Registered Nurses for students. Enrollment dwindled but the midwifery course continued until 1960. It is not known when RNs were first admitted to the course [17].

The second significant event was the introduction of nurse-midwives from Europe. Nurse-midwives had proved their effectiveness in European countries, where they were an established part of the health care system.

The Frontier Nursing Service

The first nurse-midwives to practice in the United States were British-trained nurse-midwives brought to this country in 1925 by Mary Breckinridge as part of her plan to provide health care for people in the remote rural areas of the Kentucky mountains. This endeavor was organized as the Kentucky Committee for Mothers and Babies in May 1925; through a change in its articles of incorporation, it became the Frontier Nursing Service (FNS) in 1928. Thus, FNS traces its history back to, and dates itself from, 1925.

Breckinridge was admirably suited for the task she undertook. Her qualifications included a family background and upbringing that gave her a wealth of influential contacts, professional preparation as a Registered Nurse in the United States and as a State-Certified Midwife in England, personal and professional life experiences, and a carefully self-designed program of observation and study of the Highlands and Islands Medical and Nursing Service in Scotland, concentrating on the Outer Hebrides with further study in England. From this background she crystallized a plan involving outpost nursing centers staffed by nurse-midwives and backed by a medical director located at a small, local, rural hospital. Breckinridge's program was to be administered by a director, overseen by an executive committee and board of trustees, and supported by local committees throughout the United States. Before the work began, a survey of births and deaths in the region where the nurse-midwives planned to work was conducted to provide baseline data for subsequent statistics and research. In her book *Wide Neighborhoods* [18], Breckinridge writes in fascinating detail of the myriad activities, people, concerns, and problems involved in bringing her plan to fruition.

The work and record of the Frontier Nursing Service (Figure 1-1) are legendary. The records kept during the earlier years were in accord with a statistical system set up by the Carnegie Corporation and tabulated by statisticians from the Metropolitan Life Insurance Company. In 1951, the FNS statistics showed that 8596 registered nurse-midwifery patients had been delivered since 1925, 6533 of whom were delivered in mostly primitive homes, with a

FIGURE 1-1 A nurse-midwife of the Frontier Nursing Service in a home in Kentucky, circa 1950. (Reproduced by permission from Frontier Nursing Service, Hyden, Kentucky.)

gross maternal death rate of 1.2 per 1000 for the 25 years studied. This rate was in contrast to national maternal mortality rates of 6.73 per 1000 in 1931, 3.76 per 1000 in 1940, and 0.83 per 1000 in 1950, or an average of 3.4 per 1000 for the same overall period of time. In addition, a comprehensive scope of health care services had been brought to the people, including general dental, pediatric, medical, and surgical services; general eye, tonsil, and worm treatment services; special tuberculosis and trachoma services; and social services supported by Alpha Omicron Pi, the national sorority of social workers, as its national philanthropic project.

World War II had a great effect on the Frontier Nursing Service, both in staffing levels and in the direction the war mandated for nurse-midwifery education at FNS. Great Britain had been both the source of British nurse-midwives working in the Frontier Nursing Service and the provider of midwifery education for U.S. Registered Nurses, who were sent to Great Britain for their education and returned to work at FNS. With the advent of war, the British nurse-midwives wanted to return to their homeland to be of service to their country. It became evident that a long-deferred plan for an educational program in nurse-midwifery had to be instituted immediately. The Frontier Graduate School of Midwifery started with a class of two students in November 1939. By the summer of 1976, 460 nurse-midwives had graduated from the school. In 1970, the school changed its name to the Frontier School of Midwifery and Family Nursing when a Family Nurse Program was begun. This program closed in 1991 and then was resurrected in 1999 as the Community-Based Family Nursing Education Program (CFNP). In the meantime, midwifery education at FNS continued without pause, and in 1989 became the Community-Based Nurse-Midwifery Education Program (CNEP).

The Frontier Nursing Service did not have, however, the first nurse-midwifery education program in the United States.

The First Nurse-Midwifery Education Programs

The Manhattan Midwifery School [19]

The first school established specifically to educate graduate nurses to be midwives was the Manhattan Midwifery School, which opened in New York City in 1925. Although the Preston Retreat course in midwifery started in 1923, it is not known when it first admitted graduate nurses in addition to practical nurses, though it is thought to have occurred some time later.

The Manhattan Midwifery School was affiliated with the Manhattan Maternity and Dispensary, a hospital specializing in maternity care. The midwifery course was initiated by Emily A. Porter, an R.N. and Superintendent of the Hospital, and placed under the jurisdiction of the hospital's School of Nursing. Plans were formulated during 1924, and there were three graduates from the four-month course in 1925. The 1927 *Annual Report of the Manhattan Maternity and Dispensary* states that "this is the only school in the country offering such a course at present." Mary M. Richardson, R.N., B.S., a public health nurse who was a graduate of St. Luke's Hospital in New York City and of Columbia University Teachers' College, studied midwifery at the Hospital for Mothers and Babies in London and became the Directress of the School of Nursing, including the course in midwifery, in 1928. Two of the 1928 graduates went to work with the Frontier Nursing Service. By 1929, the course was six months in length. The 1931 *Annual Report* noted that Mary Richardson had left as Directress of Nursing to return to public health work and that the course had ended:

> The Midwifery Course for graduate nurses started in 1925 has been discontinued during the last year as it was becoming more and more difficult to get enough District cases to take care of the needs of Medical Students.... It was the first and only Midwifery School for graduate nurses in the country. We are glad to hear that a similar one has recently been opened in New York City—The Lobenstine Midwifery Clinic to which we may refer our many applicants.

There were at least 18 graduates of the Manhattan Midwifery School [19].

The Lobenstine Midwifery School

The School of the Association for the Promotion and Standardization of Midwifery was more commonly known as the Lobenstine Midwifery School, named for one of the charter members, Dr. Ralph Waldo Lobenstine. The Association for the Promotion and Standardization of Midwifery was the creation of the Maternity Center Association in New York City. MCA was convinced of the need for nurse-midwives whose preparation would com-

bine U.S. education in obstetric nursing with the education received by the professional European midwife. Much had happened to create a more favorable atmosphere since the abortive attempt by MCA in the early 1920s to establish a nurse-midwifery education program. There was growing recognition of how obstetric conditions in the United States compared poorly with those in other countries, which had much lower mortality rates and well-organized systems of educated and supervised midwives. Publicity spread about the conclusive proof gathered by the Frontier Nursing Service of the value of a system utilizing nurse-midwives, the work of Maternity Center Association in parent education, and its demonstration with the Henry Street Visiting Nurse Association of the value of specialized maternity nursing care.

The Association for the Promotion and Standardization of Midwifery was incorporated in early 1931 by three members of the medical board of the Maternity Center Association and its general director, Hazel Corbin, R.N. Ralph Waldo Lobenstine, M.D., chairman of the medical board of MCA since 1918, was one of the charter members, as was Mary Breckinridge, director of the Frontier Nursing Service. Lobenstine worked tirelessly until his death in 1931 to bring about the establishment of nurse-midwifery services and education. The determination of the members of the Association for the Promotion and Standardization of Midwifery and the financial support of a group of 60 former patients and friends of Lobenstine led to the establishment of the Lobenstine Midwifery Clinic, Inc., in November 1931.

Organizational and administrative details of the clinic were worked out, and a curriculum was designed for the school, the latter guided by British curricula but modified to meet the needs, cultural patterns, and health care systems in the United States. Hattie Hemschemeyer, a public health nurse educator, was named director of the Lobenstine Midwifery Clinic and School. Rose McNaught, a public health nurse who had obtained her midwifery preparation in London and then returned to work at the Frontier Nursing Service, was loaned out by FNS to help develop the program and joined the Lobenstine staff as a clinician and faculty member. The school opened in September 1932 and had six graduates in 1933, including Hattie Hemschemeyer. The memorial funds that had been pledged to establish and maintain the school and clinic for three years were exhausted in 1934. Therefore, in 1934, Maternity Center Association and the Lobenstine Midwifery Clinic consolidated under the name and auspices of Maternity Center Association, which also assumed administrative and financial responsibility for the School of the Association for the Promotion and Standardization of Midwifery. Thus MCA traces the history of its school of nurse-midwifery back to 1932.

The nurse-midwifery services provided through the clinic consisted of antepartal care and patient education at the clinic, intrapartal and postpartal care in the patient's home except when hospitalization was required for medical reasons, and postpartum checkups at 14 days and 6 weeks in the clinic. Four attending obstetricians provided their services at medical clinics and round-the-clock consultation and, if necessary, were present in the patient's home for delivery. During the 26 years the Lobenstine Clinic provided clinical services (1932–1958), a total of 7099 deliveries were attended, of which 6116 took place in patients' homes. The maternal mortality rate of the clinic was 0.9 per 1000 live births, as contrasted to a maternal death rate of 10.4 per 1000 live births for the same geographic district as a whole and 1.2 per 1000 live births for a leading hospital in New York City.

The Maternity Center Association School of Nurse-Midwifery (Figure 1-2) graduated 320 students between 1933 and 1959, utilizing the services

FIGURE 1-2 A new nurse-midwifery student (Margaret Thomas) in the 1930s being greeted by faculty member Rose McNaught at the Maternity Center Association Lobenstine Clinic and School. (Reproduced by permission from Maternity Center Association, New York, New York.)

provided by the Lobenstine Clinic for educational purposes. In 1958, it moved inside a major medical and educational institution, and was established in the Downstate Medical Center, State University of New York in Brooklyn, New York; students used Kings County Hospital for clinical experience. This move was facilitated by Hazel Corbin, R.N., executive director of MCA, Marion Strachan, C.N.M., director of the nurse-midwifery program, and Louis Hellman, M.D., chairman and professor of obstetrics and gynecology at Downstate Medical Center and Kings County Hospital.

Subsequent Programs of Education

Almost all of the nurse-midwifery and midwifery education programs today that are accredited by the Division of Accreditation of the American College of Nurse-Midwives can trace their beginnings to the Maternity Center Association's School of Nurse-Midwifery because they were started by either graduates or students of graduates of the MCA program. The exceptions are the Frontier School of Midwifery and a handful of programs started by Frontier Nursing Service graduates.

There were seven nurse-midwifery education programs nationwide by the end of the 1950s. They are listed here with their starting dates, names, and locations as of 1960:

1932 School of the Association for the Promotion and Standardization of Midwifery (became the Maternity Center Association School of Nurse-Midwifery in 1934; affiliated with Downstate Medical Center, State University of New York and Kings County Hospital, Brooklyn, New York, in 1958; also includes an early affiliation of MCA and Kings County Hospital with Johns Hopkins University during 1958–1960)

1939 Frontier Graduate School of Midwifery of the Frontier Nursing Service, Hyden, Kentucky

1945 Catholic Maternity Institute School of Nurse-Midwifery, Santa Fe, New Mexico

1947 Catholic University of America, Washington, D.C. (affiliated with Catholic Maternity Institute)

1955 Columbia University Graduate Program in Maternity Nursing, New York City, New York

1956 The Johns Hopkins University Nurse-Midwifery Program, Baltimore, Maryland

1956 Yale University Graduate Maternal and Newborn Health Nursing Program, New Haven, Connecticut

Three of these programs subsequently closed: Catholic Maternity Institute (1968); Catholic University of America (1968), which had the distinction of being the first nurse-midwifery education program to be part of a master's degree program; and the Johns Hopkins University Nurse-Midwifery Program (1981). In addition to the closure of the Manhattan Midwifery School in 1931 and the Preston Retreat School of Midwifery in 1960, two other schools opened and closed during the 1940s:

1941–1946 The Tuskegee School of Nurse-Midwifery in Tuskegee, Alabama; a joint project of the Macon County Health Department, the Children's Bureau, the Julius Rosenwald Fund, Tuskegee University, and the Alabama State Department of Health. Graduated 31 students [20].

1942–1943 The Flint-Goodridge School of Nurse-Midwifery in New Orleans, Louisiana; in connection with Flint-Goodridge Hospital and Dillard University. Graduated two students [21].

The 1940s and 1950s

The early graduates from MCA went into a variety of positions, the only common denominator being their goal of improving maternity care. The majority of graduates either practiced or taught clinical nurse-midwifery in MCA or FNS programs or became involved with various aspects of public health. A number of nurse-midwives in public health went to work in state health departments in positions designed for the supervision and teaching of indigenous midwives. These positions were in keeping with an original purpose of the Sheppard-Towner Act—that public health nurses be employed for the instruction of untrained midwives. As many of the early MCA graduates were also public health nurses, they were ideally prepared for working in rural maternity care, where the majority of indigenous midwives practiced.

Other graduates held positions as maternal-child health consultants for state boards of health or within the federal bureaucracy. Still other graduates became involved in the nurse-midwifery education programs at Tuskegee Institute in Alabama and Flint Goodridge in Louisiana.

In 1944, members of the Medical Mission Sisters, a Roman Catholic order, who were graduates of the MCA program started the Catholic Maternity Institute (CMI) in Santa Fe, New Mexico. CMI long stood as an outstanding example of what could be accomplished through intera-

gency cooperation and commitment to patient care. Births took place in the home or in La Casita, the first nurse-midwifery birth center.

In the middle and late 1940s, graduates of MCA at Yale University were central in developing the concept and practice of rooming-in and in studying the effects of natural (prepared) childbirth and family-centered supportive care on a woman's antepartal, intrapartal, and postpartal experience.

The 1950s saw the development of three more educational programs by MCA graduates at Columbia University, Johns Hopkins University, and Yale University. Maternity Center Association was directly involved in initiating two of these programs (Columbia and Johns Hopkins) by sending nurse-midwives to start them. The 1950s also saw the founding of the American College of Nurse-Midwifery. The history of this professional organization is detailed later in this chapter.

In the 1940s and 1950s, there was considerable demand for nurse-midwives to serve as nursing educators in maternity nursing; to fill nursing service staff, supervisory, and consultant positions in hospital obstetrics departments; and to act as consultants in federal and international health organizations. These employment possibilities, combined with a lack of opportunities for clinical nurse-midwifery practice, created the situation in which a large percentage of the early graduate nurse-midwives did not actually practice clinical nurse-midwifery. In a 1954 survey, 147 nurse-midwives identified 426 job positions they had held since graduation. Of these 426 job positions, 27 percent had been as a staff nurse-midwife [22].

The 1960s

Opportunities to practice clinical nurse-midwifery were severely limited for a nurse-midwife graduating in the early 1960s. Only two states and one city legally recognized the practice of nurse-midwifery at that time: New Mexico, Kentucky, and New York City. Another state, Maryland, had nurse-midwives practicing under an old granny midwife law.

In brief, a graduate could join the faculty of one of the existing nurse-midwifery education programs; practice at Catholic Maternity Institute in Santa Fe, Frontier Nursing Service in Kentucky, Baltimore City Hospital and Johns Hopkins University in Baltimore, or Kings County Hospital or Cumberland Hospital in New York City; or go to an overseas mission field. A few other isolated service positions or projects existed but generally were not known or, as in the case of the Madera County project in California, offered only short-term employment by virtue of being demonstration projects. Therefore, the majority of graduates of that era went into teaching, supervisory, administrative, or consultative positions in related fields. This situation led to the need for refresher programs for nurse-midwives wanting to return to the practice of clinical nurse-midwifery when, less than a decade later, service sites in which to practice expanded rapidly.

In the late 1950s and the 1960s, nurse-midwives made a deliberate and concerted effort to get into hospitals, as that was where the majority of births (approximately 70 percent at that time) now took place. The movement of nurse-midwives into hospitals brought concepts of family-centered maternity care and a consumer advocate to childbearing women who delivered in hospitals. Nurse-midwives were now working in both in-hospital and out-of-hospital settings.

By 1967, approximately 23 percent of 468 employed nurse-midwives responding to a questionnaire [23] were actually practicing clinical nurse-midwifery. This number represented a substantial increase from the 11 percent practicing in 1963. Of the 468 employed nurse-midwives who responded to the 1967 survey, 103 (22 percent) worked in foreign countries, mostly through church missions or international health organizations. Fifty-six percent of the employed nurse-midwives were in service areas related to nurse-midwifery but were not actually practicing nurse-midwifery (working in obstetrics, pediatrics, maternal-child health programs, and public health departments as supervisors, administrators, staff nurses, head nurses, consultants, educators, and researchers); 75 percent held positions above the staff level. Of the 23 percent practicing nurse-midwifery, 35 percent were also on faculties of schools of nurse-midwifery; 53 percent gave nurse-midwifery services throughout the maternity cycle; and the remaining 12 percent functioned as nurse-midwives in one or more, but not all, of the phases of the maternity cycle.

Development of opportunities to practice clinical nurse-midwifery remained slow into the late 1960s, with a few isolated areas utilizing practicing nurse-midwives and the remaining nurse-midwives contributing to maternal-infant health care in related fields. It was not until 1968, when nurse-mid-

wives were employed in the Maternal-Infant Care (MIC) nurse-midwifery program in New York City to practice in community clinics linked with hospitals, that previously unheard-of employment opportunities for nurse-midwives to practice midwifery began to be available [24]. The first nurse-midwife to practice within the Indian Health Service was in 1969 [25].

Five nurse-midwifery education programs opened in the 1960s, four of which subsequently closed (the second date is the closing date):

1960–1981 University of Puerto Rico/Caparra Heights District Hospital
1963–1972 New York Medical College Graduate School of Nursing Nurse-Midwifery Program, New York City
1965 University of Utah Graduate Maternal-Infant Nursing Program
1966–1975 Ponce District Hospital, Ponce, Puerto Rico
1969–1985 University of Mississippi Medical Center Nurse-Midwifery Program

A number of obstacles contributed to this slow development in practice and education. Paramount among these were misconceptions and stereotypes regarding nurse-midwives. These mistaken ideas led to outright hostility by some professionals. At the same time, other professionals came to believe in and support the development of nurse-midwifery. Hostility and support have emanated from both professional groups of colleagues with whom nurse-midwives work: physicians and nurses.

Following are some of the misconceptions and stereotypes often heard during that period of time that hindered the development of nurse-midwifery in the 1960s, as well as the factual rebuttals given at that time:

- *Stereotype:* Midwives are all alike. Frequently, when only the midwife part of nurse-midwife is used or heard, the word conjures up a negative image. This image is of the good-hearted, loving, but untrained midwife either of past history or in rural areas of the South today or functioning as a birth attendant for those disenchanted with the present health care system. It leads to the irrational conclusion that nurse-midwives are an uneducated menace representing a backward step into illiteracy in the provision of maternal-infant health care.
- *Fact:* The name *nurse-midwife* actually specifies exactly who and what a nurse-midwife is. Either part of the name alone does not fully describe the unique profession of the nurse-midwife in the United States. The *nurse* part recognizes the prerequisite education in nursing, differentiates the nurse-midwife from the historical or contemporary lay midwife, and assures a continuing emphasis on patient education, support, and counseling. All Certified Nurse-Midwives are Registered Nurses. Two-thirds of the nurse-midwifery education programs are offered in schools granting a master's degree. The *midwife* part of the name recognizes the additional specialized preparation and functioning of the nurse-midwife, tempers the medical focus in normal obstetrics, and identifies the nurse-midwife with professional midwife counterparts the world over.
- *Misconception:* Nurse-midwives are trying to be "little doctors." In general, physicians think that nurse-midwives don't know "their place," while nurses think that nurse-midwives have "sold out" to the physicians and are, therefore, traitors to nursing.
- *Fact:* Nurse-midwifery is a clearly defined profession. Nurse-midwives believe fervently in who they are, what they have to offer, and what they can do. In fact, lack of acceptance for years by both medicine and nursing meant that the profession of nurse-midwifery attracted only those individuals who were highly dedicated and committed to contributing to the improvement and provision of maternal-infant health care in this capacity.

Nurse-midwives are experts in the normal childbearing cycle. They wish to be precisely who they are and to do precisely what they do—encourage and facilitate natural, normal childbearing processes with a minimum of interference; educate, support, and instigate personal and family growth; foster self-confidence and independence; dispel fear; and provide a calm atmosphere of acceptance and caring.

Nurse-midwives are neither sell-outs nor traitors to either nursing or medicine. Instead, they realistically recognize the need for having the support of both the nursing and the medical professions in order for real growth in nurse-midwifery to take place. For the benefit of mothers and babies, nurse-midwives continue to seek accord with both.

The 1970s

In the late 1960s and early 1970s, everything changed. Suddenly nurse-midwifery was not only acceptable but inundated with requests for practitioners and berated for the lack of nurse-midwives

to meet the demand. The late 1960s and early 1970s were a time of rapid development in nurse-midwifery, with widespread proliferation of nurse-midwifery services and educational programs that continued through the decade.

By the end of the 1970s, nurse-midwifery education had proliferated to a total of 22 basic educational programs, thereby doubling in 10 years the number of programs developed during the preceding 37 years. Fifteen new programs opened during this period of time, of which six subsequently closed (the second date is the closing date):

1972 University of Illinois at Chicago Nurse-Midwifery Program
1971–1975 Loma Linda University Nurse-Midwifery Program, California
1973 University of Minnesota Nurse-Midwifery Program
1973 Medical University of South Carolina Nurse-Midwifery Program
1973 Georgetown University Nurse-Midwifery Program, Washington, D.C.
1973–1984 St. Louis University Graduate Program in Nurse-Midwifery, Missouri
1973–1985 Meharry Medical College Nurse-Midwifery Program, Nashville, Tennessee
1973–1998 University of Kentucky Nurse-Midwifery Program
1975 University of Medicine and Dentistry of New Jersey Nurse-Midwifery Program
1975 University of California, San Diego Nurse-Midwifery Program
1974–1997 U.S. Air Force Nurse-Midwifery Program, Andrews Air Force Base, Maryland
1976 Emory University Nurse-Midwifery Program, Atlanta, Georgia
1977–1985 University of Arizona Nurse-Midwifery Program
1978 University of Miami Nurse-Midwifery Program, Florida
1978 San Francisco General Hospital/University of California San Francisco Interdepartmental Nurse-Midwifery Education Program

The proliferation of educational programs overextended the existing resources for clinical experience for students. A workshop of nurse-midwifery education and service directors focusing on their interdependence was held in 1973. The group divided into task forces to make recommendations for solutions to the serious lack of clinical experience available to students. These recommendations were forwarded from the workshop to the ACNM Board of Directors [26]. Nurse-midwives cooperated with one another in the provision of clinical facilities and clinical faculty for educational purposes. This effort has meant sacrifice on the part of many for the preservation of the profession; the joy and motivation of the practicing nurse-midwife comes from providing services directly to women, their babies, and their families.

A number of factors contributed to this unprecedented growth in nurse-midwifery education and practice sites:

1. Official recognition by organized obstetrics. A joint statement in 1971 by the American College of Obstetricians and Gynecologists, the Nurses Association of the American College of Obstetricians and Gynecologists, and the American College of Nurse-Midwives recognized and supported the development and utilization of nurse-midwives [27].
2. Increased visibility and involvement of the women's movement and feminism, which increased feelings of self-worth and self-confidence in all women. These attributes led to a natural alliance between women who wanted to participate in and be responsible for their childbearing experience and nurse-midwives, who facilitate the natural and normal processes, provide family-centered care, and promote parental self-determination.
3. Recognition by the consumer. An increasing number of articles about the "new midwife" were published in major magazines such as *Redbook*, *Newsweek*, *Life*, and *McCall's*, in Sunday newsmagazines, and in newspapers such as the *New York Times* and the *Wall Street Journal*. Greater consumer awareness and the satisfaction of those experiencing nurse-midwifery care and writing about it led to consumer demand for nurse-midwifery services.
4. Use of nurse-midwives in federally funded projects such as Maternal-Infant Care (MIC), Family Planning monies (314E), Agency for International Development (AID), and demonstration projects geared toward improving maternal-infant health care and providing family planning services. Through these projects, more professionals became familiar with nurse-midwifery. This familiarity dispelled misconceptions, and many physicians and nurses subsequently became ardent supporters of nurse-midwifery.
5. The children of the post–World War II baby boom were having babies during the mid-1960s and 1970s. This population peak meant that there was not, and would not be, a sufficient

supply of obstetricians to care for all of the childbearing women in the country. This shortage of obstetricians, combined with the small number of general practitioners doing obstetrics, highlighted the lack of human resources during this period of time. This shortage led to scrutiny of how best to use the optimal capabilities of each health care worker and promoted commitment to the obstetric team concept, which included utilization of the nurse-midwife.

6. Demonstration of the efficacy of the obstetric team concept. The effectiveness of nurse-midwives had been statistically proved repeatedly since the first studies at the Frontier Nursing Service [28], in the Madera County Demonstration Program in California in the 1960s [29], in every service where nurse-midwives had worked, and in the team concept, which decreased by half the infant mortality in Holmes County, Mississippi, in the early 1970s [30].
7. The involvement of nurse-midwives in interconceptional health care (i.e., family planning, human sexuality, and gynecological screening) and in neonatal care including promotion of parenting. This involvement fully rounded out nurse-midwifery management throughout the childbearing cycle, thereby providing continuity of care to the developing family.

The credentialing mechanisms of individual national certification as a Certified Nurse-Midwife and the accreditation of nurse-midwifery education programs were well established by the early 1970s. A decade later, both ACNM credentialing mechanisms were recognized by umbrella organizations with that purpose: certification was recognized by the National Commission of Health Certifying Agencies, and accreditation of basic nurse-midwifery education programs was recognized by the U.S. Department of Education.

The first private practice with nurse-midwives began in the early 1970s [31]. With the consumer "discovery" of the nurse-midwife came a burgeoning of private practice nurse-midwives, and another inhibiting misconception was laid to rest:

- *Misconception:* Nurse-midwifery is second-class care for second-class citizens. It follows that nurse-midwives can be utilized only for care of the indigent and will never be accepted by middle- and upper-class patients.
- *Fact:* By the mid-1970s, nurse-midwives were in practice with physicians all over the country, taking care of middle- and upper-class patients. According to a 1976–1977 survey by the American College of Nurse-Midwives [32], approximately 26 percent of all nurse-midwives practicing nurse-midwifery worked in some form of private practice arrangement. Nurse-midwives are well accepted by these women, who often prefer to be seen in the office and to be delivered by the nurse-midwife as long as their condition does not require the physician member of the team. This preference is largely a result of the time the nurse-midwife spends explaining and teaching during the office visits, the commitment of the nurse-midwife to the woman throughout labor, and the practical application of the beliefs of the nurse-midwife in promoting a family-centered, normal childbearing experience. This preference places the obstetrician in the difficult position of feeling displaced at the same time that the obstetrician is initially introducing the nurse-midwife into his or her private practice and is creating the environment in which women will come to accept the nurse-midwife by virtue of the care the nurse-midwife gives them. Mutual professional understanding and patience are required in order for the woman to obtain the maximum benefit and advantages of the physician/nurse-midwife team approach.

The misconception arose from the fact that nurse-midwifery practice for years took place mainly in large medical centers and city hospitals serving the medically indigent or in remote rural areas with few physicians. This initial concentration of nurse-midwives in settings serving women from lower socioeconomic groups occurred because the nurse-midwife's professional services were welcomed first in areas where help was most desperately needed.

During the 1970s, nurse-midwifery had become not only acceptable but also desirable and demanded. After years of struggling for existence, nurse-midwives now faced the problem of a severe shortage of supply to meet the demand. The first edition of this book (1980) discussed the conflicting pressure on nurse-midwives in the 1970s:

> On the one hand is the need for providing quantity services sufficient to warrant the expense of utilizing nurse-midwives by the established health care system and the need for nurse-midwives to be able to function within this system to benefit mothers and babies either desiring or needing care in the system. On the other hand, there is a small but growing number of consumers who are dissatisfied with the health care provided by the system, who desire care outside of the system, and who look to nurse-midwives for support and services. Lack of

> response with childbirth alternatives (e.g., hospital birthing rooms, childbirth centers, or carefully selected home births) further disenchants the consumer with professional health care and fosters the development of often untrained lay midwives or birth attendants, and a do-it-yourself movement. Affecting this conflict is the issue of nurse-midwives being able to collect third party payment for services. The resolution of this conflict has far-reaching implications and ramifications and constitutes the challenge nurse-midwifery has had in the latter half of the 1970s. [33]

Lay midwifery developed in the 1970s in response to the disenchanted childbirth consumers who wanted to give birth to their babies outside of the hospital. The term *lay midwifery* in the 1970s and 1980s referred to all non–nurse-midwives, whose preparation in midwifery was highly variable. Today the term refers to noncredentialed midwives. Some lay midwives prefer to call themselves traditional, community, empirical, or independent midwives. Sometimes the term *direct entry* is misused to mean lay or noncredentialed apprenticeship-prepared midwives. The term *direct-entry midwives* originated many years ago in England, where non-nurses completed a formal educational program leading to the same credentialed and regulated professional midwifery as nurse-midwives. Lay midwifery struggled with its early identity, as lay midwives disagreed sharply among themselves regarding the desirability of formal education, standards, credentialing, and regulation.

A number of groups and organizations supportive of lay midwifery and home birth sprang up during the 1970s: NAPSAC (National Association of Parents and Professionals for Safe Alternatives in Childbirth), HOME (Home Oriented Maternity Experience), ACHI (Association of Childbirth at Home International), and NMA (National Midwives Association). Existing organizations such as ICEA (International Childbirth Education Association) and La Leche League added their support. The first national meeting of lay midwives took place in 1977 in El Paso.

The 1980s

By the 1980s, nurse-midwives were practicing in the full range of possible arenas—from clinics and federally funded programs to HMOs and hospitals, from being employed by physicians to employing the physicians—and providing a full range of services, from in-hospital delivery services to out-of-hospital delivery services or a mix of both. By this time nurse-midwives were perceived to be competitors for the obstetric health care dollar. Supportive physicians continued to enable nurse-midwifery practice to exist by providing necessary physician consultation, collaboration, and referral systems; opposing physicians tried to restrict the growth of nurse-midwifery through state legislative battles over statutory recognition of nurse-midwives, mandated third-party reimbursement, and prescriptive authority; denial of hospital practice privileges; and pressure on supportive physicians vis-à-vis their malpractice insurance. The entire situation was exacerbated by the fact that there was an overabundance of physicians, which would continue for the foreseeable future. In the view of many physicians, nurse-midwives were no longer needed.

An investigative congressional hearing into the problems faced by nurse-midwives was held in 1980, and the Federal Trade Commission became actively concerned with possible and real restraint-of-trade issues. At the same time health care costs had become unacceptably high and some services run by nurse-midwives were demonstrating that they were cost-effective.

A survey of nurse-midwives in 1971 showed that 37 percent of the respondents were in the direct practice of nurse-midwifery, compared with 23 percent in 1967 and 18 percent of those nurse-midwives practicing in the United States in 1963. By 1976–1977, 51 percent of 1218 respondents living in the United States and replying to a questionnaire [32] were actually practicing nurse-midwifery. Within the 15 years from 1963 to 1978, active nurse-midwifery services increased from six services in three states and New York City to multiple services in 35 states, with more in planning stages. By 1982, 67 percent of 1584 survey participants living in the United States stated they were practicing nurse-midwifery [34]. In 1984, nurse-midwives were practicing in all 50 states; by 1988, nearly 80 percent of the respondents to an ACNM survey were in nurse-midwifery practice and education [35]. The legal practice of nurse-midwifery had spread from three states and New York City in 1963 with its legal status in the other states largely unknown, to a very clear legal status in all 50 states and four jurisdictions (District of Columbia, Guam, Puerto Rico, and the Virgin Islands) as a result of extensive and intensive work by the legislation

committee of the American College of Nurse-Midwives.

From practicing almost exclusively in large medical centers, city hospitals, and remote rural areas in the early 1960s, nurse-midwives had moved into every possible type of setting by the late 1970s and early 1980s. Because continuity of care is an essential component of nurse-midwifery care, a nurse-midwife may work in more than one practice setting.

The late 1970s and early 1980s also saw the rapid development of out-of-hospital childbirth centers, with Maternity Center Association spearheading this movement. Chapter 35 details the history of out-of-hospital childbirth centers.

Lay midwives organized themselves in 1982 with the creation of the Midwives Alliance of North America (MANA) to include midwives in Canada and Mexico as well as the United States. Membership is diverse; it includes anyone who chooses to call herself or, rarely, himself a midwife and reflects a complete range of educational preparation and experience. MANA established an Interim Registry Board (IRB) in 1986 to create an examination and maintain a registry of midwives who passed the examination. The examination was first administered in 1991, and the IRB subsequently separated from MANA and incorporated as the North American Registry of Midwives (NARM). In 1991, the National Coalition of Midwifery Educators, an organization separate from MANA and the MANA Education Committee, formed the Midwifery Education and Accreditation Council (MEAC).

The 1990s and Early 2000s

The early 1990s witnessed another growth spurt in nurse-midwifery education programs, in part as a result of states' recognizing the quality and cost-effectiveness of nurse-midwifery care and funding programs within their states. The ACNM set the goal of having 10,000 Certified Nurse-Midwives by 2001. In 1995, slightly more than 5000 had been certified. With the increased number of new programs, the growing number of students in existing programs, and the advent of community-based long-distance learning, the trajectory to the goal was on target. In mid-2001, the total number of persons ever certified was 9327, including 28 Certified Midwives.

During the 1980s and 1990s, the number of programs again doubled, so that by the end of the century 45 accredited basic nurse-midwifery education programs existed, one of which was also an accredited basic midwifery education program. A listing of all the current education programs accredited by the ACNM Division of Accreditation can be obtained from the ACNM Web site [36]. Seven of the 38 programs that opened during these two decades subsequently closed:

1982–1987 Stanford University Midwifery Education Program, Stanford, California

1981–1988 Rush University Nurse-Midwifery Program, Chicago, Illinois

1982–1999 University of California, San Francisco/University of California, San Diego, Intercampus Nurse-Midwifery Program

1986–1998 Education Program Associates Midwifery Education Program, San Jose, California

1991–1996 University of Alabama Nurse-Midwifery Program

1993–2001 University of Rochester Nurse-Midwifery Program, New York

1995–2002 University of Missouri Nurse-Midwifery Program

The health care system started to move in the direction of managed care in the early 1990s. Nurse-midwives once again found themselves struggling to be recognized and "at the table" both nationally and locally for far-reaching decisions affecting the health care system and nurse-midwifery practice. Practical preparation for establishing nurse-midwifery practices and services increasingly focused on business aspects of a practice, including marketing, budgets, financial concerns and policy issues, methods of determining productivity, billing and coding, and effective business practices. The Nurse-Midwifery Service Directors Network wrote *An Administrative Manual for Nurse-Midwifery Services*. In addition to its long existing *Guidelines for Establishing a Nurse-Midwifery Practice*, the ACNM put together a marketing packet for CNMs and handbooks on managed care and managed care contracting. In 1996, the Midwifery Business Institute was started by nurse-midwives at the University of Michigan School of Nursing and the University of Michigan Health System; both institutions co-sponsor this annual conference.

The ACNM Division of Accreditation (DOA) was first recognized by the U.S. Department of

Education (USDOE) as a national accrediting body in 1982. Recognition has been renewed as proscribed by the USDOE ever since. In 1989, the ACNM Board of Directors (BOD) stated that "The ACNM will actively explore, through the DOA, the testing of non-nurse professional midwifery educational routes." In 1990, the DOA determined that in order to address the charge from the BOD, it was necessary to first identify those nurse competencies that were assumed to be brought by a Registered Nurse to a nurse-midwifery education program. The DOA completed this task in 1994. These competencies were combined with specified prerequisite courses into an ACNM DOA document entitled *Skills, Knowledge, Competencies, and Health Sciences Prerequisite to Midwifery Practice* [37].

In 1994, the ACNM, in response to requests from state regulatory agencies, took the leadership role in setting the standards for the credentialing of non-nurse midwives. The immediate impetus for this effort was the growing use of licensed health care professionals, most often physician assistants, to practice midwifery without educational preparation or credentialing for this role. Using, at a minimum, the same criteria as for nurse-midwifery education programs, the ACNM DOA developed criteria for basic midwifery education programs for non-nurse midwives, and the ACNM Certification Council committed itself to the testing and certification of graduates from ACNM DOA-accredited midwifery programs who would receive the credential of Certified Midwife (CM) [37]. These direct-entry midwives meet the same end point academic and clinical objectives as Nurse Midwives: providing primary care to women from puberty through senescence with an emphasis on the maternity cycle and practice in all settings (hospital, birth center, and home).

The first educational program for non-nurse midwives preaccredited by the ACNM DOA was established in 1996. The first graduates from this program were in 1997, and in 1999 the program was fully accredited. Two other direct-entry midwifery programs have since been preaccredited by the ACNM DOA. In May 2001, the U.S. Department of Education renewed its recognition of the ACNM DOA for preaccreditation and accreditation of nurse-midwifery education programs and recognized the expansion of the scope of its activities to include preaccreditation and accreditation of direct-entry midwifery education for the non-nurse.

In the meantime, the Midwifery Education and Accreditation Council (MEAC), which had evolved from the lay midwifery movement in the 1970s and 1980s, organized and defined itself in terms of accrediting education of non-nurse direct-entry midwives in the maternity cycle and out-of-hospital—especially home birth—practice only. MEAC applied for and received recognition from the U.S. Department of Education as an accrediting body in January 2001. MEAC-accredited programs prepare graduates for the examination of the North American Registry of Midwives (NARM) and recognition as a Certified Professional Midwife (CPM). In 2001, the National Association of Certified Professional Midwives was formed with the purpose of establishing a professional organization and setting national practice standards for CPMs.

Credentialed midwifery at the beginning of the millennium now encompassed both nurses and two types of direct-entry non-nurses leading to certified midwives (CNM, CM, CPM) with different educational processes and two very different scopes of practice but well defined and distinguishable from the noncredentialed lay midwife.

The American College of Nurse-Midwives

The American College of Nurse-Midwives (ACNM) is the national professional organization for Certified Nurse-Midwives and Certified Midwives. Its mission is to promote the health and well-being of women and infants within their families and communities through the development and support of the profession of midwifery as practiced by CNMs and CMs [38]. Incorporated in 1955, the ACNM was founded as the outgrowth of a series of circumstances that rendered its creation necessary.

Early efforts to organize met with difficulties. An organizational meeting in 1940, chaired by Hattie Hemschemeyer, resulted in the formation of the National Association of Certified Nurse-Midwives (NACNM). Bylaws were written but the organization never evolved beyond this point. A 1944 meeting of nurse-midwives, again called by Hattie Hemschemeyer to discuss formation of a national organization, led the group to reject the option of establishing a new organization as financially and time/effort-prohibitive. The group also rejected the option of working to make the FNS-related American Association of Nurse-Midwives (AANM) become the national organization they envisioned because the AANM "did not

admit colored nurse-midwives." Instead, the group accepted an offer from the integrated National Organization of Public Health Nurses (NOPHN) to establish a section for nurse-midwives [39].

As a section of the NOPHN, nurse-midwives could define themselves, share information and knowledge, and start the process of setting educational and practice standards for the profession. In 1949, the nurse-midwifery section published the first national descriptive data gathered about nurse-midwives [40]. The NOPHN was dissolved in 1952 following a general reorganization of the national nursing organizations. While the NOPHN was absorbed into the American Nurses Association (ANA) and the National League for Nursing (NLN), these organizations did not make any provision for a recognizable entity of nurse-midwives. Instead, the nurse-midwives were assigned to the ANA's Maternal and Child Health Council and the NLN's Interdivisional Council, which encompassed the areas of obstetrics, pediatrics, orthopedics, crippled children, and school nursing. The membership and concerns of the NLN council were simply too broad to serve as a forum or voice for nurse-midwifery. Being part of the ANA's Council would have meant that nurses who were not midwives would be making decisions about nurse-midwifery practice and education. Ironically, even though nurse-midwives were in positions of leadership in maternal-child nursing in educational, professional, and federal organizations pertaining to health care, they were usually not thought of as being nurse-midwives.

The Committee on Organization

As the identity of nurse-midwives could not be maintained in the existing situation, the nurse-midwives present at an ANA convention in the spring of 1954 agreed to establish The Committee on Organization. Sister M. Theophane Shoemaker, the director of the Catholic Maternity Center in Santa Fe, New Mexico, was chair of the committee.

The Committee on Organization, though claiming its progress was slow and tedious, had within two months identified reasons for organizing; discussed ways in which organization could be accomplished; written a definition of a nurse-midwife; identified the functions of a new organization if one was to be established; set educational standards for nurse-midwifery schools, including a statement of purpose and basic admission requirements; designed and mailed a questionnaire to locate nurse-midwives and ascertain their desire to organize; written and mailed two of the eventual six *Organization Bulletins of The Committee on Organization*; and organized a meeting of nurse-midwives for December 1954.

Forty-six nurse-midwives attended that meeting, during which they reviewed the work done to that point and the results of the questionnaire (to which 147 nurse-midwives had replied), and approved the definition of a nurse-midwife and a statement of purposes of a nurse-midwifery organization. The major issue, however, was how organization could be accomplished. Four possible options had been identified:

1. Organization within the American Nurses' Association (ANA) as a conference group
2. Organization within the National League for Nursing (NLN) as a council
3. Reorganization of the American Association of Nurse-Midwives (AANM) into a national organization
4. Formation of an entirely new organization of nurse-midwives to be known as the American College of Nurse-Midwifery

The American Association of Nurse-Midwives had been started in 1929 as the Kentucky State Association of Midwives, incorporated by nurse-midwives working with the Frontier Nursing Service. Mary Breckinridge, then director of the Frontier Nursing Service, was the continuing president of AANM during her lifetime. Its function was akin to that of an alumnae association, although membership was not limited to alumnae. Efforts to reach out to the AANM to persuade its members to reorganize were made by Sr. Theophane Shoemaker and Hattie Hemschemeyer. Mary Breckinridge, however, stood firm in her belief that nurse-midwives should be part of the nursing organizations and that the structure of the AANM would not change [39]. AANM, therefore, was eliminated as a possible option based on its members' analysis and statement of preference not to be considered.

The remaining options were either to organize within one of the national nursing organizations or to create a new organization. The decision was deferred until letters requesting a conference group and a council, respectively, were submitted to, and replies were received from, ANA and NLN. The letters were approved during the meeting.

The NLN expressed interest and concern but pointed out that its bylaws for organization of a council would not meet the needs of the nurse-midwives. The reply from the ANA was not encouraging. The ANA was interested in a plan to establish

an interdisciplinary committee of the ANA and the NLN, with additional representatives from the public, to study the improvement of the care of mothers and children. The nurse-midwives could be a part of this committee.

This information was published in the fourth *Organization Bulletin*, along with the plans for the next meeting of The Committee on Organization and a request for comments regarding what was emerging as the obvious direction for organization. At its meeting in May 1955, The Committee on Organization voted unanimously to proceed with the formation of the American College of Nurse-Midwifery. Those present based their action on the facts that all the other options had essentially been ruled out, that 133 of the 147 nurse-midwives answering the questionnaire had responded positively to the idea of belonging to a new organization of nurse-midwives, that formation of a separate organization obviously seemed to be the only way that nurse-midwives could work together and accomplish the goals that had been delineated in the statement of purposes, and that only one response had been received to the request for comments regarding this direction. The Committee on Organization had done such a splendid job of keeping all the nurse-midwives informed and involved that there was nothing further to be said.

The Committee on Organization then began working to incorporate and establish the new organization. The incorporation of the American College of Nurse-Midwifery took place on November 7, 1955, in the state of New Mexico. New Mexico was chosen because it was one of the few states in which nurse-midwives were practicing and incorporation there involved the least amount of red tape, time, and expense.

The ACNM as an Organization

The first annual meeting of the American College of Nurse-Midwifery was held November 12 and 13, 1955, in Kansas City, Missouri. Hattie Hemschemeyer, director of the Maternity Center Association School of Nurse-Midwifery, was elected the first president of the ACNM. In her first message to members in the *Bulletin of the American College of Nurse-Midwifery*, she wrote about the driving force and movement of nurse-midwifery in terms that remain equally valid today:

> The College must select carefully the work it undertakes and then do well the work it has undertaken. We need to work with dedication and conviction. We are beginning at a time when education has concentrated too heavily on techniques and too little on the human factors involved. It is essential that education relate in a responsible and practical way with the problems and moral issues of our times.
>
> We nurse-midwives are a specialized group and our education, experience, and service have led us to the considered conclusion that in our present society it is neither desirable nor necessary to eliminate specialization. We believe that creative imagination, plus the ability to utilize ideas, is one of the most powerful influences in the world today. . . .
>
> The nurse-midwives have not substituted rationalization nor routines for reason; they have not been helpless when it comes to effecting mass movements for the care of human beings where helplessness, faith in reason, responsibility, and the dignity of the individual were concerned. They know the difference between supplying verbal allegiance and action. . . .
>
> We have a pioneer job to do, and if we work as well and as constructively in a group as we have in the past as individuals, we can help to improve professional competence, provide better service and educational programs, and make fuller use of resources. The future looks bright. [41]

On the ACNM's tenth anniversary, Hemschemeyer stated, "Our identity as a College gives us fundamental rights and grave responsibilities" [42].

In 1956, both the American College of Nurse-Midwifery and the American Association of Nurse-Midwives were accepted into the International Confederation of Midwives (ICM) upon the recommendation of England and Scotland and the unanimous vote of the executive council of the ICM. In 1969, the American Association of Nurse-Midwives (AANM) merged with the American College of Nurse-Midwifery (ACNM) to form the American College of Nurse-Midwives (ACNM). In October 1972, the American College of Nurse-Midwives hosted the triennial congress of the ICM in Washington, D.C., when Lucille Woodville, then nursing consultant to the Bureau of Indian Health Affairs and past president of the ACNM (1969–1971), was president of the ICM (1969–1972).

The objectives of the American College of Nurse-Midwives, first expressed in the Articles of Incorporation in 1955, as amended through May 2000, reflect both nurse-midwifery's concern for quality health care for women and infants and the

assumption of the "grave responsibilities" alluded to by Hattie Hemschemeyer:

That the objectives of said corporation shall be

1. To study, develop and evaluate standards for midwifery care of women and infants as provided by Certified Nurse-Midwives (CNMs) and Certified Midwives (CMs);
2. To study, develop and evaluate standards for nurse-midwifery and midwifery education;
3. To support and assist in the development of nurse-midwifery and midwifery services/practices;
4. To evaluate and accredit nurse-midwifery and midwifery educational programs;
5. To determine the eligibility of individuals to practice as Certified Nurse-Midwives and as Certified Midwives;
6. To facilitate and coordinate the efforts of Certified Nurse-Midwives and Certified Midwives who in the public interest provide quality services to individuals and childbearing families;
7. To establish channels for communication and cooperation with other professional and non-professional groups who in the public interest share the objectives of ensuring sufficient quality services to individuals and childbearing families;
8. To establish channels for interpretation of midwifery as practiced by CNMs and CMs to allied professional and non-professional groups on a regional, national and international basis;
9. To promote research and the development of literature in the field of midwifery as practiced by CNMs and CMs;
10. To speak for all members of the College in relation to issues affecting the professional affairs of Certified Nurse-Midwives and Certified Midwives;
11. To provide professional services to members of the College;
12. To promote the College as a leader and major resource in the development and promotion of high quality care for women and infants, nationally and internationally. [43]

The seal of the ACNM (Figure 1-3) reflects basic philosophical beliefs of nurse-midwifery. Rita Kroska, who designed the seal in 1955, interprets its symbols as follows:

> The large shield is comprised of four symbols: a small shield of stars and stripes exemplify the United States of America; three intertwined circles exemplify the family with the lower circle containing crosshatching to illustrate the crib containing the child; a tripod with flames rising exemplifies continuance and warmth in dedication to the American family; and, lastly, the large shield contains an undulating band above the tripod but beneath the smaller shield and circles. The undulation portrays movement, persistence, steadiness, and steadfastness to the word written within. That word is *VIVANT*, an expletive in French which means *Let Them Live!* It is there to fill out the sentence of the symbols, to give emphasis short of exclamatory oath, that of unremitting dedication to safeguarding and promoting the health and wellbeing of family life, particularly the mother and infant.
>
> The large shield is encircled by a ribboned band containing the inscription, "AMERICAN COLLEGE OF NURSE-MIDWIVES, NEW MEXICO, Nov. 7, 1955." Originally, between 1955 and 1969, the word "nurse-midwives" was "nurse-midwifery," and without the year 1929 included within the inscription. The two changes took place in 1969 when the American Association of Nurse-Midwives with headquarters at the Frontier Nursing Service in Wendover, Kentucky, and the American College of Nurse-Midwifery joined and became the American College of Nurse-Midwives. The year 1929 was the founding of the American Association of Nurse-Midwives. [44]

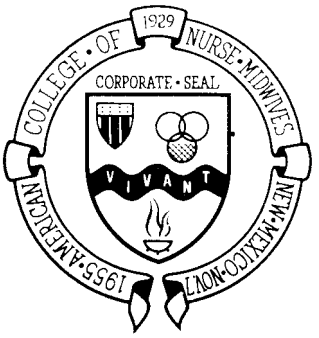

FIGURE 1-3 The seal of the American College of Nurse-Midwives. (Reproduced by permission of the American College of Nurse-Midwives.)

Activities of the ACNM

The membership of the American College of Nurse-Midwives has been characterized from the beginning by its dedication, commitment, hard work, articulateness, personal sacrifice, vision, and pioneering spirit. The annals of the ACNM's brief history are peopled with creative giants who were also willing to do the necessary detail work while dipping into their own pocketbooks to finance it. Starting with a charter membership of 124, the

ACNM had grown to a membership of 860 by its twentieth anniversary in 1975. By 1980 the membership, now including students, had increased to more than 1500, by 1984 to 2534, and by 1995 to more than 5000. This figure reflects the fact that approximately 85 percent of the total number of Certified Nurse-Midwives belong to the ACNM. Seventeen nurse-midwives attended the first annual meeting in Kansas City in 1955; 291 members attended the twentieth annual meeting in Jackson, Mississippi, in 1975. Convention attendance first passed the 1000 mark with 863 members and 138 guests at the 1984 Philadelphia meeting, and more than 2000 attended the Washington, D.C., meeting in 2000.

The rapid expansion of nurse-midwifery and proliferation of nurse-midwives placed stress on the professional organization. The total number of nurse-midwives tripled in less than ten years (1975–1984). The organization faced having to change from a small, intimate group of hard-working, dedicated nurse-midwives with a relatively simple organizational structure to a large group with an organizational structure and management style that could cope with a rapid increase in membership without losing its dedication and ideals. This goal was met. The productivity of the American College of Nurse-Midwives since its founding in 1955 is inspirational and shows what a small group can do.

The ACNM has undergirded every aspect of nurse-midwifery: education, practice, recognition, legislation, credentialing, insurance, communication, research, and interprofessional and interorganizational relationships. The founding of the ACNM was described as follows: "To support individual efforts the nurse-midwives have banded together.... This provides them with an official mouthpiece for education, a base for common planning and discussion" [45]. Almost a century ago the lack of any national organizations, journals, system of education, legal recognition, or access to the health care system led to the "midwife problem and debate." Today the ACNM provides or works for all of these mechanisms of survival and speaks for the profession of nurse-midwifery and midwifery as practiced by CNMs and CMs.

References

1. Jointly developed 1972 definition amended by the International Confederation of Midwives, 1990; amendment ratified by the International Federation of Gynaecology and Obstetrics, 1991, and the World Health Organization, 1992.
2. ACNM position statement: *Certified Nurse-Midwives and Certified Midwives as Primary Care Providers/Case Managers*, 1992, revised 1997.
3. *The Core Competencies for Basic Midwifery Practice*, May 1997. ACNM.
4. Definition accepted by the American College of Nurse-Midwives, 1997.
5. *ACNM Statement on Practice Settings*, 1980, revised 1999.
6. Definition accepted by the American College of Nurse-Midwives, 1978.
7. Definition accepted by the American College of Nurse-Midwives, 1997.
8. *Philosophy of the American College of Nurse-Midwives*, 1989.
9. Nancy Fleming was Secretary of the ACNM Board of Directors at the time. The discussion was part of a visionary planning summit conceptualized and convened by Joyce Thompson, then president of ACNM.
10. Raffloer, K. *The Experience of Childbirth on the Oregon Trail: A Search for the Presence of Midwives*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1999.
11. Fox, C. G. Toward a sound historical basis for nurse-midwifery. *Bull. Am. Coll. Nurse-Midwifery* 14(3):76–82 (August) 1969.
12. Pomerantz, M. *Factors Contributing to the Widespread Use of Epidurals for Pain Relief in Childbirth*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1999.
13. Dawley, K. The campaign to eliminate the midwife. *Am. J. Nurs.* 100(10):53, 2000.
14. Swenson, N. The role of the nurse-midwife on the health team as viewed by the family. *Bull. Am. Coll. Nurse-Midwifery* 13(4):128 (November) 1968.
15. Pressley Byrd, D. *Granny Midwives in South Carolina: The State's Regulation and Education of a Vocational Cadre of Traditional Midwives 1910–1940*. Master's thesis. New Haven, CT: Yale University School of Nursing, 2001.
16. Newspaper article, 1934.
17. Katy Dawley, e-mail communication to Jill Cassells, November 6, 1999.
18. Breckinridge, M. *Wide Neighborhoods: A Story of the Frontier Nursing Service*. New York: Harper, 1952.
19. Cassells, J. *The Manhattan Midwifery School*. Master's thesis. New Haven, CT: Yale University School of Nursing, 2000.

20. Canty, L. *The Graduates of the Tuskegee School of Nurse-Midwifery*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1994.

21. Horch, J. *The Flint-Goodridge School of Nurse-Midwifery*. Master's thesis. New Haven, CT: Yale University School of Nursing, 2002.

22. *Bull. Comm. Organ.*, vol. 1, no. 3, November 1954.

23. *American College of Nurse-Midwifery. Descriptive Data, Nurse-Midwives—U.S.A.* Washington, DC: American College of Nurse-Midwives, 1968.

24. Lang, D. Providing maternity care through a nurse-midwifery service program. *Nurs. Clin. North Am.* 4:509, 1969.

25. Landwehr, G. A. *Nurse Midwifery within the Indian Health Service: 1965–1980*. Master's thesis. New Haven, CT: Yale University School of Nursing, 2002.

26. American College of Nurse-Midwives. *Responding to the Demands for Nurse-Midwives in the United States: a Workshop Report*. Washington, DC: ACNM, March 8–10, 1973.

27. *Joint Statement on Maternity Care, 1971*. ACNM, ACOG, and NAACOG.

28. Metropolitan Life Insurance Company. Summary of the ten thousand confinement records of the Frontier Nursing Service. *Frontier Nursing Service Quarterly Bulletin* 33(4), 1958. Reprinted in the *Bull. Am. Coll. Nurse-Midwifery* 5(1):1–9, 1960.

29. Levy, B. S., Wilkinson, F. S., and Marine, W. M. Reducing neonatal mortality rate with nurse-midwives. *Am. J. Obstet. Gynecol.* 109:50, 1971.

30. Meglen, M. C. Nurse-midwife program in the Southeast cuts mortality rates. *Contemp. OB/GYN* 8:79, 1976.

31. Burnett, J. E., Jr. A physician-sponsored community nurse-midwife program. *Obstet. Gynecol.* 40:719, 1972.

32. American College of Nurse-Midwives. *Nurse-Midwifery in the United States: 1976–1977*. Washington, DC, 1978.

33. Varney, H. *Nurse-Midwifery*. Boston: Blackwell Scientific Publishing, 1980, p. 26.

34. American College of Nurse-Midwives. *Nurse-Midwifery in the United States: 1982*. Washington, DC, 1984.

35. Lehrman, E.-J., and Paine, L. L. Trends in nurse-midwifery: Results of the 1988 ACNM Division of Research mini-survey. *J. Nurse-Midwifery* 35(4):192–203 (July/August) 1990.

36. www.acnm.org or www.midwife.org.

37. Burst, H. V. An update on the credentialing of midwives by the ACNM. *J. Nurse-Midwifery* 40(3):290–296, (May/June) 1995.

38. *ACNM Mission Statement*, 1992; revised 1998.

39. Dawley, K. L. *Leaving the Nest: Nurse-Midwifery in the United States 1940–1980*. Doctoral dissertation. Philadelphia, PA: University of Pennsylvania, 2001.

40. Nurse-midwifery today. *Public Health Nurs.* (May) 1949.

41. Hemschemeyer, H. Sends message to members. *Bull. Am. Coll. Nurse-Midwifery* 1(2):5–6 (March) 1956.

42. Hemschemeyer, H. Report of the first president of the American College of Nurse-Midwifery. *Bull. Am. Coll. Nurse-Midwifery* 10(1):4–10 (Spring) 1965.

43. *Articles of Incorporation*, as amended through May 2000. American College of Nurse-Midwives, 2000.

44. Kroska, R. The emblem of the American College of Nurse-Midwives. *J. Nurse-Midwifery* 18(3):23–24 (Fall) 1973.

45. Editorial. *Bull. Am. Coll. Nurse-Midwifery* 4(2):37–38, 1959.

• • • Bibliography

American College of Nurse-Midwifery. *Descriptive Data, Nurse-Midwives—U.S.A., 1963*. New York, 1963.

American College of Nurse-Midwifery. *Descriptive Data, Nurse-Midwives—U.S.A., 1968*. New York, 1968.

American College of Nurse-Midwives. *Descriptive Data, Nurse-Midwives—U.S.A., 1971*. New York, 1971.

American College of Nurse-Midwives. *Nurse-Midwifery in the United States: 1976–1977*. Washington, DC, 1978.

American College of Nurse-Midwives. *What Is a Nurse-Midwife?* Washington, DC, 1978.

American College of Nurse-Midwives. *Nurse-Midwifery in the United States: 1982*. Washington, DC, 1984.

Borst, C. *Catching Babies: The Professionalization of Childbirth, 1870–1920*. Cambridge, MA: Harvard University Press, 1996.

Breckinridge, M. *Wide Neighborhoods: A Story of the Frontier Nursing Service*. New York: Harper, 1952.

Browne, H. E., and Isaacs, G. The Frontier Nursing Service. *Am. J. Obstet. Gynecol.* 124:16, 1976.

Burnett, J. E., Jr. A physician-sponsored community nurse-midwife program. *Obstet. Gynecol.* 40:719, 1972.

Burst, H. V. Harmonious unity. *J. Nurse-Midwifery* 22:10, 1977.

Burst, H. V. Our three-ring circus. *J. Nurse-Midwifery* 23:11, 1978.

Burst, H. V. The American College of Nurse-Midwives: A professional organization. *J. Nurse-Midwifery* 25(1):4–6 (January/February) 1980.

Burst, H. V. The influence of consumers on the birthing movement. In J. Strawn (ed.). *Topics in Clinical Nursing: Rehumanizing the Acute Care Setting* 5(3):42–54 (October) 1983.

Burst, H. V. An update on the credentialing of midwives by the ACNM. *J. Nurse-Midwifery* 40(3):290–296, (May/June) 1995.

Cameron, J. *The History and Development of Midwifery in the United States. Can Maternity Nursing Meet Today's Challenge?* Columbus, OH: Ross Laboratories, 1967.

Canty, L. *The Graduates of the Tuskegee School of Nurse-Midwifery*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1994.

Cassells, J. *The Manhattan Midwifery School*. Master's thesis. New Haven, CT: Yale University School of Nursing, 2000.

Cavero, C. Modern midwifery: complicated rebirth of an ancient art. *Fam. Community Health* 2(3):29–39 (November) 1979.

Chaney, J. A. Birthing in early America. *J. Nurse-Midwifery* 25(2):5–13 (March/April) 1980.

Cherry, J., and Foster, J. C. Comparison of hospital charges generated by certified nurse-midwives' and physicians' clients. *J. Nurse-Midwifery* 27(1):7–11 (January/February) 1982.

Cohn, S., Cuddihy, N., Kraus, N., and Tom, S. Legislation and nurse-midwifery practice in the USA. (Special legislative issue.) *J. Nurse-Midwifery* 29(2) (March/April) 1984.

Corbin, H. Historical development of nurse-midwifery in this country and present trends. *Bull. Am. Coll. Nurse-Midwifery* 4(1):13–26 (March) 1959.

Corbin, H. *Forty-Fifth Annual Report*. New York: Maternity Center Association, 1963.

Crowe-Carraco, C. Mary Breckinridge and the Frontier Nursing Service. *The Register of the Kentucky Historical Society*, July 1978.

Dawley, K. The campaign to eliminate the midwife. *Am. J. Nurs.* 100(10):53, 2000.

Diers, D., and Burst, H. V. Effectiveness of policy related research: Nurse-midwifery as case study. *Image* 15(3):68–74 (Summer) 1983.

Ernst, E. K. Tomorrow's child. *J. Nurse-Midwifery* 24(5):7–12 (September/October) 1979.

Ernst, E. K. M., and Gordon, K. A. Fifty-three years of home birth experience at the Frontier Nursing Service, Kentucky: 1925–1978. In Stewart, L., and Stewart, D. *Compulsory Hospitalization: Freedom of Choice in Childbirth?* Vol. 2. Marble Hill, MO: NAPSAC Publications, 1979.

Forman, A. M., and Cooper, E. M. Legislation and nurse-midwifery practice in the USA: Report on a survey conducted by the legislation committee of the American College of Nurse-Midwives. *J. Nurse-Midwifery* 21(2):1–57 (Summer) 1976.

Fox, C. G. Toward a sound historical basis for nurse-midwifery. *Bull. Am. Coll. Nurse-Midwifery* 14(3):76–82 (August) 1969.

Gatewood, T. S., and Stewart, R. B. Obstetricians and nurse-midwives: The team approach in private practice. *Am. J. Obstet. Gynecol.* 123:35, 1975.

Grady, S. *Midwifery and Professional Autonomy in the Early Twentieth Century*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1994.

Harris, D. The development of nurse-midwifery in New York City. *Bull. Am. Coll. Nurse-Midwifery* 14(1):4–12 (February) 1969.

Hellman, L. M., and O'Brien, F. B. Nurse-midwifery: an experiment in maternity care. *Obstet. Gynecol.* 24:343–349, 1964.

Hellman, L. M. Nurse-midwifery in the United States. *Obstet. Gynecol.* 30:883, 1967.

Hemschemeyer, H. Sends message to members. *Bull. Am. Coll. Nurse-Midwifery* 1(2):5–6 (March) 1956.

Hemschemeyer, H. Report of the first president of the American College of Nurse-Midwifery. *Bull. Am. Coll. Nurse-Midwifery* 10(1):4–10 (Spring) 1965.

Hogan, A. A tribute to the pioneers. *J. Nurse-Midwifery* 20(2):6–11 (Summer) 1975.

Horch, J. *The Flint-Goodridge School of Nurse-Midwifery*. Master's thesis. New Haven, CT: Yale University School of Nursing, 2002.

Hosford, E. Alternative patterns of nurse-midwifery care: III. The home birth movement. *J. Nurse-Midwifery* 21(3):27–30 (Fall) 1976.

Kroska, R. The emblem of the American College of Nurse-Midwives. *J. Nurse-Midwifery* 18(3):23–24 (Fall) 1973.

Landwehr, G. A. *Nurse-Midwifery within the Indian Health Service: 1965–1980*. Master's thesis. New Haven, CT: Yale University School of Nursing, 2002.

Lang, D. M. Providing maternity care through a nurse-midwifery service program. *Nurs. Clin. North Am*. 4:509, 1969.

Lang, D. The American College of Nurse-Midwives: What is the future for Certified Nurse-Midwives? In hospitals? Childbearing centers? Homebirths? In Stewart, L., and Stewart, D. *21st Century Obstetrics Now!* NAPSAC, 1977, pp. 89–104.

Lang, D. Modern midwifery. In Dickason and Schult. *Maternal and Infant Care*, 2nd ed. New York: McGraw Hill, 1979, pp. 145–147.

Lazarus, W., Levine, E. S., and Lewin, L. S. *Competition among Health Practitioners: The Influence of the Medical Profession on the Health Manpower Market*. Vol. 1: *Executive Summary and Final Report*; Vol. 2: *The Childbearing Center Case Study*. Washington, DC: Federal Trade Commission, February 1981.

Lehrman, E.-J., and Paine, L. L. Trends in nurse-midwifery: Results of the 1988 ACNM Division of Research mini-survey. *J. Nurse-Midwifery* 35(4):192–203 (July/August) 1990.

Levy, B. S., Wilkinson, F. S., and Marine, W. M. Reducing neonatal mortality rate with nurse-midwives. *Am. J. Obstet. Gynecol*. 109:50, 1971.

Litoff, J. B. *American Midwives: 1860 to the Present*. Westport, CT: Greenwood Press, 1978.

Litoff, J. B. The midwife throughout history. *J. Nurse-Midwifery* 27(6):3–11 (November/December) 1982.

Lubic, R. W. The nurse-midwife joins the obstetrical team. *Bull. Am. Coll. Nurse-Midwives* 27(3):73–77 (August) 1972.

Lubic, R. W. Evaluation of an out-of-hospital maternity center for low risk patients. In Aiken, L. H. *Hospital Policy and Nursing Practice*. New York: McGraw-Hill, 1980.

Lubic, R. W., and Ernst, E. K. M. The childbearing center: An alternative to conventional care. *Nurs. Outlook* 26:754, 1978.

Maternity Center Association. *Maternity Center Association, 1918–1943*. New York: Maternity Center Association, 1943.

Maternity Center Association. *Twenty Years of Nurse-Midwifery, 1933–1953*. New York: Maternity Center Association, 1955.

Meglen, M. C. Nurse-midwife program in the Southeast cuts mortality rates. *Contemporary OB/GYN* 8:79, 1976.

Meglen, M. C., and Burst, H. V. Nurse-midwives make a difference. *Nurs. Outlook* 22:382, 1974.

Metropolitan Life Insurance Company. Summary of the ten thousand confinement records of the Frontier Nursing Service. *Frontier Nursing Service Quart. Bull*. 1958, 33. Reprinted in *Bull. Am. Coll. Nurse-Midwives* 5:1–9, 1960.

Nurse-midwifery today. *Public Health Nursing*, May 1949.

Perry, D. S. The early midwives of Missouri. *J. Nurse-Midwifery* 28(6)15–22 (November/December) 1983.

Pomerantz, M. *Factors Contributing to the Widespread Use of Epidurals for Pain Relief in Childbirth*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1999.

Pressley Byrd, D. *Granny Midwives in South Carolina: The State's Regulation and Education of a Vocational Cadre of Traditional Midwives 1910–1940*. Master's thesis. New Haven, CT: Yale University School of Nursing, 2001.

Raffloer, K. *The Experience of Childbirth on the Oregon Trail: A Search for the Presence of Midwives*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1999.

Robinson, S. A historical development of midwifery in the black community: 1600–1940. *J. Nurse-Midwifery* 29(4):247–250 (July/August) 1984.

Rooks, J. B. American nurse-midwifery: Are we making an impact? *J. Nurse-Midwifery* 23:15–19 (Fall) 1978.

Rooks, J. Nurse-midwifery: The window is wide open. *Am. J. Nurs*. (December) 1990.

Rooks, J., and Fischman, S. American nurse-midwifery practice in 1976–1977: Reflections of 50 years of growth and development. *Am. J. Public Health* 70:990–996, 1980.

Roush, R. E. The development of midwifery—Male and female, yesterday and today. *J. Nurse-Midwifery* 24(3):27–37 (May/June) 1979.

Schlinger, H. *Circle of Midwives: Organized Midwifery in North America*. New York: Hilary Schlinger, 1992.

Sharp, E. S. Nurse-midwifery education: Its successes, failures, and future. *J. Nurse-Midwifery* 28(2):17–23 (March/April) 1983.

Shoemaker, Sister M. (Agnes Reinders). *History of Nurse-Midwifery in the United States*. Washington, DC: Catholic University of America Press, 1947.

Smith, M. C. and Holmes, L. J. *Listen to Me Good: The Life Story of an Alabama Midwife*. Columbus, OH: Ohio State University Press, 1996.

Swenson, N. The role of the nurse-midwife on the health team as viewed by the family. *Bull. Am. Coll. Nurse-Midwifery* 13(4):125 (November) 1968.

The Committee on Organization. *Organization Bulletin*. Vol. 1: No. 1, 2, and 3, 1954, and Vol. 2: No. 1, 2, and 3, 1955.

Thiede, H. A. A presumptuous experiment in rural maternal-child health care. *Am. J. Obstet. Gynecol.* 111:736, 1971.

Thiede, H. A. Interdisciplinary MCH teams can function within the system with proper planning. *Am. J. Dis. Child*. 127:633, 1974.

Thomas, M. W. *The Practice of Nurse-Midwifery in the United States*. Washington, DC: Children's Bureau, U.S. Department of Health, Education, and Welfare, 1965.

Thoms, H. *Our Obstetrical Heritage: The Story of Safe Childbirth*. Hamden, CT: Shoe String Press, 1960.

Tom, S. A. The evolution of nurse-midwifery: 1900–1960. *J. Nurse-Midwifery* 27(4):4–13 (July/August) 1982.

Transcript of the Testimony Given to the Subcommittee on Oversight and Investigation, Interstate and Foreign Commerce Committee, U.S. House of Representatives. Washington, DC, December 18, 1980.

Ulrich, L. T. *A Midwife's Tale: The Life of Martha Ballard, Based on Her Diary, 1785–1812*. New York: Knopf, 1990.

Varney, H. *Nurse-Midwifery*. Boston: Blackwell Scientific Publishing, 1980.

Wertz, R. W., and Wertz, D. C. *Lying-in, a History of Childbirth in America*. New York: Free Press, 1977.

Wiedenbach, E. Nurse-midwifery . . . purpose, practice, and opportunity. *Nurs. Outlook* 8:256, 1960.

Williams, H. V. (now H. V. Burst). *Nursing, Nurse-Midwifery, and the History of Nurse-Midwifery in the United States*. Unpublished paper, 1969.

Williams, S. R. *Divine Rebel: The Life of Anne Marbury Hutchinson*. New York: Holt, Rinehart, and Winston, 1981.

Wilson, K. T. *Physicians Instrumental in the Development of Nurse-Midwifery in the United States, 1915–1939*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1995.

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CHAPTER

2

Basics of Management of Care

Primary Care and Scope of Practice

In 1992, the American College of Nurse-Midwives formally acknowledged the historical and ongoing link between nurse-midwifery and public health and issued a statement entitled *Certified Nurse-Midwives as Primary Care Providers*. This statement was revised in 1997 to include Certified Midwives and to add the term *Case Managers* in the title [1]. The statement is as follows:

> It is the position of the American College of Nurse-Midwives that Certified Nurse-Midwives (CNMs) and Certified Midwives (CMs) are providers of primary health care for women and newborns.
>
> Care by CNMs and CMs incorporates all of the essential factors of primary care that include evaluation, assessment, treatment and referral as required. The model of health care practiced by CNMs and CMs is focused on ambulatory care of women and newborns and emphasizes health promotion, education and disease prevention and sees the woman as central to the process of providing such care.
>
> Care by CNMs and CMs includes preconception counseling, care during pregnancy and childbirth, normal gynecological services, contraceptive care and care of the peri- and post-menopausal woman. With health education as a major focus, the goals are to prevent problems and to assist women in developing and maintaining healthy habits.
>
> CNMs and CMs are often the initial contact for providing health care to women, and they provide such care on a continuous and comprehensive basis by establishing a plan of management with the woman for her ongoing health care. Such care by the CNM and CM is inclusive and integrated with the woman's cultural, socioeconomic and psychological factors that may impinge on her health status.

This statement and the ACNM definition of midwifery practice (see Chapter 1) essentially define the scope of practice of midwifery as the primary health care of newborns and of women from puberty through senescence. Primary health care by midwives emphasizes disease prevention and health promotion. Inherent in the approach of the midwife is patient education and inclusion of the woman in participatory decision making about her own health care.

The Committee on Primary Care of the Institute of Medicine (IOM) defined primary care in 1978 as having five attributes: (1) accessible, (2) comprehensive, (3) coordinated, (4) continuous, and (5) accountable. In 1990 the Health Resources and Services Administration of the U.S. Public Health Service characterized primary care as community-based, family-centered, culturally sensitive, coordinated, comprehensive, continuous, and physically, temporally, and financially accessible. In 1996, the IOM Committee on the Future of Primary Care recommended adoption of a new definition, based on the 1978 definition but expanded to emphasize a multidimensional integrated health care delivery system. The 1996 IOM definition of primary care "is the provision of integrated, accessible health care services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the con-

text of family and community" [2]. All of the words in these definitions describe the practice and beliefs of nurse-midwives.

In addition, the midwife specifically focuses on adolescents initiating pelvic health care and undergoing their first pelvic examination, female psychological growth and development throughout the lifespan, substance-abusing women, premenstrual syndrome, lesbian health care, female occupational health hazards and care, homeless women, gynecologic and psychologic trauma related to rape and battering, infertility concerns, physical changes and care of postmenopausal women, women (including pregnant women) with HIV/AIDS, women in prison, female sex workers, and the grief process. This is not an exhaustive listing. Midwifery has always been associated with pregnancy, childbirth, the postpartum period, and care of the newborn, but it also has a particular focus on family planning and gynecologic health care and screening. Gynecologic health care encompasses pelvic health care and management of infections and sexually transmitted diseases, menstrual concerns ranging from the normal physiologic processes involved in menarche and menopause through premenstrual syndrome to amenorrhea or dysfunctional uterine bleeding, differential diagnosis of lower abdominal and pelvic pain, and screening for breast and pelvic malignancies and disease.

As the health care provider whom women often see first for their gynecologic or childbearing health care, the midwife becomes the primary care provider in screening the total woman for normality and health in all her body systems, managing the care of women with routine personal health care needs and minor conditions or diseases, and referring women to medical specialists as needed. Midwives conduct a woman's annual physical examination with appropriate initial or interval history, laboratory testing, and adjunctive studies. The requisite screening assessment (history, physical and pelvic examination, laboratory tests, and adjunctive studies) is outlined later in this chapter.

Independent and Collaborative Management of Care

"Nurse-midwifery practice is the independent management of women's health care . . . within a health care system that provides for consultation, collaborative management or referral as indicated by the health status of the client . . . " [3]. In addition to including the concepts of both independent management and collaborative management within the definition of nurse-midwifery practice, the American College of Nurse-Midwives has issued separate statements specifically addressing each of these concepts [4,5]. These documents acknowledge that midwifery care is primarily intended for healthy women but state that CNMs and CMs can continue to be instrumental in the care of women who develop medical, gynecological, or obstetrical complications. Working with these women may involve the midwife in one of three processes:

1. *Consultation*. The advice or opinion of a physician or another member of the health care team is sought while the midwife retains primary responsibility of the woman's care.
2. *Collaboration*. The midwife and physician jointly manage the care of a woman or newborn who has become medically, gynecologically, or obstetrically complicated. The goal of collaboration is to share authority while providing quality care within each individual's scope of practice. The ability to share responsibility, mutual respect, trust, and effective communication between the midwife and physician is essential for successful collaborative management of quality care.
3. *Referral*. The midwife directs the client to a physician or another health care professional for management of a particular problem or aspect of the client's care.

"Independence and collaboration are not mutually exclusive" [6], but instead work together in an approach that benefits the woman and her baby. Midwives are experts on normality; when providing health care to the normal woman, the midwife practices independently. However, normality does not define or limit the patient populations of a midwife [7]. Nurse-midwifery's long history of service to underserved and vulnerable populations has demonstrated repeatedly the reduction of infant mortality and morbidity in these at-risk and high-risk complicated and complex populations [8]. No matter how much at risk or how complicated her pregnancy or gynecological status, certain components of any woman's condition and situation are normal and need attention. The contribution of a midwife in collaborative management of care includes protection and facilitation of whatever processes are normal, provision of information on safe options, inclusion of the woman in decision

making, inclusion of the woman's family, advocacy, teaching and counseling, and provision of continuity of care [7]. In many situations, collaborative management by the midwife and the physician is not only desirable, but also the most appropriate and safest approach to providing a woman with the best possible care [9].

The ACNM definition of referral implies a continuing relationship with the woman and is in keeping with the midwifery philosophy of continuity of care. Sometimes referral takes the form of outright transfer of the woman to a physician specialist. It has always been the function of a nurse-midwife to screen women for the earliest signs and symptoms of medical conditions or pregnancy complications in order to refer women who need the special skills of an obstetrician/gynecologist, geneticist, cardiologist, urologist, surgeon, gastroenterologist, or other practitioner. According to Clark-Coller, the litmus test for transfer is "whether, if transferred, the woman would gain anything specific that would benefit her care." She further clarifies that transfer should not be based on risk status but instead should take place "when there is demonstrated pathology that is outside the scope of our practice" [10]. At other times referral takes the form of obtaining medical management of a specific complicating disease when the woman is pregnant (e.g., hepatitis; see Chapter 8). In this situation, the midwife continues to manage the care of the pregnancy or enters into collaborative management of the woman's care. This continuity is in keeping with the meaning of the word midwife, "with woman," regardless of her risk status and locale [7]. The midwife does not "dump" or "punt" a pregnant woman through referral if medical or obstetrical complications arise. Rather, the midwife seeks the best balance of medicine and midwifery for the individual—hence the discussion of collaborative management. Shah identifies the hallmark of competent primary care as "knowing when to treat, when not to treat, when to just closely monitor, and when to refer the patient for consultation and/or medical intervention" [11].

The Management Process

The management process is a clinical problem-solving, decision-making, care-giving process that originated in nurse-midwifery in the early 1970s [12,13]. It provides a method of organizing thoughts and actions in a logical sequence for the benefit of both the patient and the health care provider. This process is described in terms of expected behaviors of the clinician, which clearly state the thought process and action involved. The descriptors elucidate the behavioral level at which each step is to be achieved so as to provide safe, comprehensive patient care. Because the management process follows a logical sequence, it is also useful to students in learning the management of care of patients because it provides a means of pulling together isolated fragments of knowledge, findings, skills, and judgments into a meaningful whole and focuses on the transition into the role of patient management.

The management process consists of seven sequential steps, which are periodically refined. It starts with the collection of a database and ends with evaluation. The seven steps constitute an overall framework that is applicable in all situations. Each step then may be broken down into finite tasks that vary in accord with the condition of the woman or newborn. It should be recognized that these steps are taken in collaboration with the woman and whomever she wishes to involve, or in collaboration with the parent(s) of the newborn. The seven steps follow:

1. Investigate by obtaining all necessary data for complete evaluation of the woman or newborn.
2. Make an accurate identification of problems or diagnoses and health care needs based on correct interpretation of the data.
3. Anticipate other potential problems or diagnoses that might be expected because of the identified problems or diagnoses.
4. Evaluate the need for immediate midwife or physician intervention and/or for consultation or collaborative management with other health care team members, as dictated by the condition of the woman or newborn.
5. Develop a comprehensive plan of care that is supported by explanations of valid rationale underlying the decisions made and is based on the preceding steps.
6. Assume responsibility for the efficient and safe implementation of the plan of care.
7. Evaluate the effectiveness of the care given, recycling appropriately through the management process for any aspect of care that has been ineffective.

The steps of the management process are essentially self-explanatory. However, a brief discussion

and examples of tasks that may be included in each of these steps may clarify the thinking involved in this action-oriented clinical process.

The first step is the gathering of a complete database for evaluation of the woman or newborn. This database includes a history, physical and pelvic examination as indicated, review of the current chart or old hospital records, and review of laboratory data and reports of adjunctive studies—in short, all pertinent information from all sources that has a bearing on the condition of the woman or newborn. The midwife gathers a complete initial database even if the woman or newborn has a complication that will be presented to the consulting physician for collaborative management. At times step 1 may overlap with steps 5 and 6 (or be part of a continuing sequence) as obtaining additional necessary data from laboratory tests or other diagnostic studies may be part of the plan. Sometimes the midwife will need to begin with step 4.

The second step evolves from the database: the interpretation of the data into specifically identified problems or diagnoses and health care needs. The words problems and diagnoses are both used, as some problems cannot be defined as diagnoses but do need to be considered in developing a comprehensive plan of care. Problems are frequently related to how the woman is experiencing the fact of her diagnosis and are often identified by the midwife's focus on the experiencing individual person. For example, the diagnosis might be that the woman is pregnant, and a related problem might be that the woman does not want the pregnancy. Another example is a woman in her third trimester who is frightened by her impending labor and delivery. Being frightened does not fit any category of standard diagnostic nomenclature but certainly creates a problem that needs to be explored, and a plan needs to be developed for reducing this fear. Health care needs may be identified from the problems and diagnoses or may be separate. For example, a health care need of a woman may be for an annual gynecologic examination. Problems or diagnoses may or may not be identified from these findings.

The third step—identifying other potential problems or diagnoses based on the current set of problems and diagnoses—is a matter of anticipation, prevention when possible, watchful waiting, and preparation for any eventuality. This step is vital to safe care. Take, for example, a woman with an overdistended uterus. The midwife should consider the possible reasons for the overdistention (e.g., polyhydramnios, large-for-dates baby, gestational diabetic mother, or multiple gestation) and then anticipate, take precautionary measures, and be prepared for the possibility of an immediate postpartum hemorrhage as a result of uterine atony from the overdistention. In the event of a single large baby, the midwife should also anticipate and be prepared for the possibility of shoulder dystocia and the need for infant resuscitation. Another example is the woman with sickle-cell trait. The midwife should be alert to the possibility of this woman developing a urinary tract infection, which in turn increases the possibility of either premature labor or a small-for-dates baby. Simple preventive measures, pertinent history taking at each prenatal visit, laboratory tests for asymptomatic bacteriuria, and immediate therapeutic treatment if a urinary tract infection does develop are indicated for a woman with sickle-cell trait.

The fourth step reflects the ongoing nature of the management process not only during periodic primary care or prenatal visits, but also while the midwife is continuously with the woman, such as when she is in labor. New data are constantly obtained and evaluated. Some data indicate emergency situations in which the midwife must act immediately in the interest of the life of the mother or baby (e.g., third stage or immediate postpartal hemorrhage, shoulder dystocia, or a low Apgar score). Some data indicate a situation requiring immediate action while awaiting the intervention of the physician, such as a prolapsed cord. Other situations are not emergencies but may require physician consultation or collaborative management. Early signs of preeclampsia require physician consultation. On the other hand, an initial history, physical, and pelvic examination that yield the findings of heart disease, diabetes, or any other major medical problem require collaboration with a physician for management of the pregnant woman with these complications. The condition or situation of a woman or newborn may require consultation or collaborative management with other health care team members such as a social worker, a nutritionist, or a neonatal clinical nurse specialist. The midwife evaluates each clinical situation to determine the most appropriate health care team member for management of the care of the woman or newborn.

The fifth step—developing a comprehensive plan of care—is determined by the preceding steps, is an outgrowth of the identified current and anticipated problems or diagnoses and health care needs, and also involves obtaining any missing or neces-

sary additional pieces of information for the database. A comprehensive plan of care not only includes what is indicated by the condition of the woman or newborn and any related problems, but also outlines anticipatory guidance for the woman or parent as to what to expect next, teaching and counseling, and any necessary referrals for social, economic, religious, family, cultural, or psychological problems. In other words, anything that pertains to any aspect of health care is included in the plan. A plan of care must be mutually agreed upon by the midwife and the woman or parent in order to be effective, because it is the woman or parent who ultimately will or will not implement the plan. Therefore, tasks carried out in this step include formulation and discussion of the plan with the woman or parent as well as confirmation of agreement.

All decisions made in developing a comprehensive plan of care must reflect a valid rationale based on pertinent, appropriate, and up-to-date theoretical knowledge and validated assumptions about what the woman or parent will or will not do. Rationale based on unvalidated assumptions of a person's behavior, erroneous or deficient theoretical knowledge, or an incomplete database is not valid and yields care that is incomplete and may be unsafe.

The sixth step is implementation of the comprehensive plan of care. This step may be done wholly by the midwife or in part by the woman or parent, the midwife, or other health team members. If the midwife is not doing it herself, she assumes responsibility for assuring that it is indeed done. In settings where the midwife collaborates with a physician and contributes to the management of care of women with complications, the midwife may assume responsibility for the implementation of the collaborative comprehensive plan of care. Efficient implementation minimizes time and costs and enhances the quality of care. A critical component of implementation is documentation that is timely, accurate, and thorough.

The final step—evaluation—is really one of checking whether the plan of care actually met the needs-for-help identified in step 2 as problems, diagnoses, or health care needs. The plan is deemed effective if it did and ineffective if it did not. It is possible for parts of the plan to have been effective while other parts were ineffective. Perceiving the management process as a continuum, it is necessary to recycle any ineffective care back through the management process to identify why it was ineffective and to adjust the plan of care accordingly. The management process as a fluid continuum also enables the clinician to readily respond to any actual or potential change in the condition or situation of a woman or newborn.

Because this book is clinically oriented, a modified version of the first five steps of this management process is used in presenting the content in the management sections. The steps are modified for the purpose of adding relevant theoretical knowledge necessary as background information for clinical management of the woman or newborn. Because the management process takes place in the clinical setting and because the last two steps depend on the clinical condition and situation of the woman or newborn, it is not possible to include them in this textbook.

Screening for Abnormality and Differential Diagnosis

Screening for abnormality and making differential diagnoses are vital, but unfortunately sometimes misunderstood, functions of the midwife. It is important to be clear about what these two functions involve.

The primary diagnosis made by the midwife is one of normality, and the role of the midwife includes continual screening of the woman or newborn for deviation from normal. The midwife must be astutely alert to what is abnormal and to complications that may develop, both generally in different patient populations and in relation to a specific patient situation. The midwife must differentiate between normal minor discomforts and medical conditions or diseases or, in pregnancy, complications of pregnancy. For example, the pregnancy discomfort of nausea and vomiting of the first trimester is not the same as hyperemesis gravidarum, nor is it a sign of hydatidiform mole. Likewise, rightsided round ligament pain must be differentiated from appendicitis, false labor differentiated from true labor or a urinary tract infection, bloody show differentiated from frank bleeding, and so forth.

To make differential diagnoses the midwife must know, in depth and in detail, normal obstetrics, gynecology, and newborn care; primary care aspects of women's health; and normal findings of the history, physical assessment, and pelvic examination in order to detect when a deviation from

normal exists in a woman or newborn. A thorough knowledge of the signs and symptoms of pregnancy complications is invaluable in the recognition of deviations from normal. Recognition of the signs and symptoms of medical conditions and diseases and an understanding of how pregnancy affects preexisting medical conditions and diseases is also required. The purpose of being knowledgeable in all these areas is to be able to screen the patient (woman or newborn) for abnormality and to differentiate normal from abnormal.

Differential diagnosis by a midwife does not mean pretending to be an expert diagnostician of medical conditions and diseases and pregnancy complications. If the midwife finds a medical abnormality, discussion with the consulting physician is in order for further evaluation and management of the complication. When caring for women, the midwife then enters into a relationship with the consulting physician for the collaborative management of the care of the woman, a relationship that benefits from each professional's expertise: the physician for management of the medical, obstetrical, or gynecological complication and the midwife for management of those aspects of the woman that continue to be normal. In those situations in which referral or transfer is indicated, the midwife involves the woman in the planning and arrangements so she does not feel abandoned in fact or in perception. At no time does the midwife abandon the woman. Appropriate transfer of care, when properly done, is not abandonment. On the other hand, care of babies by the midwife generally does not extend beyond the neonatal period. The midwife counsels the mother regarding a pediatric care provider for the baby during the pregnancy. In the event of a neonatal abnormality or complication, the baby usually is transferred to the care of the pediatric care provider of the mother's choice, who will collaborate with a neonatologist if indicated.

The midwife begins the process of differential diagnosis. It is not enough, for example, for a midwife to consult with a physician about a woman whose labor is failing to progress normally. The midwife needs to provide the physician with a report that includes specific data indicating differentiation between hypertonic and hypotonic uterine dysfunction and, further, differentiation as to possible causes, such as cephalopelvic disproportion (the report should detail the midwife's clinical evaluation of the pelvis, station, asynclitism, and estimated fetal weight); poorly timed administration of analgesia; psychological or environmental interference; or malposition or malpresentation of the fetus.

For other complications, the midwife goes beyond the initial signs and symptoms indicating a medical condition or pregnancy complication and orders laboratory or other adjunctive tests for confirmation or further evaluation of the diagnosis before discussing a plan of management with the consulting physician. Complications in this category may include suspected diabetes, unresponsive anemia, small-for-dates and large-for-dates fetuses, multiple pregnancy, endometritis, and postdates.

Finally, there are a number of medical conditions or pregnancy complications that a midwife both diagnoses and treats as a primary care provider. These commonly include such conditions as sinusitis, upper respiratory infections, urinary tract infections, vaginitis/cervicitis, uncomplicated sexually transmitted diseases, breakthrough bleeding with oral contraceptives, need for RhoGAM, need for rubella vaccine, need for hormone replacement therapy, and so forth.

Limits of practice are established by a state's legal definition of practice; by ACNM's definition and statements on practice; by the ACNM *Standards for the Practice of Midwifery*; by local and institutional standards of practice, policies, clinical practice guidelines, and delineated practice privileges; and by a midwife's own limitations of knowledge and capabilities. Thus there are four types of limits—legal, professional, local, and personal [14]—and they have certain elastic qualities.

There is a precise thought process involved in making differential diagnoses. This process must be followed in sequence to ensure that a diagnosis is not missed. The thought process starts with the recognition of a sign or symptom either indicative of abnormality or needing further evaluation. The next step is to list all the possible conditions, diseases, or complications of which the sign or symptom could be indicative. The third step is to go through the list methodically, obtaining additional pertinent data (from history, physical, pelvic, laboratory, or other adjunctive studies) that will either confirm or rule out each condition, disease, or complication on the list. All findings are documented, and unless the condition, disease, or complication can be independently managed by the midwife, the midwife discusses the situation with the consulting physician for further evaluation and collaborative management of care. The consultation with the physician and resulting plan of care are also documented on the patient's chart.

Physical Assessment for a Database

The following presentation on history, physical and pelvic examination, laboratory tests, and adjunctive studies is not meant to be a definitive work on the subject of physical assessment. Several excellent textbooks detailing the content of and procedures and skills used in physical diagnosis are listed in the bibliography. What is presented here, rather, is an outline of what is included in a history, physical and pelvic examination, laboratory tests, and adjunctive studies that will initially screen a woman for abnormality and determine normalcy. Assessment of the neonate is discussed in Chapters 37, 39, and 80.

Before 1970, routine physical assessment by nurse-midwives consisted primarily of thorough examination of the breasts and the pelvis; limited examination of the mouth, throat, thyroid gland, abdomen, and extremities; and hemoglobin, hematocrit, urinalysis, and Pap smear. In the early 1970s, however, nurse-midwives added interconceptional care to their services by virtue of their involvement in family planning and in accord with their philosophy of providing continuity of care. It became clear from nurse-midwives' work in family planning that the only physical examination many women received from year to year was the one the nurse-midwives were doing when the woman returned for her annual or semiannual family planning visit. Obviously, the physical examination being done was inadequate for purposes of detecting medical problems not related to contraceptive methods. The solution was for nurse-midwives to learn the content, procedures, and skills of a total history and physical examination. Physical assessment was added to the curriculum in nurse-midwifery education programs, and in-service education was held for staff nurse-midwives. By 1974, physical assessment was an accepted part of nurse-midwifery practice. The comprehensiveness of this examination has increased through the years, in keeping with the expansion of nurse-midwifery practice into gynecology and the primary care of women from puberty through senescence.

A screening examination is aimed at detecting relatively gross evidence of abnormalities and disease. Any such findings start the process of formulating a differential diagnosis for discussion with the consulting physician or referral to a medical specialist. The midwife has the responsibility of obtaining a relevant history in relation to any abnormality detected. This history becomes part of the midwife's report to the consulting physician or specialist and addresses the following questions:

Is the woman aware of the abnormality?

What brought the abnormality to her attention (e.g., she has pain; she was told during a previous physical)?

Are any related symptoms present?

How long has the abnormality been present, and what has been its course since discovery?

Has the woman ever been seen and treated for the abnormality?

By whom?

When?

What was the diagnosis as the woman understands it?

What was the treatment?

How effective was the treatment?

Is she continuing to receive care for this abnormality?

In taking a history and doing a physical and pelvic examination, midwives go into greater detail in those areas germane to childbearing, pregnancy, gynecology, and family planning than is usual for a woman admitted to a medical unit for a diagnostic workup. This is not surprising, because most often a woman sees a midwife for preventive health care or conditions related to the reproductive tract. For this reason the following outline of a history, physical and pelvic examination, and laboratory tests lacks detail for some body systems but offers considerable detail for aspects specifically related to women's health care. It includes concerns about domestic violence, occupational hazards, sexually transmitted diseases, HIV/AIDS, and substance abuse. It also includes skills, detailed in Part 8, that are not strictly related to the reproductive system but are frequently used. Examples include checking for costovertebral angle (CVA) tenderness, because urinary tract infections are a common complaint of women, and checking deep tendon reflexes, essential in evaluating the possible severity of preeclampsia.

History

Principles of History Taking (Figure 2-1):

1. Introduce yourself and state what you are going to do and your purpose for doing it.
2. Observe all rules of interviewing:
   a. Use open-ended, not closed-ended, questions.
   b. Ask only one question at a time.
   c. Avoid leading questions or questions that "put answers in the woman's mouth."

FIGURE 2-1 A midwife taking a woman's history.

   d. Clarify what the woman's behavior means to her.
   e. Use a level of terminology the woman will understand.
3. Be tactful and respectful of the woman's right to privacy about her person and personal life at all times.
4. Listen to the woman with interest and concern, and be responsive to what she is saying. For example, if she is talking about a past difficult time in her life, a response denoting sympathetic understanding is appropriate.
5. Be responsive to requests for clarification or information.
6. Be precise, thorough, and accurate in obtaining all essential information.
7. Keep the history taking focused without wasting time on a wandering line of questioning.
8. Screen out and do not record any irrelevant material.
9. Allow the woman time to answer. Don't interrupt unless she starts to ramble or you need clarification.
10. Listen to the woman carefully. She may in one answer give an answer to a later question as well. If so, don't repeat the later question. Also, don't make her repeat what she just said because you weren't paying attention.
11. Follow up on unclear responses, pertinent information, or pertinent information not directly related to the current question.
12. Be sure you understand what the woman is saying. Accents and expressions vary from one part of the country to the next. Don't hesitate to ask the woman to spell or explain words she is using.
13. Do not express negative judgments through facial expression, body language, or tonal inflection.
14. Provide as much privacy from being overheard as possible.
15. Speak in well-modulated, soothing, calming tones.
16. Maintain eye contact—don't always be reading from the history form, writing responses, and charting.
17. Don't ask a question unless you can explain to the woman your reason for asking it. A woman may consider social, sexual, economic, educational, occupational, and housing information extremely personal. Not all of the information that can be obtained in these areas is necessary information. You should obtain such information only with a purpose, because otherwise the woman may interpret your questioning as prying into her personal life and react accordingly. For example:
   a. Housing is important to ascertain. Some women are homeless, and life in shelters limits their ability to maintain personal hygiene and exposes them to a higher incidence of certain diseases, such as tuberculosis. Other women may be in group homes for drug rehabilitation, mental retardation, protection from domestic violence, etc.
   b. Sexual and substance use histories have become imperative as part of screening for sexually transmitted diseases and for HIV/AIDS.
   c. Before talking about diet and meal preparation with a woman, you should know if she does the grocery shopping and meal preparation. When possible, include the person who does these chores in your discussion if it is not the woman herself.
   d. Before talking about taking showers or soaking in a tub of warm or hot water, you should know what bathing facilities a woman has, if any.
   e. Knowing a woman's occupation and household responsibilities is important in identifying risks for such job-related injuries as carpal tunnel syndrome and environmental hazards, and, if pregnant, in ascertaining appropriate job restrictions and planning rest periods with her feet elevated.

Identifying Information

1. Name
2. Age
3. Race/ethnicity
4. Gravida and para
5. Address/telephone
6. Religion

7. Marital status
8. Occupation
9. Date of interview

Chief Complaint (CC)

The reason the woman is seeing you in the clinic, office, emergency room, birth center, hospital, or her home, as stated in her own words (may relate to any body system).

History of Present Illness (HPI) (relates to the chief complaint or problem)

1. Date and time of onset
2. Mode of onset
3. Precipitating or predisposing factors related to onset
4. Course since onset, including duration and recurrence
5. Specific location
6. Type of pain or discomfort and severity or intensity
7. Other associated symptoms
8. Relationship to bodily functions and activities
9. Description of quality (color, consistency) and quantity (amount, volume, or number), if applicable (e.g., rash, discharge, bleeding)
10. Factors influencing the problem, either aggravating or relieving
11. Previous medical help (and from whom) for this problem; diagnosis and treatment
12. Effectiveness of any treatments or medications used (self- or medically initiated)

Past Medical and Primary Care History (includes social history)

1. Childhood diseases/immunizations, such as measles (type), mumps, or chickenpox
2. Recent laboratory screening tests for infectious diseases (e.g., hepatitis, measles, tuberculosis, HIV); date, result
3. Major illnesses (e.g., pneumonia, hepatitis, rheumatic fever, diphtheria, polio)
4. Hospitalizations; date, reason
5. Surgery; date, reason
6. Accidents; fractures, injuries, unconsciousness
7. Blood transfusions; date, reason, reaction
8. Allergies (e.g., food, hay fever, environmental, dust, animals; asthma)
9. Drug allergies
10. Alcohol abuse/alcoholism; treatment
11. Drug abuse/addiction; substance(s), treatment
12. Habits
    a. smoking (amount; duration)
    b. alcohol (amount; duration)
    c. caffeine (coffee, tea, sodas, chocolate)
    d. "recreational" drugs (substance, amount; duration)
    e. safety (seat belts, helmets)
13. Sleep patterns
14. Diet/malnutrition
15. Exercise/leisure activity
16. Occupational hazards: position (standing, sitting), strain (eye, muscle), ventilation, exposure to toxic chemicals
17. Environmental hazards: air, water, sewage, lack of window screens, open fireplace, lead paint
18. Childhood physical/sexual abuse
19. Domestic violence/battering/rape/isolation: historical, current; safety
20. Genetic screening tests, when applicable (e.g., sickle cell, Tay-Sachs, G6PD, fragile X, cystic fibrosis); results
21. Specific diseases
    a. diabetes
    b. heart disease (diagnosis, e.g., mitral valve prolapse), including rheumatic fever
    c. tuberculosis
    d. asthma
    e. liver/hepatitis
    f. kidney/urinary tract infections (UTI)
    g. varicosities/thrombophlebitis
    h. glandular/endocrine (diagnosis, e.g., hypo/hyperthyroidism)
    i. gastrointestinal (diagnosis e.g., gastric ulcer)
    j. cancer
    k. hypertension
    l. HIV/AIDS
    m. mental illness (diagnosis: e.g., depression, bipolar)
    n. epilepsy
    o. blood dyscrasias, such as anemia (type)
    p. eating disorders (diagnosis, e.g., bulimia, anorexia)
22. Medications
    a. prescription
    b. nonprescription

Family History (pertains to mother, father, siblings, grandparents, aunts, and uncles)

1. Mother, father, siblings
    a. age
    b. status, i.e., living and well? If deceased, what was the cause of death?

2. Mental retardation
3. Cancer
4. Heart disease
5. Hypertension
6. Diabetes
7. Kidney disease
8. Mental illness
9. Congenital anomalies
10. Multiple pregnancies
11. Tuberculosis
12. Epilepsy
13. Blood dyscrasias, such as anemia (type)
14. Allergies
15. Genetic disorders
16. Autoimmune disorder (e.g., lupus)

Menstrual History

1. Age at menarche
2. Frequency; range if irregular
3. Duration
4. Amount of flow
5. Characteristics of flow (e.g., clots)
6. Last menstrual period (LMP); duration and amount normal?
7. Dysmenorrhea
8. Dysfunctional uterine bleeding, i.e., intermenstrual spotting or bleeding, menorrhagia, metrorrhagia
9. Sanitary product use (tampons, pads)
10. Toxic shock syndrome
11. Premenstrual symptoms/premenstrual syndrome (PMS)
12. Perimenopausal symptoms

Sexual History

1. Type of sexual relationship (heterosexual, homosexual, bisexual)
2. Monogamous relationship or number of partners
3. Partner monogamous or number and type of partners
4. Sexual frequency, satisfaction
5. Satisfaction with sexual relationship
6. Problems
   a. insufficient foreplay
   b. insufficient lubrication
   c. lack of personal consideration
   d. pain, vaginismus
   e. fear of becoming pregnant
   f. fear of hurting fetus, if pregnant
   g. problems of partner (e.g., impotence, premature ejaculation)
   h. postcoital bleeding
   i. sexual violence

Obstetric History

1. Gravida/para (four- or five-digit system)
2. Rh and ABO blood type
3. Each pregnancy
   a. date of termination
   b. weeks gestation
   c. where delivered, i.e., hospital (name), childbirth center (name), home
   d. length of labor
   e. type of delivery (spontaneous, C-section, forceps, vacuum extraction)
   f. RhoGAM received
   g. any obstetric, medical, or social problems
      (1) during pregnancy (e.g., preeclampsia, UTI, domestic violence)
      (2) during labor and delivery (e.g., malpresentation, malposition, preeclampsia, eclampsia, pitocin induction, pitocin stimulation, major perineal laceration, cervical laceration)
      (3) during postpartum period (e.g., UTI, hemorrhage, uterine infection, depression, domestic violence)
   h. weight of baby at birth
   i. sex of baby
   j. any congenital anomalies or neonatal complications (e.g., jaundice, respiratory problems)
   k. status of infant at birth (alive or dead)
   l. present status of infant (e.g., living and well, problems, cause of death)

Gynecological History

1. Infertility
2. Diethylstilbestrol (DES) exposure
3. Vaginal infections (i.e., monilia, bacterial vaginosis)
4. Sexually transmitted diseases (STD) (i.e., chlamydia, syphilis, gonorrhea, herpes, trichomonas, condylomata acuminata)
5. Chronic cervicitis
6. Endometritis
7. Pelvic inflammatory disease (PID)
8. Cysts (Bartholin's, ovarian)
9. Endometriosis
10. Myomas
11. Pelvic relaxations (cystocele, rectocele)
12. Polyps
13. Breast masses

14. Abnormal Pap smears
15. Biopsies (cervical, endometrial, breast)
16. Gynecological cancer
17. Gynecological surgery
18. Rape

Contraceptive History

1. Whether contraception is wanted
2. Knowledge of contraceptive options
3. Present contraceptive method
   a. type
   b. satisfaction
   c. side effects
   d. consistency of use
   e. length of time using this method
4. Previous contraceptive methods
   a. types
   b. duration of use for each
   c. side effects of each
   d. reasons for discontinuing each

Hormone History

1. Reason for use of contraceptive hormones (e.g., to regulate menses)
2. Hormone replacement therapy
   a. present, past, how long used
   b. type
   c. side effects

Douching History

1. Frequency
2. Method
3. Solutions used
4. Reasons for douching
5. Length of time woman has been douching
6. Last time douched

Review of Systems

The review of systems (ROS) is a structured inquiry about past or current symptoms or complaints related to each body system. Because some examiners prefer to do the review of systems during the physical examination, usually in the interest of saving time, and because it makes sense to ask questions about specific systems, organs, or body parts while they are being examined, the ROS is included in the following outline of the physical examination and designated as such. Combining the ROS with the examination has caused information about some systems (the lymphatic and hematopoietic systems, the central nervous system, and the endocrine system) to be split up so as to tie them to specific body structures. The advantage of proceeding this way is that it eliminates repetition.

Physical Examination

Principles of Doing a Physical Examination (Figure 2-2):

1. Wash your hands immediately before doing the examination.
2. Be sure that your fingernails are clean and cut to a length that will not hurt the woman.
3. Warm your hands prior to touching the woman by washing them in warm water, rubbing them together, or holding them under a lamp.
4. Tell the woman what you will be doing in general. During the examination itself, tell the woman more specifically what you will be doing just before doing it—that is, let her know where you will be touching her, what you want her to do, and whether this portion of the examination will be uncomfortable.
5. Use a touch that is gentle yet firm enough not to tickle the woman and as firm as needed to elicit accurate information.
6. Let your approach and touch bespeak respect for her body as well as respect for her right to modesty and privacy.

FIGURE 2-2 A midwife doing a physical examination of a woman.

7. Drape the woman in such a way that only the area being examined at that particular point during the exmaination is exposed.
8. Organize your examination as follows:
   a. Progress from head to toe.
   b. Minimize movement of the woman; e.g., while having her sit up so you can inspect her breasts, also listen to her lungs from the back, observe and palpate for spinal deformities, and check for CVA tenderness rather than having her return to a sitting position several times during the examination.
   c. Wait until the end of the examination to touch parts of the body that will require you to rewash your hands (e.g., the bottom of her feet).
   d. Make sure the examination progresses in the same way for every woman; this will help you to remember everything.
9. Be alert for any inconsistency between the woman's history and your physical findings.
10. Share your findings with the woman. If she is anxious about something that you find to be normal, immediately tell her your findings. If you find something that concerns you because it may be a possible deviation from normal, tell her that you are not sure of what you have found and want a physician to check it. Remember, it is the woman's body and she has a right to know everything about it. Be honest and truthful with her.

Physical Measurements

1. Temperature
2. Pulse
3. Respirations
4. Blood pressure
5. Height
6. Weight

General

ROS:

1. Woman's evaluation of own health status
2. Woman's evaluation of own dietary patterns
3. Unusual weight changes
4. Weakness
5. Fatigue
6. Malaise
7. Fever, chills, sweating
8. Woman's evaluation of own emotional status
9. Ability to carry out activities of daily living

Observations:

1. Appropriateness of appearance for age
2. General nutritional status
3. Apparent state of health
4. General personal appearance
5. General mental and emotional state: speech; appropriateness of mood or affect; general mood (e.g., anxiety, depression); orientation to time, place, person; memory; logic and coherence of thought processes; general behavior (e.g., hostile, friendly, cooperative, confused)
6. Striking or obvious findings (e.g., pallor, cyanosis, respiratory distress, persistent cough, voice or speech abnormality, facial asymmetry, orthopedic abnormalities)
7. General posture, gait, body movements

Skin and Hair

ROS:

1. Skin
   a. pruritus
   b. rashes
   c. moles: any change noted
   d. lesions
   e. tendency to bruise
   f. general character (i.e., dry, oily)
   g. hirsutism
2. Hair and scalp
   a. general character (i.e., dry, oily)
   b. loss of hair
   c. wearing wig or not; if so, why
   d. scalp infections, dandruff, lice

Observations and examination:

1. Skin
   a. temperature
   b. color: pigmentation, pallor, cyanosis, jaundice
   c. moisture
   d. turgor
   e. moles
   f. scars
   g. rashes, lesions, bruises
   h. patterns of injury, showing repetition of injury: fresh or in various stages of healing (e.g., cigarette burns)
   i. tumors
2. Hair and scalp
   a. hair pattern
   b. scalp infections, dandruff, lice, lesions
   c. bald spots (alopecia)
   d. general character (i.e., dry, oily)
   e. lumps

Head

ROS:

1. Headaches: location, duration, time of day when they occur, frequency, type of pain, severity, relief measures and their effectiveness, any known causative factors, associated symptoms (e.g., nausea and vomiting, dizziness)
2. Dizziness
3. Syncope (fainting)
4. Sinusitis

Observations and examination:

1. Size, shape, contour, symmetry
2. Facial symmetry
3. Location of facial structures
4. Involuntary movements
5. Tenderness over frontal and maxillary sinuses

Eyes

ROS:

1. Blurring of vision
2. Scotomata (blind spots in vision)
3. Diplopia (double vision)
4. Spots before eyes
5. Flashing lights
6. Pressure or pain symptoms
7. Photophobia (sensitivity to light)
8. Lacrimation (excessive tearing)
9. Discharge, redness, burning
10. Woman's evaluation of her own visual acuity and any recent changes
11. Glasses or contact lenses: for what, last time eyes examined, last time prescription changed
12. Injuries
13. Diseases or conditions

Observations and examination:

1. Eyelids: closure, edema, signs of infection, blinking, squinting, masses, lesions, ptosis (drooping eyelid)
2. Eyelashes: matting from discharge, absence
3. Lacrimal ducts: signs of infection, tenderness
4. Involuntary eye movements
5. Color of lower conjunctival sac
6. Color of sclera
7. Abrasions or opacities of lens and cornea
8. Strabismus (cross-eyes)
9. Size, shape, and equality of pupils
10. Parallel movement of eyes and gross visual fields
11. Pupillary reaction to light and accommodation
12. Protrusion of eyeball and intraocular pressure as determined by finger tension
13. Ophthalmoscopic examination
    a. presence of red reflex
    b. color and outline of optic disc
    c. color, size, and shape of retinal vessels
    d. hemorrhagic areas
    e. color and shape of macula and fovea
    f. papilledema

Ears

ROS:

1. Woman's evaluation of her own hearing acuity and any recent changes
2. Earaches
3. Discharge
4. Tinnitus (ringing in the ears)
5. Vertigo (lack of balance)
6. Infections, injuries
7. Pain

Observations and examination:

1. Enlargement or tenderness of mastoid
2. General hearing acuity
3. Placement of ears on head
4. Shape, growths, lesions, and discharge noted in auricles and outlets of external ear canal
5. Color, obstruction, lesions, edema, discharge, foreign objects in external auditory canal
6. Otoscopic examination of tympanic membrane
    a. color
    b. bulging or retraction
    c. bony landmarks
    d. cone of light: presence or absence
    e. scars, perforations

Nose

ROS:

1. Nasal obstruction (difficulty with nasal breathing)
2. Epistaxis (nosebleeds)
3. Discharge: nasal and postnasal
4. Woman's evaluation of her own sense of smell
5. Injuries
6. Frequency of colds

Observations and examination:

1. Flaring of nares
2. Deformity or septal deviation
3. Symmetry, size, placement, including symmetry of nasolabial fold
4. Patency of nostrils
5. Perforation of nasal septum
6. Nasal speculum examination

a. size, signs of infection, edema of turbinates
b. polyps, growths, obstructions
c. ulcerations, lesions, bleeding points
d. discharge
e. color of mucosa

Mouth and Throat

ROS:

1. Toothaches
2. Bleeding, lesions, pain, or edema of gums
3. Extractions and dentures
4. Any difficulty with chewing or swallowing
5. Pain, lesions, bleeding, or edema of lips
6. Pain, lesions, tumors, or bleeding of mouth
7. Pain, lesions, color, texture, tumors, bleeding, edema of tongue
8. Frequency of sore throats
9. Number of cigarettes per day
10. Surgery (e.g., tonsillectomy)
11. Woman's evaluation of own sense of taste
12. Hoarseness or voice change
13. Any difficulty with talking or speech
14. Dental care

Observations and examination:

1. Odor of breath
2. Lips: symmetry, color, lesions, edema, tumors, fissures
3. Mouth and mucosa: lesions, tumors, plaques, intactness of palate, color, vascular spots
4. Teeth: state of repair, missing teeth, caries
5. Gums: bleeding, lesions, edema, tumors, color, retractions, pus/exudate
6. Tongue: symmetry, position, texture, color, lesions, tumors, moistness, coating, mobility, deviation
7. Uvula: deviation, size, enlargement
8. Oropharynx: signs of infection in posterior pharynx, tonsillar fossae, and tonsillar pillars; inflammation, edema, bleeding, exudate, pus patches, color, lesions, tumors, size, symmetry, and enlargment of tonsils

Neck

ROS:

1. Pain or stiffness
2. Limitation of motion
3. Node enlargement or tenderness
4. Thyroid enlargement; history of goiter
5. Injuries, deformities
6. Thyroid (endocrine system)
   a. sensitivity to environmental temperature and weather changes
   b. amount of sweating (excessive?)
   c. changes in scalp and hair, breasts, skin, genitalia, neck, secondary sex characteristics
   d. changes in emotional lability
   e. changes in heart rate, tremors, nervousness
   f. change in body weight in relationship to appetite
   g. change in energy levels and activity pattern
   h. results of previous BMR (basal metabolism rate) and thyroid function tests
   i. known history of thyroid disease and medications

Observations and examination:

1. Enlargement or tenderness of the salivary, submaxillary, anterior, posterior, and deep cervical, preauricular and postauricular, and supraclavicular lymph nodes and glands; size, shape, consistency, and mobility of any palpable nodes and glands
2. Carotid pulse
3. Abnormal pulsations
4. Vein distention
5. Range of motion
6. Enlargement or tumor of parotid gland
7. Enlargement, tumor, symmetry, size, shape, tenderness, or nodules of thyroid gland
8. Symmetry and deviation (position) of trachea

Cardiorespiratory System

ROS:

1. Dyspnea (shortness of breath)
2. Orthopnea
3. Tachypnea
4. Wheezing
5. Cough
6. Pleurisy
7. Sputum production: color, consistency, amount
8. Hemoptysis
9. Chest pain
10. Stridor ("crowing" inspiratory sounds)
11. History of bronchitis, pneumonia, asthma
12. Any contact with tuberculosis
13. Date of last chest x-ray film and result
14. Night sweats
15. Palpitations
16. Cyanosis
17. Dependent edema
18. Any known abnormalities of heart rate or rhythm
19. History of rheumatic heart disease, anemia, hypertension, coronary artery disease

Observations and examination:

1. Chest and lungs
   a. configuration, deformities, symmetry, shape, masses, lesions, scars of chest structure and walls
   b. intercostal and/or subclavicular retractions or bulging
   c. equilateral respiratory excursion and symmetry with respiratory movement
   d. rate, depth, rhythm, and type (chest, abdominal) of respirations
   e. tactile fremitus
   f. auscultation of lungs
      (1) normal breath sounds
      (2) rales
      (3) rhonchi
      (4) wheezes
      (5) friction rub
      (6) adventitious sound
2. Heart
   a. size
   b. location of point of maximum impulse (PMI)
   c. palpable thrills, rubs, impulses, shocks
   d. observable bulgings, heavings, pulsations
   e. auscultation of heart
      (1) rate, rhythm, and quality of heart sounds at the four valvular areas
      (2) extra sounds, murmurs, splitting, rubs, thrills

Breasts

ROS (see Chapter 52 for a more complete history related to the breasts):

1. Pain
2. Nipple discharge
3. Lumps, biopsies
4. Whether woman does breast self-examination

Observations and examination:

See Chapter 52 for observations, examination, and significance of findings.

Abdomen (Gastrointestinal System)

ROS:

1. Appetite, anorexia (lack of appetite)
2. Nausea or vomiting
3. Heartburn
4. Eructation (belching)
5. Hematemesis
6. Pain
7. Flatulence
8. Color of stools
9. Character of stools (soft, diarrhea, constipation)
10. Any recent change in bowel habits or stools
11. Jaundice
12. Rectal itching, pain, bleeding, hemorrhoids, sphincter control
13. Known history of gallbladder disease, liver disease (hepatitis), appendicitis, colitis, ulcers, pancreatitis, parasites, hernia
14. Food allergies and idiosyncracies
15. Any gastrointestinal x-ray examinations; date and results
16. Use of cathartics, laxatives, antacids, and antiemetics
17. Pancreas (endocrine system)
    a. polyuria, polydipsia, polyphagia in relation to food ingestion
    b. hypoglycemia symptoms (weakness, nervousness, sweating, tachycardia, hunger) in relation to food ingestion
    c. known history of diabetes

Observations and examination (Figure 2-3):

1. Symmetry, shape, contour, scars, distention, striae, lesions, pigmentation, bruises, abnormal pulsations

FIGURE 2-3 A midwife palpating a woman's abdomen.

2. Masses, tenderness, organomegaly, rigidity, guarding, distention, peristaltic activity
3. Femoral pulses
4. Umbilical, inguinal, or femoral hernias
5. Diastasis recti
6. Enlargment or tenderness of inguinal lymph nodes
7. Rectal examination, done at the time of the pelvic examination. See Chapter 56 for observations, examination, and significance of findings.

Genitourinary System

ROS:

1. Urinary
   a. frequency
   b. urgency
   c. dysuria
   d. hematuria
   e. nocturia
   f. suprapubic, flank, or low back pain
   g. polyuria or oliguria
   h. pyuria (pus in urine)
   i. incontinence
   j. known history of urinary tract infections or kidney stones
2. Adrenal (endocrine system)
   a. changes in melanin pigmentation of skin
   b. weakness
   c. symptoms suggesting hypoglycemia
   d. postural hypotension
3. Genitals
   a. lesions
   b. signs of trauma
   c. discharge: character, color, odor, pruritis
   d. sexually transmitted diseases*
   e. douching history*
   f. menstrual history*
   g. sexual history*
   h. obstetrical history*
   i. family planning history*
   j. date and results of last Pap smear
4. Endocrine system
   a. hirsutism
   b. known history of gonadal insufficiency; hormone therapy

Observations and examination:

1. Urinary: CVA tenderness (see Chapter 54 for methodology and significance of findings)
2. Genitals: See Chapter 56 for observations, examination, and significance of findings.

Muscular-Skeletal-Vascular Systems

ROS:

1. Joint pain, stiffness, swelling, redness, heat
2. Muscle weakness, cramps, pain, twitching, tremors, paralysis, paresthesia, atrophy
3. Skeletal pain, injuries, deformities (e.g., scoliosis, lordosis, kyphosis)
4. Limitation of motion in back or range of motion of the extremities
5. Edema of extremities
6. Varicose veins, intermittent claudication (leg or calf muscle pain when walking or exercising), leg heat or tenderness
7. Known history of arthritis, gout, muscular dystrophy, thrombophlebitis, bursitis, osteomyelitis, fractures, disk disease, sciatica

Observations and examination:

1. Curvature and mobility of the spine
2. Spinal column vertebral tenderness
3. Radial and pedal pulses
4. Skeletal deformities
5. Range of motion of extremities
6. Edema: finger, fascia, ankle (pedal), pretibial
7. Varicosities; calf heat and/or tenderness
8. Heat, swelling, or redness of joints
9. Homan's sign
10. Length, size, edema, lesions, redness, skin temperature, tenderness or pain, muscle atrophy, contractures, color, scars, or involuntary movements of the extremities
11. Deep tendon reflexes**
12. Clonus**
13. Clubbing, cyanosis, or other abnormality of nails
14. Needle marks or tracks
15. Tremors of fingers

Review of Other Systems

Central Nervous System

1. General
   a. syncope, loss of consciousness, convulsions, vertigo

* Do not repeat if this information was already obtained as special sections of the history or under the past medical history.

** See Chapter 55 for observations, examination, and significance of findings.

   b. known history of meningitis, encephalitis, stroke
2. Mental status
   a. speech disorders, memory disorders
   b. emotional status, nervousness, mood; orientation to time, place, and person
   c. change in sleep pattern, insomnia, activity pattern
   d. history of "nervous breakdown," depression
3. Motor
   a. clumsiness of movement (ataxia), weakness (paresis), paralysis
   b. tremor or muscle twitching
4. Sensory
   a. radicular or neuralgic pain (head, neck, trunk, extremities)
   b. paresthesia (burning or crawling skin sensation)
   c. hypoesthesia (decrease in tactile sensation)
   d. anesthesia (loss of sensation)
   e. hyperesthesia (excessive sensitivity of skin or special senses)

Lymphatic and Hematopoietic Systems

1. Lymphatic: lymph node swelling
2. Hematopoietic
   a. unusual or excessive bruising or bleeding; bleeding tendencies of skin or mucous membranes
   b. known history of anemia and treatment, blood transfusion and reaction, blood dyscrasias, exposure to radiation or toxic agents

Laboratory Tests and Adjunctive Studies

Laboratory tests and adjunctive studies are an essential component of physical assessment. Which tests and studies are performed as part of a routine screening vary based on the age of the woman, her risk status (e.g., if she has been exposed to sexually transmitted diseases or tuberculosis), and whether she is pregnant. At a minimum, for all ages and regardless of status with respect to pregnancy, an assessment should be made of the need to screen for vaginal infections or sexually transmitted diseases and the following lab tests and adjunctive studies done:

1. Hemoglobin/hematocrit
2. Total cholesterol
3. Urinalysis
4. Pap smear

Additional tests for the pregnant woman are covered in Chapter 22 on antepartal examinations.

Older women should also receive the following tests and adjunctive studies:

1. Occult blood
2. Mammography
3. Triglycerides and lipid profile in addition to plasma cholesterol
4. Thyroid studies
5. Proctosigmoidoscopy (every 3–5 years)

As laboratory values vary somewhat from one laboratory to another, each laboratory publishes the range of normal values for each test done in that laboratory. It is essential that you review a given laboratory's range of normal for a test. If the woman is pregnant, you should then adjust interpretation of the test results for known normal physiologic changes occurring during pregnancy in order to determine whether the laboratory report indicates a normal physiologic state or suggests a deviation from normal that requires further evaluation.

References

1. American College of Nurse-Midwives. *Certified Nurse-Midwives and Certified Midwives as Primary Care Providers/Case Managers*. Washington, DC: ACNM, 1997.
2. Committee on the Future of Primary Care, Institute of Medicine, National Research Council. *Primary Care: America's Health in a New Era*. Washington, DC: National Academy Press, 1996.
3. American College of Nurse-Midwives. *Definition of Midwifery Practice*. Washington, DC: ACNM, 1997.
4. American College of Nurse-Midwives. *Independent Midwifery Practice*. Washington, DC: ACNM, 1997.
5. American College of Nurse-Midwives. *Collaborative Management in Midwifery Practice for Medical, Gynecological and Obstetrical Conditions*. Washington, DC: ACNM, 1997.
6. Williams, D. R. Primary care for women: The nurse-midwifery legacy. *J. Nurse-Midwifery* 40(2):57 (March/April) 1995.
7. Burst, H. V. Real midwifery. *J. Nurse-Midwifery* 35(4):189–191 (July/August) 1990.
8. Scupholme, A., DeJoseph, J., Strobino, D. M., and Paine, L. L. Nurse-midwifery care to vulnerable

populations: Phase I: Demographic characteristics of the national CNM sample. *J. Nurse-Midwifery* 37(5):341–347 (September/October) 1992.
9. Avery, M. D., and DelGiudice, G. T. High-tech skills in low-tech hands: Issues of advanced practice and collaborative management. *J. Nurse-Midwifery* 38(2 supplement):10S (March/April) 1993.
10. Clark-Coller, T. Letter to the editor. *J. Nurse-Midwifery* 39(6):389–390 (November/December) 1994.
11. Shah, M. A. The nurse-midwife as primary care provider. *J. Nurse-Midwifery* 38(4):186 (July/August) 1993.
12. University of Mississippi Medical Center, Nurse-Midwifery Education Program. *Management Process*. Jackson, MS: 1972–1973.
13. College of Medicine and Dentistry of New Jersey, New Jersey Medical School, Nurse-Midwifery Education Program. *Management Process*. Newark, NJ: 1975.
14. Wiedenbach, E. *Clinical Nursing—A Helping Art*. New York: Springer Publishing, 1964.

• • • Additional References

Avery, M. D., and DelGiudice, G. T. High-tech skills in low-tech hands: Issues of advanced practice and collaborative management. *J. Nurse-Midwifery* 38(suppl. 2):10S (March/April) 1993.

Barkauskas, V. (Ed.) *Health and Physical Assessment*, 2nd ed. St. Louis: Mosby-Year Book, 1998.

Bickley, L. S. (Ed.) *Bates' Guide to Physical Examination and History Taking*, 7th ed. Philadelphia: Lippincott Williams and Wilkins, 1999.

Burst, H. V. Real midwifery. *J. Nurse-Midwifery* 35(4):189–191 (July/August) 1990.

Byyny, R. L., and Speroff, L. *A Clinical Guide for the Care of Older Women: Primary and Preventive Care*, 2nd ed. Baltimore: Lippincott Williams and Wilkins, 1996.

Chez, N. Helping the victim of domestic violence. *AJN* 33–37 (July) 1994.

Clark-Coller, T. Letter to the editor. *J. Nurse-Midwifery* 39(6):389–390 (November/December) 1994.

Committee on the Future of Primary Care, Institute of Medicine, National Research Council. *Primary Care: America's Health in a New Era*. Washington, DC: National Academy Press, 1996.

Dornbrand, L., Hoole, A. J., and Fletcher, R. H. *Manual of Clinical Problems in Adult Ambulatory Care*, 3rd ed. Philadelphia: Lippincott Williams and Wilkins, 1997.

Erwin, D. K., and Hosford, B. Demystifying the nurse-midwifery management process. *J. Nurse-Midwifery* 32(1):26–32 (January/February) 1987.

Greener, D. Clinical judgment in nurse-midwifery: A review of the research with implications for education. *J. Nurse-Midwifery* 33(6):261–268 (November/December) 1988.

Netter, F. H. *The Ciba Collection of Medical Illustrations, Vol. II: Reproductive System*. Summit, NJ: Ciba Pharmaceutical, 1988.

Paine, L. L., Barger, M. K., Marchese, T., and Rorie, J. A. Primary care for women: An overview of the role of the nurse-midwife. *J. Nurse-Midwifery* 40(2):65–73 (March/April) 1995.

Paluzzi, P. A., and Quimbly, C. H. *Domestic Violence Education Module*. Washington, DC: ACNM Special Projects Section, 1995.

Reedy, N. J. Nurse-midwife in complicated obstetrics: Trend or treason? *J. Nurse-Midwifery* 24(1):11–17 (January/February) 1979.

Scupholme, A., DeJoseph, J., Strobino, D. M., and Paine, L. L. Nurse-midwifery care to vulnerable populations: Phase I: Demographic characteristics of the national CNM sample. *J. Nurse-Midwifery* 37(5):341–347 (September/October) 1992.

Shah, M. A. The nurse-midwife as primary care provider. *J. Nurse-Midwifery* 38(4):185–187 (July/August) 1993.

Uphold, V. and Uphold, C. R. (Eds.) *Clinical Guidelines in Family Practice*, 3rd ed. Gainesville, FL: Barmarrae Books, 1999.

Wiedenbach, E. *Clinical Nursing—A Helping Art*. New York: Springer Publishing, 1964.

Williams, D. R. Primary care for women: The nurse-midwifery legacy. *J. Nurse-Midwifery* 40(2):57–58 (March/April) 1995.

PART

II

Primary Care of Women

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CHAPTER

3

Cultural Competence in Midwifery Practice

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The United States is an abundantly pluralistic society, as evidenced by the dramatic demographic changes revealed in the data collected for the 1990 Census. In contrast to the European roots that predominated among earlier immigrants, 25 percent of today's population traces its roots to Africa, Asia, or the Pacific Islands, or to Latino and Arab countries [1, 2]. One aim of midwifery care is to provide culturally competent care to all women across the life span. Culturally competent practice is particularly important for midwives in a country as diverse as the United States. To provide such care, midwives must understand the importance of each woman's cultural frame of reference. Midwives serve a rich and varied tapestry of women from a multitude of populations. The data from the 1991 study entitled "Nurse-Midwifery Care to Vulnerable Populations in the United States" is a visit and practice analysis of 5.4 million annual patient visits conducted by CNMs [6]. According to this study, 71 percent of these visits were made to women and infants from vulnerable populations; 42 percent were to women of a race or ethnicity other than European American (including 19.4 percent Black, 15.8 percent Latino, 2.6 percent Native American, and 3.3 percent Asian) [7]. The majority of those visits was for maternity care and included client education and counseling, two core components of midwifery care. On average, midwives spend 22 minutes with women during an established visit [4, 5]. According to the 1998 *Nurse-Midwifery Practice Survey*, CNMs described the population they served as nonwhite, immigrant, and uninsured [3].

Because health care is a cultural construct—emerging from beliefs about the characteristics of disease and the impact on the human body—cultural issues are primary in the provision of health services treatment and preventive intervention [8]. Midwives must thus be prepared to deliver care in a culturally competent manner and to ensure that our own lack of knowledge about others does not impair the delivery of such care. Cultural competence is a set of behaviors, attitudes, and policies that enable a system, agency, or individual to function effectively with culturally diverse clients and communities. Competence also implies skills that help to translate beliefs and orientation into action and behavior within the context of daily interaction with women and their families. Cultural competence refers to a health care provider's ability to honor and respect those beliefs, interpersonal styles, attitudes, and behaviors of clients as well as the multicultural staff who are providing services. These values must be incorporated at all levels—from policy and administration to clinical practice [9, 10].

Cultural competence is also a process in which the nurse-midwife gets in touch with his/her own culture and its influence on clinical practice. This is the first step in cross-cultural effectiveness. Culture implies an integrated pattern of human behavior that includes the thoughts, communications, actions, customs, beliefs, values, and institutions of racial, religious, socioeconomic, educational, occupational, or geographic groups. Culture defines all aspects of health care—how health care information is received and perceived, what is considered to

be a health problem, how symptoms are expressed, who and where treatment should be provided, and what type of treatment is acceptable and affordable [1, 8, 11]. To begin to understand the concept of culture and the plethora of world views that each person brings to a situation, it is important to keep the following three points in mind:

1. Culture is not static; it is dynamic and ever changing; the cultural practices that individuals remember and practice from their country or place of origin are often different from the practices that are occurring in that same place today.
2. Culture, language, ethnicity, and race are not the only determinants of a person's values, beliefs, and behaviors. Occupation, socioeconomic status, cultural upbringing, and educational level have an influence on how individuals define and view themselves.
3. In describing any culture or cultural practice, within-group differences are as great as across-group differences. In other words, no culture and no ethnic, linguistic, or racial group is monolithic. There are wide variations in attitudes, beliefs, and behaviors. To assume that people who share a common culture and language are alike is to make a dangerous mistake [11].

The Demographic Shift

The United States has become a global village. There have been major population changes as a result of immigration patterns and significant increases among racially, culturally, ethnically, and linguistically diverse populations already residing in the United States. The 1990 Census data revealed that the number of persons who spoke a language other than English at home rose by 43 percent to 28.3 million. Of these, nearly 45 percent indicated that they had trouble speaking English. The results of a 2000 survey conducted by the Census Bureau reveal that one in every ten persons in the United States is foreign born. Currently, the U.S. foreign-born population comprises the largest segment of any time in the past 50 years—a trend that is expected to continue. To further illustrate the need for culturally competent health care interventions, the Children's Defense Fund predicts that before 2010 there will be 9.5 million children of other races and 6.2 milllion fewer white, non-Latino children in the United States. By the middle of the twenty-first century, the average U.S. resident will trace his or her roots to Africa, Asia, the Pacific Islands, Latino, and Arab countries [1, 12].

Nowhere are the divisions of race, ethnicity, and culture more sharply drawn than in the area of health care. "The Institute of Medicine (IOM) defines disparities in health care as racial or ethnic differences in the quality of healthcare that are not due to access-related factors or clinical needs, preferences, and appropriateness of intervention." [8] Disparities in the incidence of illness and death among women of color persist. In recognition of these disparities the federal government has targeted several areas of health status, including infant mortality and committed resources [12]. Nationally, health care organizations are struggling with the challenges and opportunities of responding effectively to the needs of individuals and families from racially, ethnically, culturally, and linguistically diverse groups. The incorporation of culturally competent strategies within primary health care systems remains a great challenge for many communities. The *National Standards for Culturally and Linguistically Appropriate Services in Health Care* issued by the U.S. Department of Health and Human Services (HHS) reports that there currently is no agreement across health professional specialties on what specifically constitutes individual cultural competence or how it is best measured [8]. However, numerous reasons justify the need for cultural competence in the health care system at the patient-provider level. According to the Pew Health Professions Commission recommendations issued in 1998, the development of cultural competence is a priority [2, 12]. This is important for midwives who provide services in a variety of women's health care settings throughout the United States. Midwives may provide care for a childbearing woman from Africa who has been ritually circumcised, an Arabic Muslim woman who can only be examined by a female provider, or a Hispanic woman newly arrived from Central America who does not speak English.

According to the 2000 Census, there are 281.4 million persons living in the United States, of whom 143 million are female. Of this number, 27 million females are members of racial and ethnic minority groups [13]. Because of economic, social, and cultural barriers, these women are in poor health, have fewer health services, and bear the burden of poor health outcomes. Women of color in the United States encompass four major groups (which are listed in descending order of the size of the populations): (1) African American, (2) Hispanic, (3) Asian American/Pacific Islanders, and (4) American

Indian/Alaska native. The majority all-White population is referred to as Caucasian. Slightly more than 100 million or 71.6 percent of American females are Caucasian not of Hispanic origin [8, 9, 10].

Women of Color Population Overview

When discussing racial and ethnic terms, the language is often confusing. The Office of Management and Budget (OMB), an agency that defines racial groups, issued new standards in 1997 for collecting and presenting data on race and ethnicity. These standards recognized two categories of ethnicity (Hispanic or Latino) and five categories of race: (1) Asian, (2) American Indian or Alaska Native, (3) Native Hawaiian or Other Pacific Islander, (4) Black or African American, and (5) White. These categories are neither anthropologically nor scientifically based. In addition, the 2000 Census allowed respondents to self-identify and mark or select one or more races. The Office of Minority Health (OMH) within the Department of Health and Human Resources classifies minorities into the following main groups: (1) African American/Black, (2) Hispanic/Latina, (3) Asian American, Native Hawaiian, and Other Pacific Islanders, and (4) American Indian/Alaska Native. The term "of color" describes racial, ethnic, and national groups [15, 16, 17, 18, 19].

African-American/Black Women

According to the OMH, the term "African American or Black" refers to people having origins in any of the Black race groups in Africa. It is estimated that 10 million Africans were transported as slaves from the coast of West Africa to this country as part of the greatest migration in American history. They came from several African tribes including Ibo, Ashantis, Fanti, Mandingo, and Senegalese. The first landing took place in 1619, 244 years before the signing of the Emancipation Proclamation [20]. The 2000 Census included people who reported themselves to be Black, African American, or Negro or wrote in entries such as Nigerian, Jamaican, or African American. Of the 281.4 million people in the United States in 2000, 12.9 percent (36.4 million) reported themselves to be African American or Black. Non-Hispanic Black women outnumbered non-Hispanic Black males by nearly 1.9 million. In 1999, 17.5 million, or 12.5 percent of all females living in the United States were African American, not of Hispanic origin, 54 percent of all African Americans lived in the southern United States [11].

African-American women are more likely to die from breast cancer than are women from any other ethnic group, although the incidence rate of newly diagnosed cases is about 13 percent lower for them than for White women. The five-year survival rate for African-American women who are diagnosed with breast cancer is 71 percent compared with 86 percent for White women. Heart disease is the leading cause of death among African-American women and they have the highest death rate from stroke of all women (see Table 3-1). When compared with mothers of non-Hispanic white infants, mothers of African-American infants are 145 percent more likely to experience an infant death. Between 1996 and 1998, the difference in this rate between Blacks and Whites increased from 2.0 to 3.1. Among African-American women, the low birth weight rate remains twice that of White women. Recent data indicate that even among highly educated upper-income African-American women disparate rates of adverse outcomes persist [11, 16, 21, 22, 23].

Hispanic/Latina Women

In 2002, 12.5 percent of the U.S. population was Hispanic. The term "Hispanic" is an ethnic identity used by the federal government to classify those who

TABLE 3-1 Leading Causes of Mortality Among Women in the United States, by Race and Ethnicity

White	African American	Hispanic/Latina	Asian American	American Indian/ Alaska Native
Heart disease	Heart disease	Heart disease	Malignant neoplasms	Heart disease
Malignant neoplasms	Malignant neoplasms	Malignant neoplasms	Heart disease	Malignant neoplasms
CVD (including stroke)	CVD (including stroke)	CVD (including stroke)	CVD (including stroke)	Unintentional injuries
Chronic obstructive pulmonary diseases	Diabetes mellitus	Diabetes mellitus	Unintentional injuries	Diabetes mellitus

Source: Cross et al. *Towards a Culturally Competent System of Care*. Washington: CASSP Technical Assistance Center, 1989.

identify ties to Spain as part of their heritage. Most Hispanics in the United States trace their origin to Mexico, Puerto Rico, Cuba, Central America, or South America. The majority are Roman Catholic. The earliest forebears of this group were Spanish colonists from Mexico who came in the late 1500s to live in what is now the southwestern United States. Today, 43 percent of Hispanics live in the western United States. In 1999, Hispanic females of any race numbered 15.7 million, comprising slightly more than 11 percent of the U.S. female population. Many Hispanic women are recent immigrants. The leading causes of death among Hispanic/Latina women are the same as for African-American women [20, 24, 25, 26] (see Table 3-1).

Asian American and Pacific Islander Women

Asian American/Pacific Islander (AAPI) is a category that refers to people having origins in any of the original people of the Far East, Southeast Asia, Cambodia, China, India, Japan, Philippines, Hawaii or other Pacific Islands, and Thailand. In the 2000 Census 11.9 million Americans, 4.2 percent report themselves as Asian, with Chinese being the largest Asian group; 5.4 million are female. Nearly 75 percent of this population group are foreign born, including an increasing number of immigrants and refugees from Southeast Asia. Asian Americans and Pacific Islanders speak more than 100 different dialects. Nearly 66 percent speak an Asian or Pacific Islander language at home. Approximately 35 percent are linguistically isolated, living in households where no one aged 14 or older speaks English "very well." The 5.4 million females in this population group who are not of Hispanic origin comprised 3.8 percent of all U.S. females in 1999.

The four leading causes of death for AAPI women are all cancers combined, heart disease, stroke, and unintentional injuries (see Table 3-1). Due to a lack of data, relatively little is known about the health status of AAPI women. According to Surveillance, Epidemiology, and End Results (SEER) data, the highest age-adjusted incidence rate of cervical cancer occurs among Vietnamese women. A major barrier to care for AAPI women is the lack of linguistically and culturally appropriate services. Women of color for whom English is not the primary language often experience difficulties obtaining even the most basic health promotion and disease prevention information [14, 27, 28].

American Indian/Alaska Native Women

According to the Office of Minority Health, American Indian/Alaska Native is a category that refers to persons having origins in any of the original peoples of North and South America, including Central America. They are members of more than 500 federally recognized tribes as well as many recognized or unrecognized tribal organizations. The largest tribal groups are Navajo, Sioux, Blackfeet, Cherokee, Latin American Indian, Choctaw, Chippewa, Iroquois, and Pueblo. The largest Alaska Native tribe is Eskimo. Of the 281.4 million people in the United States in 2000, 4.1 million (1.5 percent) reported themselves to be American Indian or Alaska Native. Slightly more than 1 million females, or 0.7 percent of all U.S. females, belonged to this population group in 1999. Forty-three percent of all American Indians live in the western United States. The states with the largest American Indian population are California, Oklahoma, and Arizona.

The four leading causes of death among American Indian/Alaska Native women are heart disease, all cancers combined, unintentional injuries, and diabetes (see Table 3-1). Infants born to American Indian/Alaska Native women accounted for a disproportionate number of Fetal Alcohol Syndrome (FAS) deaths. Native American women consider alcohol abuse to be the primary health issue affecting their families, and alcohol and its multigenerational effects are thought be at the root of many of the health-related problems they experience. The death rates associated with alcoholism are much higher than they are among women of all other races. American Indian/Alaska Native women who abuse alcohol and drugs rarely receive treatment; instead they are often sent to jail where they lose their parental rights [14, 29, 30].

Cultural groups often forgotten by our health care system are women prisoners and homeless women. In 1998, 84,000 women were incarcerated, 22 percent of all arrestees. Approximately 67,000 of these women were mothers of children under 18 years of age, and 26 percent of all incarcerated females were women of color. Eighteen percent of all drug arrests involved women of childbearing ages; half of all incarcerated women were serving sentences for drug related crimes (32, 33].

Culturally Competent Care

The diversity among women of color accounts for a wide variance in health status, health behaviors, and health care needs. As primary care providers, midwives must ensure that women from vulnerable populations have access to a culturally responsive

health care system. Cultural competence requires commitment to an ongoing process [2].

The "cultural competence continuum" can help midwives meet the health care needs of a culturally diverse population. The "cultural competence continuum" (Figure 3-1) describes six distinct levels of competence, ranging from destructiveness to proficiency. Originally developed by Terry Cross et al. to describe six stages of competence at the organizational level [31], it has since been adapted for use at the individual level. It is especially helpful in the identification of cultural deficits and the targeting of areas in need of development and improvement. The cultural competence continuum also provides a framework for the recognition of practitioner and service intervention biases [2, 31].

The characteristics of the cultural competence continuum can be summarized as follows [31]:

1. *Destructiveness:* The attitudes, policies, and practices that are exhibited can be destructive to a culture. At the individual level, people in this phase believe that everyone should be more like the "mainstream."
2. *Incapacity:* A biased, authoritarian system lacks the capacity to facilitate growth in culturally diverse groups. Individuals at this level lack cultural awareness skills and believe that the dominant group is racially superior.
3. *Blindness:* A "we're all human" approach is used, wherein culture, ethnicity, and race make no difference in how services are provided.
4. *Precompetence:* Also known as "cultural sensitivity," wherein there is a desire and attempt made to deliver services in a manner respectful of cultural diversity. In general, there is awareness about the set of norms, values, and beliefs associated with a particular group, and how these affect group interactions and experiences.
5. *Competence:* There is an acceptance of, and respect for, cultural norms, patterns, beliefs, and differences. Individuals accept the influence of their own culture in relation to other cultures and are willing to examine components of cross-cultural interactions.
6. *Proficiency:* These individuals move beyond accepting, appreciating, and accommodating cultural differences to developing skills to interact in culturally diverse settings. There is a motivation toward developing culturally therapeutic approaches, and hiring staff who are specialists in cultural competence.

Application of the Cultural Competence Continuum

The following scenarios illustrate three phases along the cultural competence continuum.

Scenario 1

Background Information Tran is a 21-year-old Vietnamese woman Gravida 1, Para 0 who registered for prenatal care at 16 weeks gestation. Since she arrived from Vietnam nine months ago, Tran has been living with her aunt, who has accompanied her to the clinic. The FOB is a 25-year-old Vietnamese man, currently unemployed. He has lived in the United States for three years with his aunt and uncle. Both he and Tran speak no English.

Tran was raised in a small village in the mountains of Vietnam where her mother sent her at the age of three because she could not afford to take care of her. When her mother died, Tran was brought to the United States by her aunt, the owner of a small jewelry store. The aunt does not intend to accompany Tran on all of her visits. Displeased about this pregnancy, she has told Tran that she and her boyfriend will have to find a place to live when the baby is born. Tran has little formal education and can read only at a fourth grade level. Social service has tried on numerous occasions to encourage Tran to take the English as a Second Language classes at the local church. Tran attended one class and refuses to return; the reason is unknown.

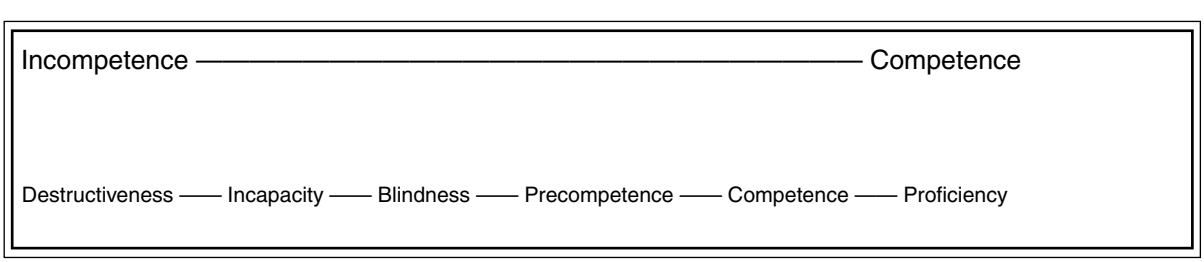

FIGURE 3-1 Cultural competence continuum. *Source:* Cross et al. [31].

Tran has been labeled a poor historian by the OB staff at the health center. Tran has come to the clinic with facial and upper body bruises, and the midwife suspects that she is being battered. The midwifery service has two Vietnamese outreach workers in the clinical setting. One of the outreach workers, Lan, plans to accompany Tran for labor support. Lan has asked Tran about the bruises. She denies being beaten, and claims she obtained the bruises by falling and bumping into things.

The hospital where Tran is going to deliver has no Vietnamese staff employed in any capacity. The night that Tran goes into labor the outreach worker has a personal family crisis and is unable to provide any support. Tran's aunt is away on business. The FOB accompanies Tran to labor and delivery, but he leaves and goes to the waiting room, where he remains. He does not see Tran again until she is being sent to the postpartum floor.

Tran has a spontaneous birth of a baby girl. Lan comes to the hospital the next day to help Tran with newborn care and to prepare for going home. The social service staff at the hospital are suspicious of Lan and do not believe she is translating their concerns regarding Tran's possible history of battering. Communication shuts down between Tran and the hospital staff. Tran is discharged home from the hospital on the second postpartum day.

Analysis This case study suggests a very typical precompetence. The health center has responded to the community needs by hiring two Vietnamese outreach workers. The hospital, an extension of Tran's health care system, is not responsive to this population's need. The next step on the continuum would be for the hospital administration to provide translation coverage and to meet with the health center administration to implement hospital and community-based strategies to assist women from other cultures who they know will be receiving care at the hospital. According to the Culturally and Linguistically Appropriate Services recommendations, health care organizations receiving federal funding must offer and provide interpreter service at no cost to patients with limited English proficiency [8].

Scenario 2

Background Information Marie is a 26-year-old CNM who is a recent graduate of her nurse-midwifery program. She is working at an urban health center in Boston doing full-scope midwifery in fulfillment of her National Health Service Corps obligation. Of Irish and Italian decent, Marie was raised in a military family. Her family of origin has settled in Illinois. She plans to return to Illinois to marry and join a physician/CNM practice when her obligation is completed in two years.

Gwendolyn is a 25-year-old African-American woman with five previous births who presented late for prenatal care. All of Gwendolyn's children have been in state custody. The first four are in the temporary custody of her mother, and she has custody of her two-year-old daughter. Now living in a shelter, Gwendolyn is waiting for her Section 8 (affordable housing) designation. She has a past history of depression treated with Prozac and individual counseling. She stopped taking the Prozac when she found out she was pregnant and decided not to return for counseling. Gwendolyn has been in drug treatment on seven separate occasions in five different programs. Drug free for 10 months, her urine toxicology was negative x1.

Gwendolyn has 4 siblings that she is not willing to talk about. It has been two years since she has spoken to her mother, who refuses to allow her any access to her children. Gwendolyn dropped out of school in the seventh grade. When she comes to the clinic, she is demanding and argumentative with the clinic staff. She rarely keeps appointments, as public transportation to the clinic is difficult. The shelter where she stays is a 35-minute drive. She comes to the clinic when she can get a ride. The FOB is the same for all of her children. The relationship is abusive; the FOB is currently in prison serving a two-year sentence for battering her. She has been evicted from two apartment buildings because of persistent fights between her and the FOB.

Gwendolyn's second prenatal care visit with Marie does not go well. Marie is frustrated with Gwendolyn because she arrives at the clinic unannounced, having missed her last two appointments. Gwendolyn's weight is 340 pounds, her blood pressure is 120/68, and her urine 2+ glucose, neg. protein. Marie tells Gwendolyn she will have to wait because there are two patients before her. Gwendolyn agrees and goes to the cafeteria to get something to eat. When she and Marie meet for the visit, she has a list of physical complaints she wants to discuss.

Gwendolyn's goals for the visits are to speak to the outreach worker regarding housing and to obtain an ultrasound for sex determination because she would like to start collecting clothes for her baby. Marie wants to get a one-hour glucose test, and urine for toxicology as she thinks Gwendolyn has relapsed.

Gwendolyn refuses to give a urine sample and accuses Marie of looking for an excuse to take her

baby away. Marie refuses to discuss another ultrasound and tells Gwendolyn that she "might as well write her a check for $500 now because an ultrasound for sex determination is a waste of the taxpayers' money." She also tells Gwendolyn that she will not be seen at the clinic unannounced again without an appointment. Gwendolyn leaves and goes to the clinic director's office and files a complaint of discrimination.

Marie tells the clinic director that she regrets the encounter and that she resents the charge of discrimination, as it would not matter to her what color Gwendolyn was. She says that she regards Gwendolyn as noncompliant and a drain on the clinical resources. The clinic director tells Marie that other staff members have heard her describe Gwendolyn using terms like "train wreck" and "walking wounded." Marie's response is that Gwendolyn has no business bringing another child into the world. Marie isolates herself and does not speak to any of the staff for the rest of the day. Gwendolyn transfers her care to another service.

Analysis This scenario is complex in nature, illustrating several overlapping issues. There is cultural blindness on the part of both the provider and the client. Marie believes that she treats all clients the same, regardless of race or socioeconomic status and that the health care system is set up to serve everyone with equal effectiveness. This approach makes Gwendolyn a victim and blames her for her problems, thereby rendering her culturally invisible. Leadership can be provided here by providing training in which Marie is able to understand and acknowledge the influence of her own cultural roots, beliefs, and behaviors. From this assessment, she can acquire skills to progress toward cultural competence.

Scenario 3

Background Information Itza is a 25-year-old married women from Cuba who presents for prenatal care with a midwifery service located in a community health center. Itza and her husband Rafael have been in the United States seven months. They came to the midwifery service based on a recommendation from her sister-in-law, who recently received labor and birth care from the same group.

The demographics of this health center have changed rather rapidly. When the Hispanic/Latino population at the health center reached 20 percent, the administration applied for Healthy Start funding, with which the center hired two Spanish-speaking midwives, one trained medical assistant, and a case manager. Additionally the entire health center staff, including the administrators, have been involved in a yearlong cultural diversity training that includes developing and participating in community-based health fairs. Itza was made to feel immediately at home as the waiting room has a variety of Spanish literatures. Because Itza and Rafael speak very little English, they have been assured that a Spanish-speaking midwife and doula will support them in labor.

Analysis The midwifery service described in this scenario demonstrates the characteristics of a culturally proficient agency through its commitment to hiring multicultural providers and its active participation in community health promotion projects [2]. Table 3-2 summarizes the characteristics of a culturally competent practitioner.

TABLE 3-2 Characteristics of Culturally Competent Practitioners

- Move from cultural unawareness to an awareness and sensitivity of their own cultural heritage.
- Recognize their own values and biases and are aware of how they may affect clients from other cultures.
- Demonstrate comfort with cultural differences that exist between themselves and clients.
- Know specifics about the particular cultural groups they are working with.
- Understand the historical events that may have caused harm to a particular cultural group.
- Respect and are aware of the unique needs of clients from diverse communities.
- Understand the importance of diversity within as well as between cultures.
- Endeavor to learn more about cultural communities through client interactions, participation in cultural diversity dynamics, and consultations with community experts.
- Make a continuous effort to understand a client's point of view.
- Demonstrate flexibility and tolerance of ambiguity, and are nonjudgmental.
- Maintain a sense of humor and an open mind.
- Demonstrate a willingness to relinquish control in clinical encounters, to risk failure, and to look within for the source of frustration, anger, and resistance.
- Acknowledge that the process is as important as the product.

Source: Randall-David, E. *Culturally Competent HIV Counseling and Education*. Rockville, MD: DHHS Maternal and Child Health Bureau, 1994.

Conclusion

Eliminating health disparities is a national agenda. Poverty, primary language, and health insurance are among the many factors that affect access to health care as well as health status. Recent national and state data describe the prevalence of the poor health outcomes among women of color. One approach to eliminating racial and ethnic health disparities is to increase the cultural competence of the health care workforce. Becoming a culturally competent provider requires a series of steps. The first is recognizing where one is on the continuum and moving forward. The second is to remain committed to the process. The health care system is very likely going to rely on midwives to provide leadership in the development and implementation of health promotion strategies for women of color across the life span. It is essential that CNMs and CMs deliver culturally competent, comprehensive primary care services for all women. Cultural competence includes being able to recognize and respond to health-related beliefs and cultural values. Examples of culturally competent midwifery care include striving to overcome cultural, language, and communications barriers, and providing an environment in which women and their families from diverse cultural backgrounds feel comfortable discussing their cultural health beliefs and practices in the context of reproductive health. Midwives must be at the forefront in the implementation of cultural competence training programs, which are now considered a key intervention in reducing the health care disparities that disproportionately affect women of color. Integrating traditional healing methods and spiritual beliefs where appropriate into treatment plans is another crucial element toward achieving the goal of cultural competence.

References

1. Rorie, J. L., Paine, L. L., Barger, M. K. Primary care for women: Cultural competence in primary care services. *J. Nurse-Midwifery* 41(2):92–100 (March/April) 1996.
2. Callister, L. C. Culturally competent care of women and newborns: Knowledge, attitude, and skills. *J. Obstet. Gynecol. Neonatal Nurs.* 30(2):209–215, 2001.
3. Declercq, E. R., Williams, D. R., Koontz, A. M., Paine, L. L., Streit, E. L., McCloskey, L. Serving women in need: Nurse-midwifery practice in the United States. *J. Midwifery Womens Health* 46(1):11–16 (January/February) 2001.
4. Paine. L. L., et al. A comparison of visits and practices of nurse-midwives and obstetrician-gynecologists in ambulatory care settings *J. Midwifery Womens Health* 42(1):37–44 (January/February) 2000.
5. Scupholme, A., Paine, L. L., Lang, J. M., Shylendra, K., DeJoseph, J. F. Time associated with components of clinical services rendered by nurse-midwives: Sample data from phase II of nurse-midwifery care to vulnerable populations in the United States. *J. Nurse-Midwifery* 39(1):5–10 (January/February) 1994.
6. Scupholme, A., DeJoseph, J., Strobino, D. M., Paine, L. L. Nurse-midwifery care to vulnerable population phase I: Demographic characteristics of the national CNM sample. *J. Nurse-Midwifery* 37(5):341–347 (September/October) 1992.
7. Paine, L. L., et al. Characteristics of nurse-midwife patients and visits. *Am J. Public Health* 89(6):906–909, 1999.
8. U.S Department of Health and Human Services, Offices of Minority Health. *National Standards for Culturally and Linguistically Appropriate Services in Health Care, Executive Summary*. March 2001.
9. Randall-David, E. *Culturally Competent HIV Counseling and Education*. Rockville, MD: DHHS Maternal and Child Heath Bureau, 1994.
10. Roberts, R., et al. *Developing Culturally Competent Programs for Families of Children with Special Needs* (Monograph), 2nd ed. Washington, DC: Georgetown University Child Development Center, 1990.
11. Lynch, E., and Hanson, M. J., eds. *Developing Cross-Cultural Competence: A Guide for Working with Children and Their Families*, 2nd ed. Baltimore, MD: Paul H. Brooks Publishing, 1999.
12. Lollock, L. The Foreign Born Population in the United States: March 2000, Current Population Reports, pp. 20–534, U.S. Census Bureau, Washington, DC.
13. U.S. Census Bureau, *Census 2000 Profile of Gender in the United States*. (March 2001). Internet Release Date: February 2, 2002. http://eire.census.gov/popest/data/national/tables/asro/US-EST2001-ASRO-02.php.
14. Office of Women's Health, CDC. *The Health of Minority Women*, May 2002.

15. Stover, G. Colorful communities: Toward a language of inclusion. *Am. J. Public Health* 92(4):512–513, 2002.

16. *The Black Population 2000,* Census Brief 2000. http:/www.census.gov/main/www/cen2000.html.

17. Thomas, S. B. The color line: Race matters in eliminating health disparities. *Am. J. Public Health* 91(7):1046–1048 (July) 2001.

18. Willis, D. P. Them and us: the politics of population taxonomy. *Am. J. Public Health* 91(7):1048–1049 (July) 2001.

19. Oppenheimer, G. M. Paradigm lost: race, ethnicity, and the search for a new population taxonomy. *Am. J. Public Health* 91(7):1049–1055, (July) 2001.

20. Willis, W. Families with African-American roots. In Lynch, E. W. and Hanson M. J. (Eds.) *Developing Cross-Cultural Competence: A Guide for Working with Children and Their Families*. Baltimore, MD: Paul H. Brookes Publishing, 1998, pp.165–207.

21. Hogan, V. K., Njoroge, T., Durant, T. M., and Ferre, C. D. Eliminating disparities in perinatal outcomes—lessons learned. *Maternal Child Health J.* 5(2):135–140 (June) 2001.

22. Hogue, C. J. R., and Vasquez, C. Toward a strategic approach for reducing disparities in infant mortality. *Am. J. Public Health* 92(4):552–556 (April) 2002.

23. Jackson, F. M., Phillips, M. T., Hogue-Rowland, C. J., and Owens-Curry, T. Y. Examining the burdens of gendered racism: Implications for pregnancy outcomes among college-educated African-American women. *Maternal Child Health J.* 5(2):95–107 (June) 2001.

24. Vasquez, M. J. T. Latinas. In Comaz-Diaz, L., and Green, B. (Eds.) *Women of Color: Integrating Ethnic and Gender Identities in Psychotherapy*. New York: Guilford Press, 1994, pp. 114–138.

25. Zuniga, M. E. Families with Latino roots. In Lynch, E. W., and Hanson, M. J. (Eds.) *Developing Cross-Cultural Competence: A Guide for Working with Children and Their Families*. Baltimore, MD: Paul H. Brookes Publishing 1998, pp. 209–250.

26. Ocasio-Burges, H. Understanding the Hispanic community. In Julia, M. C. (Ed.) *Multicultural Awareness in the Health Care Professions*. Needham Heights, MA: Simon and Schuster, 1996, pp. 111–130.

27. *The Asian American/Pacific Islander Population 2000,* Census Brief 2000. http://www.census.gov/main/www/cen2000.html.

28. Ro, M. Moving forward: Addressing the health of Asian American and Pacific Islander women. *Am. J. Public Health* 92(2):516–519 (April) 2002.

29. National Institutes of Health. *Women of Color Health Data Book: Adolescents to Seniors*. NIH publication no. 98-4247. Bethesda, MD: Office of Research on Women's Health, 1996, pp. 1–5.

30. *The American Indian and Alaska Native Population 2000*, Census Brief 2000. http://www.census.gov/main/www/cen2000.html.

31. Cross, T. L., Brazon, B. J., Dennis, K. W., and Isaacs, M. R. *Towards a Culturally Competent System of Care*. Washington: CASSP Technical Assistance Center, 1989.

32. Johnson, D. Developing services for incarcerated mothers. In Blinn, C. (Ed.) *Maternal Ties: A Selection of Programs for Female Offenders*. Arlington, VA: Kirby Lithographic Company, 1997, p. 1.

33. U.S. Department of Justice, Office of Justice Programs. *Bureau of Justice Statistics Special Report: Women Offenders*. NCJ 175688. December 1999, pp. 1–2.

• • • Additional References

Brice-Baker, J. R. West Indian women of color: the Jamaican women. In Diaz-Comas, L., and Green, B. (Eds.) *Women of Color: Integrating Ethnic and Gender Identities in Psychotherapy*. New York: Guilford Press, 1994, ch. 5, pp. 139–160.

Fadiman, A. *The Spirit Catches You and You Fall Down*. New York: Farrar, Straus, and Giroux, 1997.

Johnson, C., and Smith, P., and the WGBH Series Research Team. *Africans in America: America's Journey Through Slavery*. New York: Harcourt Brace, 1998.

Kavanaugh, K. H., and Kennedy, P. H. *Promoting Cultural Diversity: Strategies for Health Care Professionals*. Newbury Park, CA: Sage, 1992, pp. 9–34.

Lynch, E. W., and Hanson, M. J. (Eds.). *Developing Cross-Cultural Competence: A Guide for Working with Children and Their Families*, 2nd ed. Baltimore, MD: Paul H. Brookes Publishing, 1998.

Leigh, W. E. The health of African-American women. Adams, D. L. (Ed.) *Health Issues for*

Women of Color: A Cultural Diversity Perspective. Thousand Oaks, CA: Sage, 1995, ch. 8, pp. 112–132.

Paine, L. L., and Rorie, J. L. Expanding role of nurse-midwifery in obstetric practice. In Repke, J. T. (Ed.) *Intrapartum Obstetrics*. New York: Churchill-Livingstone, 1995.

Smedley, B. D., Stith, A. Y., and Nelson, A. R. (Eds.) *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*. Washington, DC: Institute of Medicine, National Academy Press, 2002.

CHAPTER

4

International Midwifery and Safe Motherhood

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A 43-year-old Gravida 11 came complaining of severe lower abdominal pain for the past two days. Then she had slight dark bleeding, dizziness, and couldn't walk. Her BP 110/50, pulse 160, and abdomen tender to touch. Lucky for me it was on a Tuesday which is our market day and judging from her age and parity I thought could this be appendicitis. The BP too could not give me a clue as to ectopic. But I gathered courage, did the puncture [an abdominal puncture to rule out ectopic pregnancy], and it was positive. So I referred her immediately to hospital. Luck was not on my side. The only M.O. [medical officer] had traveled to Accra. She was detained according to her [the patient] to give her some tablets to take home the next day.

So they returned to me on a Thursday with a BP of 60/0. I set up Dextrose 5% with hydrocortisone 100 mg IV and arranged for a boat to take her to Kpando Hospital on the Volta River. This patient will prefer to die in my clinic if I won't accompany her to Kpando myself, for fear that if she does not meet any Doctor she won't know what to do; and she believes my company will help give her prompt treatment. So, we got a boat which took 20,000 cedis [approximately one month's salary for a hospital nurse]. Immediately we got there a blood transfusion was arranged for and I gave a pint of blood. I left on the third day for my station. I had lost all confidence as I knew this patient was going to die. But she survived!!!

This rural midwife from the Affron Plains in Ghana was trained in Life-Saving Skills. It took an average of 26 hours to refer a patient to the nearest facility with surgical capability. Travel was by car/truck, boat, bicycle, and again car/truck. During the rainy season, referrals would take up to three days.

Source: Marshall, M. A. *Ghana Registered Midwives Association Continuing Education Project—Carnegie Corporation Grant B 5071, Final Evaluation Report*. Unpublished evaluation of Life-Saving Skills Training Project, 1992.

Introduction

Midwifery—"an ancient profession reborn in contemporary society" [1]—is by its very nature global. Midwives have been with women for pregnancy and birth since the beginning of civilization. Likewise, for centuries midwives often accompanied women as they migrated to new lands to live and raise their families. Today's focus on international midwifery reflects the continued migration of the professional workforce of midwives.

An international or global focus to midwifery practice is reflected in the expanding network of midwifery associations working in partnership with global agencies, policymakers in governments, and groups—from the World Health Organization and the United Nations, to the White Ribbon Alliance—that share common goals and concerns related to the health of women. The international nature of midwifery, and the work of midwives with women often not of their own race, ethnicity, or culture, also raises daily concerns for cultural competence and respect in the practice of midwifery. The most

compelling reason for understanding the international nature of midwifery is the ever-increasing demand for promoting basic human rights, especially for girls and women—including the right to a safe and secure reproductive life [2, 3].

This chapter will focus on the role of midwives as the key health professional in global efforts to make pregnancy and birth safe throughout the world and to promote the health and well-being of girls and women wherever they reside. Data on the health of women globally are used to set the stage for understanding the work of midwives around the world. The key role of the International Confederation of Midwives (ICM) and its work with midwives and women throughout the world will be featured. In addition, a brief introduction to the World Health Organization as a leader in global health efforts, and other global partners in the Safe Motherhood Initiative will be addressed. The end of the chapter will focus on frequently asked questions about international midwifery derived from decades of working with midwifery students in the United States and other areas of the world.

The Situation Worldwide

> Every minute of every day, somewhere in the world, a woman dies as a result of complications arising during pregnancy and childbirth. The majority of these deaths are avoidable. [4]

Every minute around the world

380 women become pregnant

190 women face unplanned or unwanted pregnancies

110 women experience pregnancy-related complications

40 women have unsafe abortions

1 woman dies

White Ribbon Alliance for Safe Motherhood. *Awareness, Mobilization, and Action for Safe Motherhood: A Field Guide.* Washington, DC: NGO Networks for Health, 2000.

Since 1982, the World Health Organization (WHO) has systematically reviewed indexed medical literature, nonindexed publications, and reports from national and local authorities regarding maternal mortality and maternity care coverage worldwide. Its best estimate in 1987 was that there were in excess of 500,000 pregnancy-related deaths per year, most of them preventable [4]. Subsequent reanalysis of the data revealed that closer to 585,000 women die per year [5]. Of these nearly 600,000 deaths, more than half come from just eight countries: Bangladesh, Ethiopia, India, Indonesia, Nepal, Nigeria, Pakistan, and Uganda. Nepal suffers a maternal death every five minutes, Nigeria every ten minutes.

The worldwide Safe Motherhood Initiative was launched in 1987 in Nairobi, Kenya. The goal of this meeting was to raise awareness, alert the international community to this silent tragedy, and mobilize efforts and resources on the behalf of women. At the 1990 World Summit for Children, 166 nations signed on to the action plan goals, one of which was to reduce maternal mortality by 50 percent by the year 2000 [6]. In September 2000, the United Nations member states adopted the Millennium Development Declaration that reinforced the emphasis on healthy women and safe pregnancies and birth for development in any country. The Millennium Development goals included the reduction of maternal mortality by 75 percent between 1990 and 2015, using the proportion of births attended by skilled personnel as an indicator for this goal [7].

Mortality figures, though difficult to obtain, have been the most sensitive indicator of the health of women. However, in considering maternal mortality, it is important that a far wider scope of pregnancy-related health problems, including maternal trauma, chronic disease, and reduced energy output, which have profound ramifications for the family and the economy, not be overlooked. Maternal mortality represents only the tip of the mountain of health problems for women. The road to maternal death and disability for many women begins at birth, when they are born female. Morbidity has been even more difficult to define and measure. Many women never enter the health care system during pregnancy, even when gravely ill, and therefore their deaths or disabilities are not captured in vital statistics or other records.

A myriad of service factors—from improper care to a lack of supplies, transport to a referral center, surgical capability, blood banks, and money with which to access available care—contribute to maternal mortality in developing countries. These factors most recently have been categorized as the "enabling environment or system of care" as distinct from the person who provides needed care [8].

Cultural factors that limit access to care tend to be less well known and less well documented.

Utilization of faith healers, local herbs, over-the-counter treatments, and "quack" practitioners who claim unearned health credentials can complicate access to appropriate care given in a timely fashion. When disease is believed to be caused by black magic or lack of faith, orthodox medical services based on belief in the germ theory are not seen as offering solutions. Cultural factors also include the existing norms that define the status of women, with the consequence of interfering with a woman's decisions to seek care in a timely manner.

To confront the problems of maternal mortality and morbidity, issues of quality and access must be addressed. They can be analyzed within the framework of the three delays [9]:

1. Delay in recognition that there is a problem
2. Delay in reaching the appropriate level of care once the problem/complication has been recognized
3. Delay in receiving the appropriate care after arrival at the service site

Maternal Death

The World Health Organization defines *maternal mortality* as follows:

> Death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of pregnancy, from any cause related to or aggravated by the pregnancy itself or its management, but not from accidental or incidental causes [10]. Accidental or incidental causes are those that would have caused death irrespective of pregnancy, such as traffic accidents, gunshot wounds, poisonings, and so forth.

Deaths are then divided into two categories:

1. *Direct obstetrical deaths*, resulting from obstetrical complications of the pregnancy state (pregnancy, labor, and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above [10].
2. *Indirect obstetrical deaths*, resulting from previous existing disease or disease that developed during pregnancy, and that were not due to direct causes, but were aggravated by physiologic effects of pregnancy [10].

In developing countries, the five major direct causes of maternal death are (1) hemorrhage, (2) sepsis, (3) pregnancy induced hypertension, (4) unsafe abortion, and (5) obstructed labor.

The patient was a 32-year-old Gravida 3, one live baby, who had been attendant since 12 weeks of pregnancy. She was my friend and came from this very village. The patient came in with labor pains at 9 p.m. onset 4 p.m. P.V. [vaginal examination] done. Os was 2 cms. dilated. Membranes intact. Labor progressed well. Patient delivered spontaneously a live female infant at 4:15 a.m. The placenta appeared to be complete but the membranes was ragged. Patient started bleeding. IV 500 cc set up with pitocin. External bimanual compression done without effect. Manual removal [uterine exploration] done. Only blood clots expelled. Internal bimanual compression done without effect. Another IV 1000 mls set up and the patient was transferred. There were transportation difficulties and the road is very bad. It took us 4 hours 10 minutes to travel a 35 km journey. The patient received 2500 mls of IV fluids but very unfortunately the IV got infiltrated on the way; but due to the bad road I could not get the vein. All attempt to start the IV again failed. The patient expired at the hospital before the Doctor arrived. EBL 2500cc. I collapsed at the hospital. They gave me Valium 20 mgs and put me in a bed. I was not aware for some time. I cried and felt very bad. They talked to me and explained that they sometimes have such women die at their hospital with everything. I did not feel confident and competent. Sometimes when I think about it now I cry.

This rural midwife trained in Life-Saving Skills had organized the TBAs in the seven villages around her to come to her maternity home for continuing education and to refer their patients with problems. Note that once the bad road was graded, travel time was decreased from 4 hours 10 minutes to under an hour and a half.

Source: Marshall, M. A. *Ghana Registered Midwives Association Continuing Education Project—Carnegie Corporation Grant B 5071, Final Evaluation Report*. Unpublished evaluation of Life-Saving Skills Training Project, 1992.

Ways to Express Mortality

There are three main ways to calculate and express maternal mortality: (1) rate, (2) ratio, and (3) lifetime risk.

Maternal Mortality Rate The maternal mortality rate is expressed as the number of women who die while pregnant or within the first 42 days after pregnancy, from any cause related to or aggravated by preg-

nancy per 100,000 women of reproductive age in a given year [10]. The WHO International Classification of Diseases (Vol. 10, 1997) has revised the definition to include deaths within one full year after the termination of pregnancy. Because this definition is less in use and difficult to obtain, it is important to see how data are reported when making comparisons over time or from one country to another for both maternal mortality rate and ratio [11]. The rate is determined as follows:

$$\frac{\text{Number of maternal deaths in a year}}{\text{100,000 women of reproductive age in the population}}$$

The advantage of using the maternal mortality rate is that it compares maternal deaths with all women at risk in the population. In a society with a reliable system of gathering statistics, this provides a clear way of expressing deaths. However, in most developing countries, the census data are too old or faulty to make it possible to use rates.

Maternal Mortality Ratio The maternal mortality ratio is expressed as the number of women who die while pregnant or within the first 42 days after pregnancy, from any cause related to or aggravated by pregnancy per 100,000 live births in a given year [10].

$$\frac{\text{Number of maternal deaths in a year}}{\text{100,000 live births in a year}}$$

The advantage of using maternal mortality ratio is that the numbers of live births are comparatively easier to count. This is the most commonly used way to express trends within a country and to make cross-country comparisons.

Lifetime Risk of a Maternal Death The lifetime risk of a maternal death is calculated by multiplying the maternal mortality rate by 30 (the number of years of exposure between ages 15 and 44), but the effective duration of exposure can vary widely. The lifetime risk of maternal death can be more simply stated as the risk of an individual woman dying from pregnancy or childbirth during her lifetime. Calculations are based on maternal mortality and fertility rates in the country. A lifetime risk of 1 in 3000 represents a low risk of dying from pregnancy and childbirth, while 1 in 100 is a high risk [12]. Table 4-1 presents regional data on lifetime risk of a woman dying during the childbearing cycle.

The advantage of using lifetime risk of dying a maternal death is that it recognizes that women of high fertility or women lacking in universal access to effective family planning have an extremely high risk of dying as a result of pregnancy or childbirth.

TABLE 4-1 Women's Lifetime Risk by Region

Region	Lifetime Risk of Dying
Africa	1 in 16
Asia	1 in 65
Latin America/Caribbean	1 in 130
All developing countries	1 in 48
All developed countries	1 in 1800

Source: From 1997 World Health Organization data, in Ross, S. R. *Promoting Quality Maternal and Newborn Care: A Reference Manual for Program Managers*. Washington, DC, Cooperative for Assistance and Relief Everywhere (CARE), 1998, pp. 1, 17.

Maternal Morbidity

As difficult as it is to obtain accurate maternal mortality data, morbidity data collection is far more difficult. However, women worldwide are dying during pregnancy of diseases for which we have prevention and treatment strategies. In Nigeria, where a maternal death occurs every ten minutes, 10 percent of maternal deaths are from malaria. Other common causes include maternal tetanus, tuberculosis, and increasingly HIV/AIDS.

One of the huge challenges for this century is improved prevention, recognition, and low-technology treatment for morbid conditions of pregnancy. Currently, there is no global agreement as to definitions of pregnancy-induced hypertension, obstructed labor, and hemorrhage. Definitions are crucial because they dictate what treatment protocol will be used. A practical example of this is hemorrhage, which is defined as 500 cc of blood loss during the birth process. A woman entering labor with a hemoglobin of 12 g can tolerate this blood loss with few symptoms. A woman entering labor with a hemoglobin of 4 g may well go into shock and die with a 300 cc blood loss.

Historically, much time and effort have been invested in the training of traditional birth attendants (TBAs), feeling that this investment would decrease maternal deaths in the community. More than 20 years experience has shown that this has not contributed significantly to a reduction in mortality. Clearly, it is unreasonable to expect that community women, no matter how skilled and loving, can affect great change when working within a system bedeviled with poor transportation, lack of emergency funds, inadequate blood safety, and poor referral institutions. Rendering maternity care is a system problem

requiring multiple levels of preparedness and active community awareness and participation.

Many nations have felt that moving childbirth into institutions was the answer to maternal mortality. Experience has shown that site of delivery is not the critical factor. The linchpin of improved maternal outcomes is introducing skilled providers at every level of care. An important distinction has evolved to differentiate between a *trained* and a *skilled* provider. A trained provider may have as little as a five-day training for TBAs and is not in a position to negotiate and handle emergencies.

Skilled Provider A skilled provider refers exclusively to a person with midwifery skills (for example, a doctor, midwife, or nurse) who has completed a set course of study and can manage normal labor and delivery, recognize the onset of maternal and neonatal complications, perform essential Life-Saving Skills, initiate treatment, and supervise the referral to a higher health care facility.

Source: Family Care International. *Saving Lives: Skilled Attendance at Childbirth*. New York: FCI, in collaboration with Safe Motherhood Inter-Agency Group, 2001, pp. 5–16.

Persons who are skilled providers are referred to as those who have midwifery skills, whether or not they are midwives. At the ten-year anniversary conference in Sri Lanka for the Safe Motherhood Initiative, it was noted that worldwide 75 million births take place annually and 60 million of those births take place without the presence of a skilled attendant.

> The single most critical intervention is to ensure that a health worker with midwifery skills is present at every birth, and transportation is available in case of emergency. A sufficient number of health workers must be trained and provided with essential supplies and equipment especially in poor and rural communities. [13]

Clearly the presence of a skilled provider, though essential, is not sufficient to save women's lives. Providers work within teams with complementary skills and need essential equipment and supplies. Given a supportive environment, skilled providers may render safe, high-quality care in any site: home, maternity home, birth center, health post, district hospital, or referral hospital. The inputs at each level of care play an important role in rendering emergency obstetrical services when required. The levels of obstetric care and personnel providing such care are summarized in Table 4-2.

TABLE 4-2 Levels of Obstetric Care

Comprehensive Emergency Obstetric Care Facilities: 1 per 500,000 people	**District Hospital Providers**
Perform surgery under general anesthesia Perform assisted removal (e.g., D&C) of retained placental pieces Perform manual removal of retained placenta Perform assisted vaginal delivery (e.g., vacuum extraction or forceps delivery) Provide safe blood replacement Administer parenteral (IV or IM) antibiotics Administer parenteral (IV or IM) sedatives Administer parenteral (IV or IM) oxytocics	Physicians, midwives, paramedical and support staff
Basic Emergency Obstetric Care Facilities: 4 per 500,000 people	**Health Center**
Perform manual removal of retained placenta/pieces Perform assisted vaginal delivery (e.g., vacuum extraction) Administer antibiotics, sedatives (e.g., Valium, magnesium sulfate), and oxytocics (ergometrine, Pitocin) IM or IV, and IV fluids.	Physicians and/or midwives, paramedical and support staff
Obstetric First Aid in the Community	**Village/Community Level**
Uterine massage/pressure point May be able to administer sublingual/nasal/IM oxytocics (ergometrine) Provide oral rehydration salts	Junior health staff, traditional birth attendants, local leaders, women's groups, community workers, families

Source: Ross, S. R. *Promoting Quality Maternal and Newborn Care: A Reference Manual for Program Managers*. Washington, DC: Cooperative for Assistance and Relief Everywhere (CARE), 1998, p. 5.55.

The Newborn

The mother/newborn dyad is inseparable. Improving the health of the mother will improve the outcome for the infant. It is likewise crucial to improve the survival of the infant so that women are not exposed to the risks of many pregnancies to ensure that a few children make it to adulthood and are able to care for their aged parents. Repeated pregnancies take a huge toll on a woman's body and increase her lifetime risk of dying a death related to childbearing. Again, the essentials of newborn care are low technology and well within our hands today, as described in Table 4-3.

Approximately 8 million perinatal deaths occur each year. Of these, approximately 85 percent of newborn deaths are from infections, birth asphyxia, and birth injury [14]. More than two-thirds of these newborn deaths occur in fully developed term-sized infants. These infant losses contribute in turn to the cycle of poor birth spacing, excessive fertility, recurring fetal loss, and maternal morbidity and mortality.

The Situation in the United States

For most women in the United States, childbirth is a relatively normal experience and people have come to expect the perfect delivery experience, the perfect newborn, and a mother unharmed by the experience. In fact, from 1990 to 1995, almost 2000 American women died from pregnancy and its complications, even with modern advances in health care (see Figure 4-1).

TABLE 4-3 Essentials of Newborn Care

Care of Future Pregnancies	Special Attention
Improve the health and status of women Improve the nutrition of girls Discourage early marriage and early childbearing	Promote safer sexual practices Provide opportunities for female education
Care During Pregnancy	**Special Attention**
Improve the nutrition of pregnant women Immunize against tetanus Screen and treat infections, especially syphilis and malaria Improve communication and counseling: birth preparedness, awareness of danger signs, and immediate and exclusive breastfeeding	Monitor and treat pregnancy complications such as anemia, preeclampsia, and bleeding Promote voluntary counseling and testing for HIV Reduce the risk of mother-to-child transmission (MTCT) of HIV
Care at Time of Birth	**Special Attention**
Ensure skilled care at delivery Provide for clean delivery, clean hands, clean delivery surface, clean cord cutting, tying and stump care, and clean clothes. Keep the newborn warm; dry and wrap baby immediately, including head cover, or put skin-to-skin with mother and cover Initiate immediate, exclusive breastfeeding, at least within one hour Give prophylactic eye care, as appropriate	Recognize danger signs in both mother and baby and avoid delay in seeking care and referral Recognize and resuscitate asphyxiated babies immediately Pay special attention to warmth, feeding, and hygiene practices with preterm and low birth weight babies.
Care after Birth	**Special Attention**
Ensure early postnatal contact Promote continued exclusive breastfeeding Maintain hygiene to prevent infection; ensure clean cord care and counsel mother on general hygiene practices, such as hand-washing Provide immunizations such as BCG, OPV, and hepatitis B vaccines, as appropriate	Recognize danger signs in both mother and newborn, particularly of infections, and avoid delay in seeking care and referral Support HIV positive mothers to make appropriate, sustainable choices about feeding Continue to pay special attention to warmth, feeding, and hygienic practices for low birth weight babies

Source: Costello, A. *State of the World's Newborns: A Report from Saving Newborn Lives*. Washington, DC: Save the Children, 2001, p. 9.

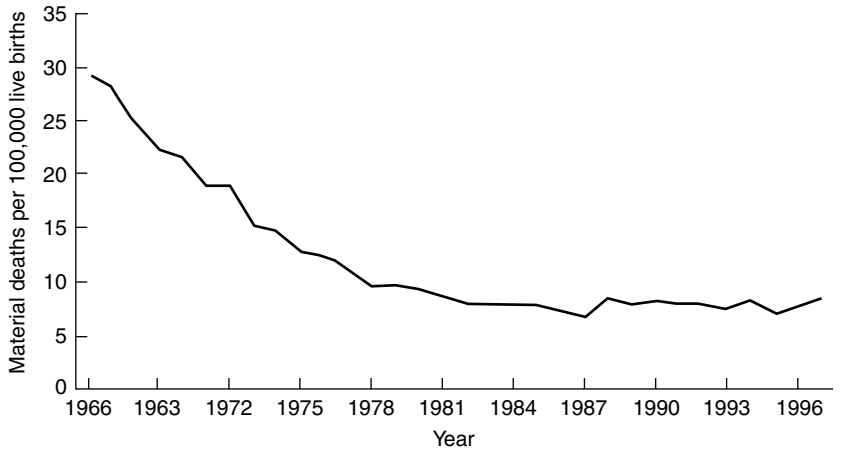

FIGURE 4-1 Maternal mortality in the United States: 1966–1997.

Source: National Center for Health Statistics, Centers for Disease Control and Prevention. *Vital Statistics*, 1998.

According to the National Center for Health Statistics (NCHS), no progress has been made in decreasing maternal deaths since 1982 (see Figure 4-2). Twenty other countries have lower maternal mortality rates than the United States. In 1990, the federal government set a goal to decrease maternal mortality to 3.3 per 100,000 live births by the year 2000. Only three states achieved the goal: Massachusetts, Nebraska, and Washington. Eight other states were able to achieve a maternal mortality rate of less than four. This indicates clearly that there is excess mortality, that decreases can be achieved, and that meeting these goals in other states will be difficult. The Health and Human Services Healthy People objectives for 2010 have again been set at 3.3 maternal deaths per 100,000 live births. The special focus for the 2010 goal is to reduce racial disparities [15].

Early in the twentieth century, the death rate for Black women was twice that of White women. Today, the racial disparity has increased: the death rate of Black women is 4.5 times that of Whites and 1.6 times that of Hispanics. In addition to these

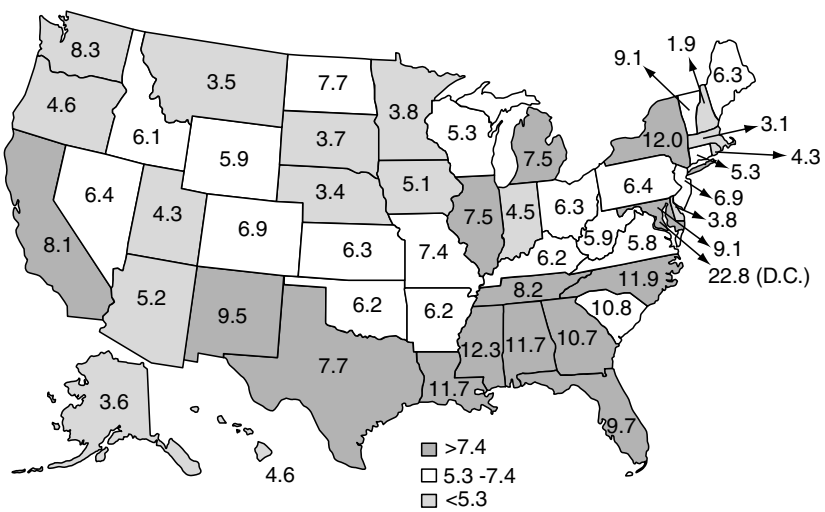

FIGURE 4-2 Maternal mortality ratios: 1987–1996.

Source: National Center for Health Statistics, Centers for Disease Control and Prevention. *Vital Statistics*, 1998.

mostly preventable deaths, many more women (approximately 25 percent) suffer significant complications of pregnancy and childbirth, including infections, hemorrhage, hypertension, depression, and urinary incontinence.

In a federal study of the pregnancy-related mortality ratio between 1991 and 1997, the overall maternal mortality ratio was 7.31. However, the ratios for Hispanic women were 10.3 times that of white women; for Asian/Pacific islanders they were 11.3 times; for American Indians/Alaska Natives they were 12.2 times; and for Black women they were 29.6 times the rate for white women (see Figure 4-3) [16]. During this time frame, 3193 women died during pregnancy or within one year of the end of pregnancy. Some developed countries are moving toward the use of the Pregnancy Related Mortality Rate (PRMR), the feeling being that with the use of current technology, some women are dying after the typical 42 days postpartum time frame that would clearly have died sooner in the absence of the technology [16]. The PRMR captures those pregnancy related deaths that fall after the traditional 42-day cutoff postpartum.

Race and ethnicity are not considered risk factors for maternal mortality, but rather they are indicators of lack of an enabling environment in the areas of the economy, access to the health system, and lack of quality of care.

Accurate reporting of maternal deaths is a problem in the United States as well as in the rest of the world. Underreporting of deaths due to misclassification are estimated to be 1.3 to 3.0 times the numbers of deaths reported through the vital statistics system. Thus the 3086 deaths recorded between 1987 and 1996 may well be closer to 9300.

Global Partners Promoting the Health of Women and Childbearing Families

The International Confederation of Midwives

The International Confederation of Midwives (ICM) is a global federation of midwifery associations, functioning as either independent entities or as autonomous groups within other organizations, such as nursing or physician groups. These midwifery associations choose to join together to promote and strengthen midwifery in order to enhance the health of women and childbearing families throughout the world. The ICM is the only international midwifery association with formal recognition by the United Nations (UN) as a nongovernmental organization (NGO), receiving its first UN accreditation in the early 1960s. The official mission of the ICM as stated in 1993 is to "advance worldwide the aims and aspirations of midwives in the attainment of improved outcomes for women in their childbearing years, their newborns, and their families wherever they reside" [17]. From modest beginnings in the early 1900s, the ICM in 2002 has more than 80 midwifery associations in membership from over 70 countries, representing an estimated 500,000 midwives worldwide [18].

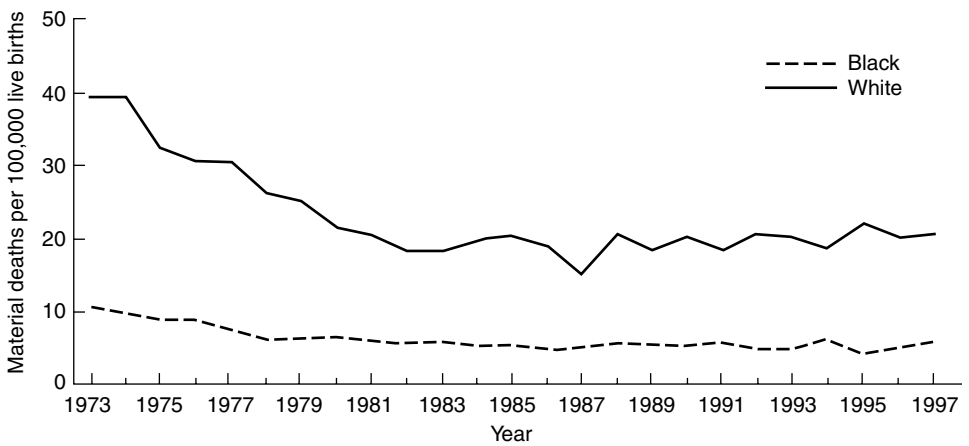

FIGURE 4-3 Maternal mortality ratios in the United States by race: 1973–1997.
Source: National Center for Health Statistics, Centers for Disease Control and Prevention. *Vital Statistics*, 1998.

History Midwives and midwifery practice survived for centuries without formalizing midwifery education, regulation, and standards of practice, or developing an organizational structure at the local, national, or international level. Midwifery was, and continues to be, a vital service provided to women during one of the most vulnerable times of their lives—that of conceiving and bearing children. Until the beginning of the twentieth century, however, only a few countries (among them, Finland, France, Germany, Holland, and Sweden) had sophisticated educational programs for midwives and regulated the practice of midwifery. Most other countries "were content to leave childbirth to the care of traditional practitioners whose skills were transmitted from generation to generation through some form of apprenticeship" [19].

In the late nineteenth century, industrialized nations became concerned about the high death rates of women and children and their overall poor health. Policymakers, politicians, and public health officials searched for ways to promote the health of women and infants, albeit for a variety of reasons (including hopes for an intelligent workforce, healthy army recruits, etc.) that often failed to recognize the importance of women as human beings beyond their reproductive abilities. At the same time that awareness of the poor health status of childbearing women was being discussed, many midwives realized that they would have to improve their standards of education and working conditions if they were to survive within newly developing systems of health and illness care. European midwifery was strongest and continues to thrive in the twenty-first century. The foundation of the ICM was thus firmly rooted in European midwifery of the early 1900s. In other parts of the world, midwives found their practice limited to their own immigrant group or were pushed aside by the rapid increase in the number and prominence of physicians struggling to gain recognition by denigrating the importance of the midwife in the care of childbearing women [19] (also see Chapter 1).

The rapid institutionalization of childbirth after World War I, falling birth rates, and an ever-growing number of doctors threatened the ancient practice of midwifery in many countries. The need to work together across national and cultural boundaries was compelling, and European midwives formed the International Midwives Union (IMU) in 1919. Meeting every two to three years in Europe, the IMU members debated such timeless issues as the place of birth, expansion of the traditional midwifery role beyond childbearing care, methods of pain relief that could be offered to women safely, and ways to improve the standards of education and practice as well as working conditions for midwives. Wars interrupted the IMU meetings, and many records were lost during World War II [20]. In 1954, the "reborn" International Confederation of Midwives, with headquarters in London (until 2000), reached well beyond Europe. Midwives throughout the world began to realize the value of sharing information and working together to improve conditions for childbearing women and families while strengthening the profession of midwifery [19].

Aims and Objectives The ICM's primary aims are to "improve the standard of care provided to mothers and babies and the family throughout the countries of the world; to support and advise, when required, associations of midwives in liaison with their Governments; to advance the provision of maternity care; and to develop the role of the midwife as a professional practitioner in her own right" [21]. The ICM also represents midwifery to international bodies and agencies, through meetings or consultations, or through direct relationships with the heads or governing bodies of such organizations. All of the ICM's activities are directed toward a single aim: to achieve a reduction in rates of maternal and neonatal mortality and morbidity [20, 21] as well as to promote the health and well-being of young girls and women throughout their lives.

Organization and Structure All members of the ICM are either independent associations of midwives or autonomously governed midwives' groups within other organizations, such as nursing or obstetrical societies. Criteria for association membership in the ICM is delineated in the ICM constitution and bylaws. Membership is based on members of an association meeting the International Definition of the Midwife, including educational preparation as a midwife and legal recognition to practice midwifery. There is no individual midwife membership category within ICM. All midwives who are members of an association having membership status in the ICM are considered members. For example, all members of the American College of Nurse-Midwives (ACNM) are automatically members of ICM and can participate in any of the ICM activities.

The structure of the Confederation is based on four regions with 11 elected representatives, who

also serve as members of the Executive Committee. The regions and number of representatives include Africa (2), Americas (2), Asia-Pacific (2), and Europe (5). The International Council is the governing body of the Confederation, made up of two voting delegates from each member association, 11 named Regional Representatives, the Officers of the Confederation (President, Vice-President, and Immediate Past President), and three elected members of the Board of Management (Director, Deputy Director, and Treasurer). Meetings of the International Council are normally held every three years prior to the ICM Triennial Congress. Terms of office for elected officials are also three years, with provisions for reelection for a total of three consecutive terms in the same office.

The Executive Committee (Regional Representatives and Board of Management) functions as an advisory body to headquarters staff and ICM Council, meeting twice in each three-year period. The Board of Management is charged with implementing the ICM Council policies and activities and provides oversight to ICM staff, meeting at least every three to four months. The Secretary General, based at ICM headquarters, is the chief executive officer of the ICM, appointed by the International Council to manage the day-to-day affairs of the Confederation as directed by the Council and the Board of Management.

Global Vision and Goals The preface to the original statement of the ICM Global Vision and Goals [22], first adopted by the ICM Council in 1993, includes the following statement of purpose:

> In looking forward to the twenty-first century, midwives and women share many of the same concerns and will work toward achieving the vision that empowers both women and midwives to be fully respected as persons who are also productive members of all societies.

This purpose statement reflects the awareness that the growth and development of midwifery and the ICM are inevitably linked to the educational, social, and economic status of the women it serves along with the evolution and promotion of the rights of women in all societies.

Core elements contained in the *Empowering Women . . . Empowering Midwives* ICM Vision Statement focus on a vision for women and their health as well as a vision for the future of midwifery. Much of this content was based on the vision statements of the ACNM [23] and used with permission—an example of the importance of having global midwifery partners working together to share experiences and ideas. These core elements begin and end with respect for women as persons with inherent human rights—whether as the recipient of midwifery care or the midwife, herself [24, 25]. The vision is of a world where "no woman has to fear for her life or the life of her baby when she is pregnant," and "women are educated and empowered to delight in a strong sense of self, to trust their bodies, to plan their pregnancies, and to make wise choices in the health care arena" [22].

Core elements in the *Vision for the Future of Midwifery* [22] include having a world where "midwives provide care in all settings and for all women who need midwifery care" as "autonomous health care providers who value team work in providing for the total needs of women and their families." The vision continues with "Midwives are recognized as the experts in the care of childbearing women and the linchpins in any Safe Motherhood effort" and "midwives play a key role in determining the future of health care, including community-based primary health care for all women and families."

All vision statements must have a companion "strategy" document [26]. The ICM has identified specific strategies to meet their goals: (1) to address women's health globally, (2) to strengthen the midwifery profession, and (3) to promote the organization internationally. The updated 2002 goals include working toward the achievement of Safe Motherhood goals and demonstrating the potential of midwifery actions to reduce maternal and perinatal mortality and morbidity; extending the knowledge of midwifery and the influence of midwives throughout the world in venues where decision making takes place and policies are made about the delivery of maternity care; and working with communities and women's groups to develop their knowledge and awareness of how to attain and maintain health. Other ICM goals relate to strengthening midwifery education and regulatory activities, encouraging and supporting midwifery research, and promoting quality midwifery care. As an organization, ICM is also committed to increasing membership, disseminating information, and securing the financial viability of ICM as well as providing forums such as Triennial Congresses where member associations can share and develop from the experience of others.

International Definition of the Midwife (1972; 1990; 2002) The International Definition of the Midwife (see Chapter 1, p. 3), first developed in 1972, has

been one of the most important documents that the ICM has put forth to the global community. The fact that it was subsequently agreed to by the WHO and then the International Federation of Gynecology and Obstetrics (FIGO) speaks well of ICM's collaborative status with major players in global health, as well as its credibility in defining who the midwife is, what the midwife should be doing, and within what regulatory framework and enabling environment the midwife works. This definition was updated in 1991 and again in 2002, primarily to modernize language and to reflect more clearly the self-governance and autonomy of midwifery.

During 2000 and 2001, a statement of essential competencies for basic midwifery practice was field tested in 22 different countries [27]. A total of 214 individual task statements within six domains (e.g., antepartum, intrapartum) were presented for consideration and comment by midwifery educators, senior midwifery students, practicing midwives, and regulators of midwifery practice. It was during this field-testing that both the type of midwifery education and the scope of midwifery practice were addressed. Of this sample, slightly more than 40 percent of education programs were direct entry, 30 percent were based on nursing first, and 20 percent integrated nursing and midwifery. The scope of practice ranged from care during pregnancy and childbirth only to care for women from adolescence to senescence, with births attended in all settings. The majority of midwifery respondents were salaried employees working primarily in institutional settings, with 75 percent providing antenatal care, 93 percent intrapartal care, and 85.5 percent caring for women during the immediate postpartum period. Only 63 percent of practicing midwives provided care for the newborn. There were some noticeable differences by regions of the world, with midwives in southern tier developing nations having a wider scope of practice than midwives in many developed countries [28].

Key Activities The steady growth and increasing influence of the ICM during the past decade give rise to the increasing need for young midwives to become active in the programs and activities of the ICM. Some of these activities are described below.

Congresses and Conferences The ICM Triennial Congresses bring together midwives from all over the world to share knowledge, ideas, and experience. The congresses have been the primary activity and financial strength of ICM since 1919, with the exception of the world war years. The series of meetings has been uninterrupted since 1954.

Since 1987, when the Safe Motherhood Initiative was launched by the World Health Organization and other global partners following the Nairobi Conference, the ICM has been an active player and leader in global efforts to promote Safe Motherhood. It has educated and supported midwives who live and work in those countries where most maternal deaths occur by organizing workshops to be held either before an ICM Congress, in the same venue, or between venues in regions where the need is greatest. Since 1987, the Pre-Congress Workshops have been a collaborative effort with WHO and with UN agencies such as UNICEF, UNAIDS, and UNFPA. In addition, mid-triennium workshops are held following the Executive Committee meetings in developing countries.

International Day of the Midwife In the mid-1990s, the ICM designated May 5 each year as the International Day of the Midwife. Efforts to gain global recognition of this day are continuing through individual member associations. The ICM Council sets the theme for activities during each triennium within the context of Safe Motherhood and the role of midwives. In 2000, a poster was created by ICM to be used for announcing the Day of the Midwife and the year's theme. Member associations are very active during this annual event and often raise funds to support attendance by midwives from developing countries at ICM conferences and congresses.

Representation As the only international midwifery organization with official recognition by the United Nations, the ICM elects member organizations to represent the ICM by attending meetings of interest to midwives at selected regional and global offices of the United Nations (New York, New Delhi) and the World Health Organization (Geneva). In addition, ICM participates in regional and global committees addressing women's health, Safe Motherhood, and workforce issues. As of 1999, the ICM is a member of the Interagency Group on Safe Motherhood and has taken on the role of co-chair since 2000.

Resources/Tools Key midwifery resources have evolved during the past 50 years, and they are still important to the work of ICM, midwives, and midwifery associations. These include the *International Definition of the Midwife*, Pre-Congress Workshops on Safe Motherhood that have resulted in the WHO Midwifery Modules [29] used

throughout the developing world, the ICM Mission Statement [19], and the *International Code of Ethics for Midwives* [24], which has been used to formulate statements of ethics in individual member associations. Other documents, such as the *ICM Vision and Global Strategy* [22], *Essential Competencies for Basic Midwifery Practice* [27], and *Guidelines for Establishing a Midwifery Educational Programme* [30], along with assorted position and policy statements, have guidelines for their use within a given member association or group.

The ICM Web site was initiated in 1996 and reconfigured in 2001. (See Appendix B at the end of this chapter.) Current ICM documents and activities can be located on the Web site, or by contacting ICM headquarters in the Netherlands.

Publications The major publication of the ICM is *International Midwifery*, published four to six times a year, which contains information on headquarters and Board of Management activities and midwifery association activities as well as individual midwife efforts to make pregnancy and birth safe throughout the world. Individual subscriptions are encouraged and can be made through the ICM Web site. ICM also publishes yearly press releases for the International Day of the Midwife, May 5, and works with the International Council of Nurses (ICN) on joint press releases.

The World Health Organization

The World Health Organization (WHO)—established under Article 57 of the Charter of the United Nations in 1948—is a prime player in the global health arena. It was in this original UN charter that the broad definition of health was codified and reiterated in the constitution of the World Health Organization: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" [31].

The WHO works diligently to achieve its primary objective—the attainment by all people of the highest possible level of health—by acting as the directing and coordinating authority on international health work; by establishing and maintaining effective collaboration with the United Nations, specialized agencies, governmental health administrations, professional groups, and other organizations, such as NGOs; by furnishing technical assistance when requested by governments; by proposing conventions, agreements, and regulations with respect to international health matters, such as gender discrimination and human rights; by working with specialized agencies, such as the CDC, on the eradication of epidemic, endemic, and other diseases; by establishing and revising as needed the international nomenclatures of diseases, causes of death, and public health practices; and by developing, establishing, and promoting international standards with respect to food, biological, pharmaceutical, and similar products. The WHO also advocates and promotes maternal and child health and welfare, mental health, health services, health personnel preparation and deployment strategies, and conducts research in the field of health in cooperation with member states and designated centers of excellence, such as the WHO Collaborating Centers in Nursing and Midwifery.

Organization and Structure The WHO global headquarters are located in Geneva, with regional and country offices throughout the world. The six WHO regions include Africa (Brazzaville, Republic of the Congo), the Americas (Pan American Health Organization in Washington, DC), Europe (Copenhagen, Denmark), Eastern Mediterranean (Cairo, Egypt), Southeast Asia (New Delhi, India), and Western Pacific (Manila, The Philippines). Each of the WHO regional offices has a post for a nursing/midwifery advisor, although nurses without midwifery credentials often fill these posts.

The WHO consists of "member states"—generally countries with membership in the United Nations who agree to the conditions set forth in the WHO constitution, including the payment of assessed financial dues. Each member state may send up to three official delegates to the World Health Assembly (WHA), the formal policymaking body of the WHO, which meets each May in Geneva. Selected observers may also be admitted, upon approval of the Director General. Such observers may be individuals or organizational representatives from NGOs, such as ICM and ICN, and other health-related groups or alliances. The Executive Board normally meets in January and May to set the agenda for the WHA and consider other business of note that has occurred between the meetings. The WHA selects individual member states each year who then designate a person to serve on the Executive Board. The Director General of the WHO, currently Dr. Gro Harlem Bruntland from Norway, presides over meetings of the board and determines the work of the WHO Secretariat (in Geneva as well as in the regional offices), including the proposed work for each year.

WHO Programme of Work The strategic directions adopted in the *General Programme of Work 2002–2005* to focus WHO's technical work are as follows [32]:

1. Reduce excess mortality, morbidity and disability, especially in poor and marginalized populations.
2. Promote healthy lifestyles and reduce risk factors to human health that arise from environmental, economic, social and behavioral causes.
3. Develop health systems that equitably improve health outcomes, respond to people's legitimate demands, and are financially fair.
4. Frame an enabling policy, create an institutional environment for the health sector, and promote an effective health dimension to social, economic, environmental and development policy.

In order for the WHO to respond effectively to a changing international context, new ways of working have been identified and are being implemented. These include adopting a broader approach to health within the context of human development, humanitarian action, equity between men and women, and the establishment of human rights, with a particular focus on the links between health and poverty reduction. This change of approach places the WHO at the forefront in several areas: establishing wider national and international consensus on health policy, strategies, and standards through the generation and management of effective interventions from research and expertise; triggering more effective action to promote and improve health and to decrease inequities in health outcomes using carefully negotiated partnerships; and creating a responsive organizational culture [32].

Each year the WHO sets overall organization-wide priorities to shape technical advice, policy, and use of budgetary allotments. For example, the 2002–2003 organization-wide priorities include the following: (1) malaria, tuberculosis, and HIV/AIDS; (2) cancer, cardiovascular disease, and diabetes; (3) tobacco; (4) maternal health; (5) food safety; (6) mental health; (7) safe blood; (8) health systems; and (9) investing in change in WHO. The various departments within WHO Geneva are charged with carrying out the plan of work and providing needed technical expertise to governments and member states.

Role in Making Pregnancy Safer The WHO overall organization-wide priorities since 1987 have included an emphasis on maternal health, beginning with the launch of the global Safe Motherhood Initiative in Nairobi in 1987. Resources such as videos, *Why Did Mrs. X Die?* and *Opening the Gates to Life* (see Appendix B), manuals such as the *Mother-Baby Package* [33], and educational standards such as the *Midwifery Modules* [29] have all come from the technical arm of WHO, the Division of Reproductive Health. In 1998, World Health Day was dedicated to Safe Motherhood, and maternal health received global attention in a new way.

In 1999, WHO, UNFPA, UNICEF, and the World Bank issued a joint statement for reducing maternal mortality. The new emphasis in this document was acknowledgement that Safe Motherhood can be achieved by the promotion and support of basic human rights, including empowering women to make choices in their reproductive lives with the support of their families and communities, and ensuring access to quality maternal health services, with birth attended by skilled personnel with midwifery skills, along with timely access to emergency obstetric care should severe complications arise [4].

In 2000, WHO's renewed commitment to the health components of the Safe Motherhood Initiative took the form of a program entitled Making Pregnancy Safer (MPS)—a health sector strategy for reducing maternal and perinatal morbidity and mortality [34]. Specific goals include improving national capacity to reduce maternal and perinatal ill health, standard setting and the development of tools to use in the field, research and development of the best practices for reducing maternal death and disability, and monitoring and evaluating such practice for replication in areas of the world in greatest need. In addition, other divisions and clusters within and outside the WHO continue work on other aspects of the Safe Motherhood Initiative, including human rights, women's empowerment, education of young girls and women, and socioeconomic development of women.

Key messages of the MPS strategy, which mirror those of SMI-USA and the White Ribbon Alliance, include the following: (1) every pregnancy should be wanted; (2) all pregnant women and their infants should be able to access skilled care; and (3) all women should be able to reach a functioning health facility to obtain appropriate care for themselves or their newborns when complications arise [34]. The need for greater collaboration in the global effort to ensure healthy outcomes for all childbearing women and their newborns is the cur-

rent theme of WHO, ICM, FIGO, IAG, and the White Ribbon Alliance—key organizations interested in making maternal and newborn health a top priority for all governments and nations. For without healthy women, we will never have healthy children. And without healthy children, no nation will achieve its highest potential for health and development. Midwives are therefore crucial to the development of healthy nations.

Role of Midwives and Midwifery in WHO The WHO has long recognized the value of a well-trained midwife in reducing maternal death and disability [35]. The 1999 joint statement noted above more fully recognized the fact that midwifery can make a difference in promoting safe pregnancy and birth for women and newborns. Midwives have held key positions within WHO Geneva as technical experts in the Safe Motherhood programme of work, and they have worked with ICM, ICN, and FIGO on the development of training materials for midwives and physicians. An example of a productive partnership between the WHO and the ICM was the development of the WHO midwifery modules based on the outcomes of the 1990 and 1993 ICM Collaborative Pre-Congress Workshops. Midwives are vital partners in any Safe Motherhood strategy. Indeed, as Dr. Barbara Kwast, a Dutch midwife, noted in the early 1990s, midwives are the linchpin in any effort to make pregnancy safe for women and newborns [36].

World Health Assembly Resolutions on Strengthening Nursing and Midwifery Since 1948, the World Health Assembly (WHA) has adopted a series of 11 resolutions aimed at strengthening nursing and midwifery in order to achieve health for all [37]. The resolution in May 2001 expressed concern for the global shortage of nurses and midwives, and recognized the importance of "nursing services and midwifery services being the core of any health system and in national health" [38]. The resolution urged member states "to pursue health sector reform by involving nurses and midwives in the framing, planning, and implementation of health policy at all levels" [38] and was an important step in acknowledging the policy role that midwives and nurses must play in designing responsive health services and systems. Other aspects of the resolution addressed competency-based education of nurses and midwives, facilitative regulatory frameworks for nursing and midwifery practice, and the development and maintenance of healthy work environments. The WHO Web site (see appendix B) under WHA resolutions provides details of recent resolutions. This and other WHO activities recognize the valuable role that professional midwives play in any effort to improve the health of women, especially childbearing women.

The International Federation of Gynecology and Obstetrics (FIGO)

One of the health professional groups with a keen interest and expertise in women's health is the global organization of obstetricians and gynecologists (FIGO). FIGO is the only worldwide organization that groups obstetricians and gynecologists from national societies together in membership. FIGO was founded in 1954 with 42 national societies, and as of 2000, there were 102 national societies in membership representing OB/GYNs in more than 100 countries.

Mission and Governance The mission of FIGO is to promote the well-being of women and to raise the standard of practice in obstetrics and gynecology [39]. The Executive Board is composed of six officers and 24 representatives from national societies. It determines policy and is responsible for administration of the society, meeting once a year, with the officers meeting at least twice a year. The General Assembly meets every three years at the time of the triennial World Congress of Gynecology and Obstetrics to receive reports, approve financial accounts, and elect the officers and new members of the Executive Board for three-year terms.

Save the Mothers Fund Project One of the major activities related to Safe Motherhood is the organization and administration of the FIGO Save the Mothers Fund Project. Designed to reduce maternal mortality in developing countries, this project works primarily through the "twinning" of developed country OB/GYN societies with developing country societies. FIGO also awards social action grants to societies involved in the organization of national workshops related to Safe Motherhood and the reduction of maternal mortality. In 1999, FIGO joined the Safe Motherhood Interagency Group along with the ICM. Since 2000, the ICM Secretary General has sat on the board of the Save the Mothers Fund Project—two important examples of global partnerships for Safe Motherhood.

Other Activities and Resources FIGO publishes the monthly peer-reviewed *International Journal of Gynecology and Obstetrics* (*IJGO*), as well as the

FIGO Newsletter. Through the work of four committees and 21 advisory panels, FIGO extends its efforts to many aspects of obstetrics and gynecology, including oncology, STDs/AIDS, perinatal health, education, medical terminology, the pathology of the breast, and ethics. Of great interest to midwives is FIGO's *World Report on Women's Health*, published every three years to coincide with the World Congresses. This supplement to the *International Journal of Gynecology and Obstetrics* represents a comprehensive overview of issues in women's health. The FIGO Web site provides updated information on activities and resources (see Appendix B).

Safe Motherhood Interagency Group/Global Partnership for Safe Motherhood and Newborn Health

History The Safe Motherhood Interagency Group (IAG) was formed in 1987 at the launch of the Global Safe Motherhood Initiative in Nairobi, which gathered 130 participants to draw attention to maternal mortality and to mobilize action at the international and national levels. The founding members of IAG included the World Health Organization, UNICEF, UNFPA, the World Bank, the Population Council, and the International Planned Parenthood Federation. In 1999, a decision was made to add the two major health professional groups involved in Safe Motherhood—the International Confederation of Midwives (ICM) and the International Federation of Gynecology and Obstetrics (FIGO)—as well as two regional Safe Motherhood groups—the Regional Prevention of Maternal Mortality Network (Africa) and the Safe Motherhood Network of Nepal. The Secretariat for the IAG is Family Care International (FCI) in New York City.

Aims and Objectives The primary objectives of the IAG are to mobilize and inform governments and others on the continuing problem of maternal mortality and disability in many areas of the world, to offer strategic directions for intervention to promote Safe Motherhood based on expert technical advice, and to provide a variety of informational tools and resources, such as fact sheets and briefing cards, which can be used to promote Safe Motherhood throughout the world.

Summary of Activities 1987–2002 Notable among the activities during the past 15 years were regional and national workshops held between 1989 and 1994 to mobilize and inform government and non-governmental organization (NGO) leaders around the issue of maternal death and disability in areas of the world where maternal death is highest. One of the capstone events was the tenth anniversary (1997–1998) of the global Safe Motherhood Initiative (SMI), with a technical consultation held in Colombo, Sri Lanka. The focus of this meeting was to identify those interventions that had been successful in reducing maternal death and disability, to define needs and priorities including cost-effective strategies, and to determine future action needed to promote safer pregnancy and birth in the world (see Table 4-4).

These action messages have been used to focus subsequent IAG activities since 1997, beginning with an emphasis on skilled attendance at birth (1999–2002) and adding an emphasis on the prevention of unsafe abortion in 2001. The process followed for each message includes the preparation of a "review of evidence" paper, technical consultation, an international and/or regional conference for advocacy of the specific approach defined by the experts, and the completion and dissemination of a set of materials, such as a policy booklet, briefing cards, country case studies, and conference reports.

Family Care International, as the Secretariat for the IAG, serves as an information clearinghouse on Safe Motherhood, including the development of an annotated bibliography of Safe Motherhood publications, responding to individual requests for information and materials, and launching the Safe Motherhood Partners Listserv in 2000 to improve coordination and collaboration among a range of organizations who share the commitment to make pregnancy and birth safe for all women and new-

TABLE 4-4 Ten Action Messages from the Sri Lanka Meeting on Safe Motherhood Intiatives

1. Advance Safe Motherhood through human rights.
2. Empower women, ensure choices.
3. Safe Motherhood is a vital social and economic investment.
4. Delay marriage and first birth.
5. Every pregnancy faces risks.
6. Ensure skilled attendance at delivery.
7. Improve access to quality maternal health services.
8. Prevent unwanted pregnancy and address unsafe abortion.
9. Measure progress.
10. Power of partnership.

Family Care International. *The Safe Motherhood Action Agenda: Priorities for the Next Decade*, 1998.

borns. The Web site for reviewing and ordering Safe Motherhood materials at FCI is listed in Appendix B at the end of this chapter.

In 2001, a decision was made to review the objectives and structure of the Safe Motherhood IAG in order to become a more inclusive organization and to mobilize significant financial resources directed toward the improvement of the health and well-being of childbearing women and their newborns. In January 2002, an expanded partnership for Safe Motherhood and Newborn Health met in London to determine the future of global efforts to promote Safe Motherhood in the world. The draft mission statement is "to mobilize and monitor political will, global resources, and effective interventions in support of health systems and communities to improve survival and well-being of women and newborns. This mission will be achieved in the context of global efforts toward poverty reduction, equity, and human rights." The group includes all former IAG members, in addition to representatives from the U.S. Agency for International Development (USAID), Department for International Development (DFID), Save the Children, Initiative for Maternal Mortality Programme Assessment (IMMPACT), White Ribbon Alliance, UN Foundation, Asian Development Bank, Norwegian Ministry of Foreign Affairs, and the Maternal Newborn Health (MNH) project of Johns Hopkins University. The future of Safe Motherhood will be much stronger with the combination of major donors, bilateral agencies, and universities, as well as international provider groups.

American College of Nurse-Midwives

The American College of Nurse-Midwives (ACNM) has had a strong international orientation since its inception. Founders came from primarily European midwifery traditions. Early midwifery graduates often served as missionaries worldwide. A significant percentage of ACNM members have overseas work experience and foreign language ability.

Concern for international health is found in the official documents of the ACNM as well. Among its goals is "to establish the ACNM as a national and international leader in promoting optimal health care for mothers and children" [40]. The ACNM has also had a long history of active involvement in the International Confederation of Midwives, frequently providing leadership by filling the roles of Regional Representatives or Board of Management officers.

In the late 1970s Bonnie Pedersen, a visionary CNM, was concerned that midwives were not strengthening the practice of midwifery worldwide by assisting one another. In her quest to have "midwives help midwives," she sought a home for the conduct of international projects, which became the ACNM in 1981. The first funding was for the International Project for Traditional Birth Attendants (TBA) in 1982.

During the first five years, Pedersen was joined by Deborah Armbruster and Gilberte Vansintejan and their group conducted extensive needs assessments, training of TBAs, and the development of training materials in multiple languages. As funded projects expanded to include midwifery continuing education and preservice midwifery education, the name was changed to the ACNM Special Projects Section to reflect the enlarged scope of work undertaken. Much work was done to integrate family planning into the practice of West African midwives who had come from an educational tradition with no family planning.

In the early 1990s, following the conduct of two maternal mortality studies by Margaret Marshall in Ghana, the Special Projects Section began to move into an era of a number of Safe Motherhood projects. *The Life-Saving Skills Manual for Midwives* [41] was developed, piloted in Ghana, and then taught in Nigeria, Uganda, Indonesia, Vietnam, and ultimately other countries through the ACNM and other agencies. It has also been translated into multiple languages.

The 1990s also brought a number of exciting opportunities to work with sister midwifery associations working on institution strengthening and continuing education for members. Significant multiyear relationships developed with the national midwifery associations in Ghana, Uganda, and Indonesia. Through skills-building efforts, these associations are now in a position to accept multiple donor projects and to serve their own memberships in policy development, continuing education, and the creation of model service delivery projects.

In the mid-1990s, the ACNM expanded into the domestic arena with a project to address continuing education needs of ACNM members on domestic violence. As this expansion into domestic projects progressed and to better portray the work of the ACNM, the Special Projects Section changed its name in 2000 to the ACNM Division of Global Outreach. Today, the work of Global Outreach is approximately 80 percent international and 20 percent domestic, with international projects including training in Life-Saving Skills, home-based Life-Saving Skills, postpartum and post-abortion care, midwifery association development, family planning, maternal-to-child HIV transmission, family-centered maternity care, and domestic violence. In

its first 20 years of work, ACNM efforts have involved more than 30 countries, employment of approximately 20 CNMs on staff, and more than 40 CNMs working as consultants. The vision of "midwives helping midwives" has been realized [42].

Safe Motherhood Initiative–USA

In May 1996, the voting members at the ACNM annual business meeting unanimously endorsed the establishment of a Task Force on Safe Motherhood to focus on maternal death and disability in the United States. ACNM President Joyce Roberts appointed Drs. Joyce Thompson and Margaret Marshall to cochair this Task Force. The first meeting of the Task Force was in December 1996, following the charge to submit a tentative plan of action to the ACNM Board of Directors in 1997.

From this early endeavor, the Safe Motherhood Initiative–USA was born on October 25, 1997, on the tenth anniversary of the International Safe Motherhood Initiative. The founding partners included ACNM, Midwives Alliance of North America, American College of Obstetricians and Gynecologists, March of Dimes, the National Black Women's Health Project, and the National Coalition of Hispanic Health and Human Services Organization. Technical support and expertise were contributed by the Centers for Disease Control and Prevention and the Maternal-Child Health Bureau of the U.S. Department of Health and Human Services. New partners have been added since 1997, including the Asian Women's Health Network, and the American Public Health Association. The SMI–USA Web site provides updated information (see Appendix B).

Definition of Safe Motherhood The original definition of Safe Motherhood adopted within the Task Force and founding partners was as follows:

> Safe Motherhood in the USA means that no woman should die or be harmed by pregnancy or birth. Safe Motherhood begins with having it safe to be a girl and a woman in our society. Safe Motherhood–USA is founded on freedom from discrimination of any form and freedom from the exaggerated fear of childbirth. Safe Motherhood is a state of well-being in which a woman approaches childbirth with confidence in her abilities to birth and nurture her newborn. Safe Motherhood values the girl child, respects the freedom to choose when and whether to have children, and encourages active participation during health care. Safe Motherhood implies the availability, acceptability, and easy access to health care for a woman's prenatal, birth, postpartum, family planning, and gynecological needs. Safe Motherhood demands the ethical use of technology. It also requires involvement and commitment from each community and the nation to fairly allocate resources that promote the health of all women. [43]

Each of these statements in the definition of Safe Motherhood have been further defined within the SMI–USA brochure as part of the group's effort to educate the public on the nature and need for SMI activities in the United States.

Vision for Safe Motherhood in the United States The vision of SMI–USA agreed to by the founding and subsequent partners is that:

All pregnancies are intended.

All women will complete childbirth strengthened.

No woman will die or be harmed as a result of being pregnant.

The rationale for such a vision was based on the fact that every day at least one to four women die from pregnancy-related causes in the United States, with most of these deaths preventable. In addition, no improvement has been made since 1982 in the maternal mortality rate in the United States. Among the most tragic statistics is the fact that black women are four times more likely than white women to die from pregnancy-related causes (see Appendix B, CDC Web site).

Selected Priorities for SMI–USA After much discussion and deliberation among the SMI–USA partners, it was agreed that there would be three priorities to be addressed during the next few years. These include access to quality childbearing care for all women and behavioral changes among health professionals and pregnant women that result in first trimester pregnancy care in a woman-centered service that promotes self-esteem, confidence, and positive health outcomes for mothers and babies. Beginning in 1999, model programs that exemplify the Safe Motherhood Vision have been selected, publicized for replication in other communities, and held up as examples of what can be done to promote safe pregnancy and birth for women and newborns.

SMI–USA is a unique opportunity for midwifery students and new midwives to become active players in the political action needed to make all pregnancies safer in the United States.

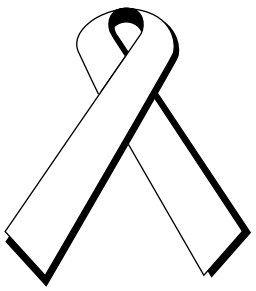

FIGURE 4-4 The white ribbon is a symbol dedicated to the memory of women who have died during pregnancy or childbirth.

Source: White Ribbon Alliance for Safe Motherhood. *Awareness, Mobilization, and Action for Safe Motherhood: A Field Guide.* Washington, DC: NGO Networks for Health, 2000.

The White Ribbon Alliance

The goal of the White Ribbon Alliance (WRA) is to raise awareness of the need to make pregnancy and childbirth safe for all women in both developed and developing countries. The WRA envisions broad-based, collaborative efforts among international non-governmental organizations (INGOs), government agencies, NGOs, and community-based organizations in developing countries to decrease maternal mortality through shared resources and experiences [44].

The organization members attempt to assist in the development of coalitions, usually called Safe Motherhood Initiatives or White Ribbon Alliances, in all countries of the world. The group encourages the largest membership possible from all sectors of society. Activities undertaken to date include provision of advice and technical assistance to groups in developing countries wishing to start their own WRA, an electronic newsletter to share experiences and lessons learned, development of a social mobilization field guide on how to start a Safe Motherhood coalition, and awarding annual prizes in conjunction with the Global Health Council, a U.S.-based NGO working on international health issues, to those groups making a substantial contribution to the health of childbearing women through their own national alliances. Members include NGOs, governments, and interested persons.

Frequently Asked Questions About International Midwifery

The following are a few of the frequently asked questions related to international midwifery and Safe Motherhood.

1. What do I need to do in order to work as a midwife in another country? Midwives desiring to practice midwifery in a country where they did not complete their basic education as a midwife need to investigate such issues as reciprocity of education, recognition of licensure or other regulatory conditions, and the ability to obtain a permit to work in that country. The U.S. system of basic or first-level midwifery education meeting criteria specified by the ACNM Division of Accreditation is very specific to midwifery practice in the United States. In most countries, basic midwifery education and/or licensure is rarely transferable to another country without some type of negotiation with the regulatory body in the new country. In some cases, presentation of evidence of graduation from an ACNM accredited nurse-midwifery or midwifery education program, successful completion of the ACC Certification Examination, and a notarized copy of one's license to practice midwifery in a given state will meet the regulatory requirements to be registered or licensed as a midwife in another country. In other cases, presentation of these documents will obviate the need to take another examination for entry into midwifery practice, though a period of observation by supervisor midwives may be required before a permit to practice is issued.

If you are thinking about practicing midwifery in another country, it is wise to learn as much as possible about the status of maternity care and women's health, the scope of midwifery practice, and any particular regulatory and reimbursement patterns under which midwives work. Beginning your exploration of almost any country is made easy through the Internet. Finding out the details about the vital health indicators (e.g., maternal and infant mortality and morbidity rates and/or ratios) can often be done through the World Health Organization or other agencies of the United Nations in addition to the U.S. Centers for Disease Control and Prevention. Several Web sites are listed at the end of this chapter (Appendix B) to facilitate this investigation of health indicators.

Discovering the details about midwives and midwifery practice in a given country is often difficult, especially in those developing countries where access to electronic media is still quite limited. The International Confederation of Midwives (ICM) is a good place to begin for contacts with individual member associations that might become your contact for a discussion of midwifery work in that country. However, not all countries of the world have midwifery associations, and there are some

midwifery associations that are not yet members of the ICM. In these cases, you might talk with individuals or agencies that work in such countries, including staff of the ACNM Division of Global Outreach, Save the Children—Saving Newborn Lives, and Family Care International.

Obtaining a global perspective on midwifery education, regulation, and practice is essential for all midwives as women throughout the world need the services provided by well-prepared midwives, and global migration of health workers is a reality. A note of caution is warranted: any new midwifery graduate often needs time to become confident with all the midwifery skills, management decisions, and adjustment to the autonomous role of the licensed midwife. It is often easier for new graduates to attain this level of confident practice in their own country before learning a new health system and pattern of midwifery practice in another country. Take time to make good decisions about your career and how to advance it to include international midwifery service.

2. What do I need before applying for international consultation positions in midwifery? International midwifery experience is often a prerequisite to becoming eligible for international consulting positions in midwifery—whether short- or long-term. In many ways, it becomes a catch-22 situation: in order to be employed in international midwifery, you have to have had international midwifery experience—and yet it is difficult to obtain international midwifery experience if you have never worked in another country. However, many midwives gain such international experience through volunteering—either with a church-related organization, the Peace Corps, emergency relief agencies, or other volunteer agencies. Sometimes the international experience required does not have to relate to midwifery; at other times international midwifery experience is vital.

Among the most important criteria for international consultation in midwifery is excellence in both practice and teaching. Be the best midwife you can be prior to thinking about sharing your experience with others. Hone your teaching skills with individuals and with groups. Remember, expertise takes time and is built upon one's ongoing midwifery experience—it does not come quickly or without effort, including learning from your mistakes. Effective consultation also requires expert communication skills, cultural sensitivity and competence, and insight into and awareness of the impact of your values and value-biases on how you view the world—especially when that world is very different from your own. We all view the world through our own "value lens"—and must understand that though there are some universal values, such as respect for human dignity, there are many values that are not shared from one culture to another, from one country to another, or from one person to another in the same country. The person with unexamined values can be a menace to others, for lack of insight into oneself often means the unconscious imposition of one's personal values on others—often inappropriately.

It is important to have a working ability in at least one language other than English. The effort involved in learning another language (or more) is an important element of becoming culturally competent. Multiple language ability is an extra bonus for those interested in international midwifery consultation. English, Spanish, and French are the major languages of the United Nations, the World Health Organization, the International Confederation of Midwives, and other international agencies. With these languages, a midwife can work successfully in almost all areas of the world. Taking time to learn the dominant language of the country where you plan to work is not only valuable for working with in-country colleagues, but also expresses your respect for their language. Consultants assigned on a short-term basis (working for a few days or weeks) often do not have the luxury of time to learn a local language, such as Chichewa, Urdu, Hindi, or Polish, and therefore need to know how to work through interpreters. Long-term consultants working for several months or years will need to learn the local language and will need to have time provided to study in the country if the language is not among those taught in colleges and universities in their home country. While working in the language of the host country is not always mandatory, having the ability to do this demonstrates exceptional commitment to the host colleagues and their culture.

The primary role of the consultant is to offer advice after learning about the country and background on issues to be addressed during the consultation, sharing experiences from other areas of the world that might be useful in the given situation, or offering suggestions as to how these experiences might be adapted to the country or situation. Above all, a consultant is a guest in the country and needs to act in a way that preserves the integrity of the host country. A large measure of humility is vital to international consultants—for a consultant must al-

ways remember that the host country needs to make the final decisions on any advice or suggestions given. This is yet another example of the midwifery model of care that empowers others to care for/decide for themselves what is best for them.

It is a good idea and often fun to spend time talking with midwives who have spent a good portion of their career as international midwifery consultants. These are very wise and worldly individuals, and they can offer insight into what works and what does not work in the international arena relative to midwifery, women's health, family planning, public health, or primary care—to name a few of the areas of consultation needed in the world. International midwifery consultants work with a variety of levels of health workers—from the revered Traditional Birth Attendant (TBA) to physicians needing midwifery skills. They may provide educational consultation at universities and colleges for preservice (basic) or postbasic (degree) midwifery education, hands-on training in Life-Saving Skills (LSS) or upgrading of general midwifery skills (on-going education). They may provide consultation to governments, Ministries of Health, and policymakers on the health needs of women and childbearing families. They may work with in-country midwives to begin and/or strengthen local midwifery associations. They may also work with regulatory agencies, such as nurses' and midwives' councils, to provide for strong self-governance and regulation of midwifery practice in the country. There is a great need for strengthening midwives and midwifery throughout the world, and ACC certified nurse-midwives and midwives have a strong educational base on which to build the needed skills to become an effective international midwifery consultant. Clinical and teaching expertise, cultural competence, known personal values, and a minimum of a second language joined together with a passionate commitment to women's health and quality midwifery care can result in an effective career as an international midwifery consultant.

3. Where can I find information on topics such as Safe Motherhood, violence against women, female genital cutting (mutilation), positive and negative traditions (practices) surrounding pregnancy and birth in a variety of cultures, and gender discrimination? As more and more midwives are guided into international midwifery—whether by faculty when they are students or through personal interests—searching for the best sources of information on selected international topics in women's health becomes very important. Every midwife should fully understand the global efforts to make childbearing safe for all women and should remember that pregnancy is a condition that was never intended to result in the death of the woman or infant. However, hundreds of thousands of women still die during childbearing, and many of their newborns also die.

As Rebecca Cook noted several years ago [2], the global tragedy of maternal death and disability is one of the most poignant reminders that women's rights are being disregarded in many areas of the world. Human rights for girls and women are another key topic of interest among midwives, as the nature of midwifery is working with women—wherever they are and in whatever condition midwives find them [28]. Violence against women, female genital cutting, the continued low status of women, and other forms of gender discrimination are all evidence of the persistent denial of the basic human rights of young girls and women throughout the world. Key sources of information on human rights and the status of women can be located in the Web sites of the World Health Organization, and UN agencies such as the United Nations Fund for Women (UNIFEM), UNICEF, and UNFPA.

Some of the most interesting topics surrounding pregnancy, birth, and the immediate postnatal periods involve cultural rituals and taboos for the woman. These range from what can be eaten or not eaten, to what the woman can see or do. Selecting an area of the world to read about, explore, and discuss with members of that society can be a mind-expanding activity for the midwifery student or new graduate. As you will discover when working in the international arena, the goal of midwifery care is to support those cultural traditions that promote the health and well-being of women or are harmless, and to work to eliminate those rituals and taboos that are harmful to women and infants. Books on these topics abound, beginning with some of the early writings of Margaret Mead and other cultural anthropologists. A literature search will result in some very interesting reading, and will help you to understand the culture of birth, including the culture in the United States, more fully.

4. What are the various educational pathways to midwifery practice throughout the world? There are a variety of educational pathways to becoming a professional midwife throughout the world in keeping with the ICM/WHO/FIGO International Definition of the Midwife. These can be captured in two main categories: (1) midwifery education built

upon or within nursing, and (2) midwifery education entered directly without a health background. In each of these two pathways, there are a variety of educational levels that are prerequisite to entering midwifery education. Within developed nations, the majority of midwifery education is built upon a minimum of a high school education, although the actual midwifery education may or may not lead to a college degree. In developing nations, midwifery education is generally built upon a minimum of a tenth grade secondary education.

It is estimated that approximately one-half of the world's professional midwives are also nurses, constituting dual professional qualification. Many nations require dual qualification in nursing and midwifery to meet the growing need for professional health workers working in community-based primary care facilities. In other areas of the world, direct-entry midwifery is encouraged to meet the demand for childbearing services of high quality. And in several nations, both types of professional midwives are prepared. Whatever the pathway to midwifery education, it is the competencies of the individual midwife that are most important.

5. How can I become active in the International Confederation of Midwives? Any individual midwife who is a member of a midwifery association that is a member of the International Confederation of Midwives (ICM) is considered an active member of the ICM. As noted earlier in this chapter, ICM depends on the volunteer efforts of midwives throughout the world to carry out its mission, vision, and global strategy. Midwifery students, new graduates, and experienced midwives are encouraged to take an active role within the ICM. This role may be working with officers of the Confederation on individual projects, such as the evolving international midwifery competencies and standards of practice, the development of the ICM Web site, or on mid-triennium conferences and Triennial Congresses held in their area of the world. Anyone interested in becoming active in the ICM should contact the Secretary General at ICM headquarters to volunteer their time and talents.

Future Trends and Challenges in International Midwifery

Historically the evolution of midwifery practice internationally has undergone a series of major changes. A profession that started out with just attending the labor and delivery and providing several days postpartum care has added on a full range of services, including antenatal care, newborn care, family planning, minor gynecological care, preconception care, care of the menopausal woman, and care of some medical conditions. These services have always been delivered in a variety of worksites—home, clinic, and hospital.

The challenges for the midwife in addressing Safe Motherhood today and in the future can be discussed in several areas: involvement in policy, clinical practice, and community-based approaches to social mobilization.

Policy

Midwifery associations in various countries have made huge gains over the past 20 years by being at the table in policy development. It will be critical that we build on the gains of midwifery pioneers and do not slide into the expectation that others will recognize our value or what we have to share. Volunteerism is difficult as we live busy lives with competing priorities. But without it, we cannot serve the compelling needs of mothers and newborns around the world.

Clinical Practice

Historically, midwifery clinical practice has always been undergoing change. As painful as it may be for those of us who are comfortable with our current scope of practice, we must remain flexible in order to embrace changing conditions and priorities. Expanded emergency skills as well as dealing with all areas of AIDS prevention and care, displaced populations, post-trauma war survivors, environmental hazards, terrorism, and war all challenge our creativity, stamina, fund-raising skills, and multiyear commitment.

Community Based Approaches to Safe Motherhood

One of the ongoing challenges for midwives dealing with Safe Motherhood is how to better address community issues. If we stay in clinical facilities, we will miss a majority of maternal complications and deaths. We must develop improved strategies for addressing delay in recognition of complications and delay in reaching the appropriate level of care. Midwives need skills in advocacy, social mobilization, participatory learning methodologies, utilization of positive deviance approaches, and other strategies. Advocacy can address policy issues. Social mobilization brings community awareness to what are the barriers to safer pregnancy

(communication, emergency transportation, emergency funds, permission to seek medical care, etc.) and development of community solutions to community problems. This local solution means that solutions are within the means of the community and therefore have potential for sustainability. Participatory learning activities (PLA) are techniques developed by agricultural workers to involve community members in examining all sides of an issue and seeing how multiple inputs can help bring a solution. The goal is to encourage various levels and groupings of stakeholders to contribute in practical ways. Positive deviance is a strategy that analyzes how positive behavior has survived in the face of cultural and family pressures. For example, if a few families in a village have resisted the pressure to have their daughters circumcised, studying how they have succeeded in a pressured environment yields helpful information in developing a strategy to eliminate female genital mutilation. Applying strategies such as PLA and positive deviance helps bring about profound changes at the community level.

As a midwife, you will have the power to make a profound impact on the survival of mothers and infants globally. Begin with the best educational preparation, maintain competence, listen to women and respond to their needs, and never become complacent about maternal mortality and morbidity. Women and families are counting on you!

References

1. Mercer, J. M. Honorary doctorate citation for Helen Varney Burst. Georgetown University, May 23, 1987.
2. Cook, R. J. *Advancing Safe Motherhood Through Human Rights*. Paper presented at the tenth anniversary of Safe Motherhood Initiative, Colombo, Sri Lanka, 1997, p. 1.
3. Thompson, J., and Thompson, H. (2001). Ethical aspects of care. In Walsh, L. V. *Midwifery: Community-Based Care During the Childbearing Year*. Philadelphia, PA: Saunders, 2001, ch. 29, pp. 489–490.
4. WHO, UNFPA, UNICEF, and World Bank. *Reduction of Maternal Mortality: A Joint WHO/UNFPA/UNICEF/World Bank Statement*. Geneva: WHO, 1999, p. 2.
5. World Health Organization. Revised 1990 *Estimates of Maternal Mortality: A New Approach by WHO and UNICEF*. Geneva: WHO, April 1996.
6. Ross, S. R. *Promoting Quality Maternal and Newborn Care: A Reference Manual for Program Managers*. Washington, DC: Cooperative for Assistance and Relief Everywhere (CARE), 1998.
7. Family Care International. *Skilled Care During Childbirth: Policy Brief*. New York: FCI, 2002.
8. Family Care International. *Saving Lives: Skilled Attendance at Childbirth*. Background paper. New York: FCI, in collaboration with Safe Motherhood Inter-Agency Group, 2001.
9. Thaddeus, S., and Maine, D. *Too Far to Walk: Maternal Mortality in Context*. Columbia University, May 1990.
10. World Health Organization. *International Classification of Diseases*, Vol. 9, December 1987.
11. World Health Organization. *International Classification of Diseases,* Vol. 10, 1997.
12. Herz, B., and Measham, A. R. *The Safe Motherhood Initiative: Proposals for Action*. World Bank Discussion Paper No. 9. Washington, DC: World Bank, 1987.
13. Family Care International. *The Safe Motherhood Action Agenda: Priorities for the Next Decade*, New York: FCI, 1998.
14. Costello, A. *State of the World's Newborns: A Report from Saving Newborn Lives*. Washington, DC: Save the Children, 2001.
15. U.S. Department of Health and Human Services. *Tracking Healthy People 2010*. Washington, DC: Government Printing Office, November 2000.
16. Centers for Disease Control and Prevention: CDC report highlights selected racial and ethnic pregnancy-related death rates. *Morbidity and Mortality Weekly Report*. www.cdc.gov. May 11, 2001.
17. International Confederation of Midwives. *Mission Statement 1993*. London: ICM.
18. International Confederation of Midwives. Personal correspondence from ICM headquarters on member data, August 2002.
19. International Confederation of Midwives. *Milestones in International Midwifery*. London: ICM, 1994.
20. International Confederation of Midwives. *A Birthday for Midwives: Seventy-five Years of International Collaboration, 1919–1994*. London: ICM, 1994.
21. International Confederation of Midwives. *Constitution and Byelaws* (revised). Adopted by ICM Council in Manila, 1999.

22. International Confederation of Midwives. *Empowering Women—Empowering Midwives: Global Vision for Women, Global Vision for Midwifery*. London: ICM, 1999.

23. American College of Nurse-Midwives. *Listening to Women: Visionary Planning Document*. Washington, DC: ACNM, 1992.

24. International Confederation of Midwives. *International Code of Ethics for Midwives*. London: ICM, 1999.

25. International Confederation of Midwives. *Midwives, Women, and Human Rights*. Provisional statement presented to ICM Council, Vienna, April 2002. The Hague, Netherlands: ICM.

26. Barker, J. A. *Future Edge: Discovering the New Paradigms of Success*. New York: Morrow, 1992, p. 203.

27. Fullerton, J. T., and Brogan, K. *Essential Competencies for Midwifery Practice: A Project Report and Survey Analysis*. The Hague, Netherlands: International Confederation of Midwives, 2002.

28. Fullerton, J. T., Severino, R., Brogan, K., and Thompson, J. Essential competencies of midwifery practice, phase II: affirmation of the competency statements. *Midwifery* (September) 2002.

29. World Health Organization. *Midwifery Modules*. Geneva: WHO, revised, 2002.

30. International Confederation of Midwives. *Guidelines for Establishing a Midwifery Educational Programme*. Presented at the ICM Council, Vienna, April 2002. Adopted in principle.

31. World Health Organization. *Constitution of the World Health Organization*. Geneva: WHO, 1948.

32. World Health Organization. *General Programme of Work 2002–2005*. Geneva: WHO, 2001.

33. World Health Organization. *The Mother Baby Package*. Geneva: WHO, 1994.

34. World Health Organization. *Making Pregnancy Safer: A Health Sector Strategy for Reducing Maternal and Perinatal Morbidity and Mortality*. Geneva: WHO, 2001.

35. World Health Organization. Midwives to the world. *World Health: The Magazine of the World Health Organization 50th Year*, No. 2, March-April 1997.

36. Kwast, B. E. Midwives: key rural health workers in maternity care. *Int. J. Gynecol. Obstet.* 38 (suppl.) S9-S15, 1992.

37. Vonderheid, S. C., and Al-Gasseer, N. World Health Organization and global health policy. *J. Nurs. Scholarship* 34:2:109–110, 2002.

38. World Health Assembly. *Strengthening Nursing and Midwifery: WHA 54.12*. Geneva: World Health Organization, May 2001.

39. International Federation of Gynecology and Obstetrics. *Mission Statement 1998*. Web Site www.figo.org.

40. American College of Nurse-Midwives. Statement of Goals #6. Web site www.acnm.org.

41. Marshall, M. A., and Buffington, S. T. *Life-Saving Skills Manual for Midwives*, 3rd ed. Washington, DC: American College of Nurse-Midwives, 1998.

42. Armbruster, D., Buffington, S. T., and Vivio, D. Personal communication, February 2002.

43. Safe Motherhood Initiative–USA. Brochure. Tampa, FL Lawton Chiles Center, 2000.

44. White Ribbon Alliance for Safe Motherhood. *Awareness, Mobilization, and Action for Safe Motherhood: A Field Guide*. Washington, DC: NGO Networks for Health, 2000.

• • • Bibliography

American College of Nurse-Midwives. *Listening to Women: Visionary Planning Document*. Washington, DC: ACNM, 1992.

Armbruster, D., Buffington, S. T., and Vivio, D. Personal communication, February 2002.

Buffington, S. T., and Beck, D. *Home-Based Life-Saving Skills*. Washington, DC: American College of Nurse-Midwives, 2002.

Centers for Disease Control and Prevention. *Increased Risk of Dying from Pregnancy Among Hispanic Women in the United States*. Fact sheet. Atlanta, GA: March 28, 2000.

Centers for Disease Control and Prevention. *Safe Motherhood: Preventing Pregnancy-Related Illness and Death*. Atlanta, GA, 2001.

Centers for Disease Control and Prevention. State-specific changes in singleton preterm births among black and white women—United States, 1990 and 1997. *Morbidity and Mortality Weekly Report*, September 22, 2000, pp. 837–840

Centers for Disease Control and Prevention. CDC report highlights selected racial and ethnic pregnancy-related death rates. *Morbidity and Mortality Weekly Report*, May 11, 2001.

Cook, R. J. *Advancing Safe Motherhood Through Human Rights*. Paper presented at the tenth an-

niversary of Safe Motherhood Initiative, Colombo, Sri Lanka, 1997.
Costello, A. *State of the World's Newborns: A Report from Saving Newborn Lives*. Washington, DC: Save the Children, 2001.
Family Care International. *The Safe Motherhood Action Agenda: Priorities for the Next Decade*, 1998 New York: FCI.
Family Care International. *Saving Lives: Skilled Attendance at Childbirth*. New York: FCI, in collaboration with Safe Motherhood Inter-Agency Group, 2001.
Family Care International. *Skilled Care During Childbirth: Policy Brief*. New York: FCI, 2002
Fullerton, J. T., and Brogan, K. *Essential Competencies for Midwifery Practice: A Project Report and Survey Analysis*. The Hague, Netherlands: International Confederation of Midwives, 2002.
Fullerton, J. T., Severino, R., Brogan, K., and Thompson, J. Essential competencies of midwifery practice Phase II: affirmation of the competency statements. *Midwifery* (September 2002).
International Confederation of Midwives. *Mission Statement 1993*. London: ICM.
International Confederation of Midwives. *A Birthday for Midwives: Seventy-Five Years of International Collaboration, 1919–1994*. London: ICM, 1994.
International Confederation of Midwives. *Milestones in International Midwifery*. London: ICM, 1994.
International Confederation of Midwives. *Constitution and Byelaws* (revised). Adopted by ICM Council in Manila, 1999.
International Confederation of Midwives. *International Code of Ethics for Midwives*. London: ICM, 1999.
International Confederation of Midwives. *Empowering Women—Empowering Midwives: Global Vision for Women, Global Vision for Midwifery*. London: ICM, 1999.
International Confederation of Midwives. Personal correspondence from ICM Headquarters on member data, August 2002.
International Confederation of Midwives. *Global Goals and Strategies*. The Hague, Netherlands: ICM, 2002 revised.
International Confederation of Midwives. *Midwives, Women, and Human Rights*. Provisional statement presented to ICM Council, Vienna, Austria April 2002. The Hague, Netherlands: ICM.
International Confederation of Midwives. *Guidelines for Establishing a Midwifery Educational Programme*. Presented at the ICM Council, Vienna, Austria April 2002. Adopted in principle.
International Federation of Gynecology and Obstetrics (FIGO). *Mission Statement, 1998*. www.figo.org.
Kwast, B. E. Midwives: key rural health workers in maternity care. *Int. J. Gynecol. Obstet.* 38 (suppl.) S9-S15, 1992.
Lawn, J., McCarthy, B. J., and Ross, S. R. *The Healthy Newborn: A Reference Manual for Program Managers*. Centers for Disease Control and Prevention (CDC), CARE-CDC Health Initiative (CCHI) and Cooperative for Assistance and Relief Everywhere (CARE), Atlanta, GA, 2002.
Marshall, M. A. Ghana Registered Midwives Association continuing education project Carnegie Corporation, Grant B 5071, final evaluation report. Unpublished evaluation of the Life-Saving Skills Training Project, 1992.
Marshall, M. A., and Buffington, S. T. *Life-Saving Skills Manual for Midwives*, 3rd ed. Washington, DC: American College of Nurse-Midwives, 1998.
Mercer, J. M. Honorary doctorate citation for Helen Varney Burst. Georgetown University, May 23, 1987.
Ross, S. R. *Promoting Quality Maternal and Newborn Care: A Reference Manual for Program Managers*. Washington, DC: Cooperative for Assistance and Relief Everywhere (CARE), 1998.
Save the Children. *State of the World's Mothers 2002*. New York: STC, May 2002.
SMI-USA. *SMI-USA Brochure*. Tampa, FL: Lawton Chiles Center, 2000.
Thaddeus, S., and Maine, D. *Too Far to Walk: Maternal Mortality in Context*. New York: Columbia University, May 1990.
Thompson, J., and Thompson, H. Ethical aspects of care. In Walsh, L. V. *Midwifery: Community-Based Care During the Childbearing Year*. Philadelphia: Saunders, 2001, ch. 29.
U.S. Department of Health and Human Services. *Tracking Healthy People 2010*. Washington, DC: Government Printing Office, November 2000.
Vonderheid, S. C., and Al-Gasseer, N. World Health Organization and global health policy. *J. Nurs. Scholarship* 34(2), 109–110, 2002.
White Ribbon Alliance for Safe Motherhood. *Awareness, Mobilization, and Action for Safe*

Motherhood: A Field Guide. Washington, DC: NGO Networks for Health, 2000.
World Health Assembly. *Strengthening Nursing and Midwifery: WHA 54.12*. Geneva: World Health Organization, May 2001.
World Health Organization. *Constitution of the World Health Organization*. Geneva: WHO, 1948.
World Health Organization. *International Classification of Diseases*, Vol. 9. Geneva: WHO, 1987.
World Health Organization. *The Mother-Baby Package*. Geneva: WHO, 1994.
World Health Organization. *Revised 1990 Estimates of Maternal Mortality: A New Approach by WHO and UNICEF*. Geneva: WHO, April 1996.
World Health Organization. *General Programme of Work 2002–2005*. Geneva: WHO, 2001.
World Health Organization. *Making Pregnancy Safer: A Health Sector Strategy for Reducing Maternal and Perinatal Morbidity and Mortality*. Geneva: WHO, 2001.
World Health Organization. *Midwifery Modules*. Geneva: WHO, 2002.
WHO, UNFPA, UNICEF, and The World Bank. *Reduction of Maternal Mortality: A Joint WHO/UNFPA/UNICEF/World Bank Statement*. Geneva: WHO, 1999.
World Health Organization. Midwives to the World. *World Health: The Magazine of the World Health Organization 50th year*, No. 2, March-April 1997.
Williams, S. *The Oxfam Gender Training Manual*. London: Oxfam UK and Ireland, 1998.

• • • Appendix A

Sources for International Health Low Cost Books

Hesperian Foundation
1919 Addison Street, Suite 304
Berkeley, California 94704
www.hesperian.org

Teaching Aids at Low Cost (TALC)
P.O. Box 49
St. Albans
Herts AL1 5TX, England
www.rgp.man.ac.uk/gp/talc

• • • Appendix B

Helpful Websites

American College of Nurse-Midwives (ACNM): www.midwife.org
Centers for Disease Control and Prevention (CDC): www.cdc.gov
Family Care International (FCI): www.safemotherhood.org
International Federation of Gynecology and Obstetrics (FIGO): www.figo.org
International Confederation of Midwives (ICM): www.internationalmidwives.org
International Planned Parenthood Federation: www.ippf.org
Joint United Nations Programme on HIV/AIDS (UNAIDS): www.unaids.org
Population Council: www.popcouncil.org
Reproline: www.reproline.jhu.edu
Safe Motherhood Initiative–USA: www.smi-usa.org
Save the Children; Saving Newborn Lives: www.savethechildren.org
United Nations Fund for Population Activities (UNFPA): www.unfpa.org
United Nations Children's Fund (UNICEF): www.unicef.org
White Ribbon Alliance: whiteribbonalliance@hotmail.com
World Bank: www.worldbank.org
World Health Organization (WHO): www.who.ch

Videos

Barker, J. *The Business of Paradigms*. Video, 39 min. San Francisco: Discovering the Future Series AV#40037, 1989.
WHO. *Why Did Mrs. "X" Die?* Video, 25 min. Geneva: WHO, 1988.
WHO. *Opening the Gates to Life*. Video. Geneva: WHO, 1994.

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CHAPTER

5

Preconception Care

By the time a woman misses her menses, has a positive home pregnancy test, and schedules a prenatal appointment, organogenesis is nearing completion. The fetal heart is formed and functioning, the spinal canal has closed, eyes are formed, limbs are moving actively, and the genitalia are recognizable. All of this has happened while morning sickness has just begun in full swing. For those with good intentions to change lifestyle issues—from smoking to using alcohol or illicit drugs—and to increase exercise or improve nutrition, it is too late to prevent fetal exposure. Any genetic risks or teratogenic effects of medication or environmental hazards have already been expressed in the fetus.

During the 1980s and 1990s, there was great emphasis on preventing poor pregnancy outcomes with quality prenatal care. To some extent, this has been helpful. Improved management of diabetes in pregnancy, preterm labor, cardiac disease and hypertensive disorders have improved both maternal and neonatal outcomes. Expanded knowledge of human inheritance has led to greater opportunities for genetic counseling, preconception identification of risk factors, and prenatal genetic diagnosis. However, as prenatal care has been critically evaluated, it has become more obvious that the time to prevent complications of pregnancy is often before a woman conceives.

In 1989, the U.S. Public Health Service Expert Panel on the Content of Prenatal Care declared that preconception care "should be standard care" [1], and among the goals outlined in the Public Health Service's 1991 publication *Healthy People 2000* was the provision of age-appropriate preconception care and counseling by a majority of primary care providers [2]. These goals are restated and strengthened in the *Healthy People 2010* guidelines [3]. Emphasis is on prevention of pregnancy in adolescent populations as well as changes in lifestyle prior to conception. Reproductive risks should be considered a part of primary care for all persons (male and female).

As part of its ongoing goals of improving maternal and child health, the Centers for Disease Control and Prevention (CDC) has formed a partnership with other organizations to safeguard the health of mothers. They have established multiple programs to reduce pregnancy complications, to conduct research, and to gather and disseminate information to improve the overall health and health care for mothers. They state, "Safe motherhood begins before conception with proper nutrition and a healthy lifestyle" [4]. Preconception care is care provided prior to pregnancy with the goal of facilitating the efforts of a woman to be healthy before she conceives. Clearly, a healthy pregnant woman has a greater probability of having a healthy baby.

As providers of primary health care for women from puberty through senescence, midwives know that every contact with a woman of childbearing age is a time for preconception care. The dedication of midwives to health promotion, education, and preventive care makes midwives ideal providers of preconception care. Midwives practice in a variety of settings that offer the opportunity—and, indeed, give the responsibility—to midwives to provide preconception care and counseling. Settings include

family planning clinics, occupational health clinics, health fairs and workplace health promotion programs, school-based clinics, homeless shelters, halfway houses, college and university health care services, substance abuse treatment centers, women's shelters, detention centers and prisons, women's health centers, and abortion clinics. Every visit—from family planning, annual Pap smears, or pregnancy tests and sexually transmitted disease screenings, to postpartum or postabortion visits—provides opportunities for counseling. The personal, individualized care that midwives provide creates the perfect environment for preconception care.

A few couples will come to the midwife seeking a preconception health assessment and anticipatory guidance. The majority, however, will present for midwifery care for many purposes, and it is left to the midwife to be proactive in providing relevant information. This chapter covers a wide range of possible topics to be considered for preconception care, more than is reasonable to discuss with every woman at every visit. Therefore, the midwife must use the opportunity for targeting teaching. For example, at an annual visit, a woman's nutritional status and exercise habits may be emphasized and recommendation made to have adequate folic acid intake daily. Another woman may be encouraged to stop smoking for general health benefits and to avoid smoking-related problems in pregnancy. A negative pregnancy test visit is an excellent time to ask if pregnancy was being attempted and to screen for HIV, rubella, or varicella. An STD (sexually transmitted disease) visit gives the opportunity to relate the dangers of STDs to the developing fetus. Individualizing the information shared with each woman will improve the likelihood of her being able to incorporate this into her daily life without taking a lot of time during the clinical visit.

In an ideal world, all pregnancies would be planned and every infant conceived in a healthy environment. But, of the 6 million pregnancies in the United States each year, the majority are unplanned. The CDC's Pregnancy Risk Assessment Monitoring System (PRAMS), states that more than half of all pregnancies are unintended [5]. The exact numbers are not known, however, in 1999, the prevalence of unintended pregnancy for women who continued their pregnancy to a live birth was 32 to 52 percent in the states sampled [5]. It has been found that of all unintended pregnancies, about half are electively terminated [5, 6]. Therefore, the overall rate of unintended pregnancy is quite high.

Many couples are unaware of the risks to which they may be exposing their unborn children. Education is the best tool available to encourage individuals to maximize their health and minimize the risk of unintended fetal exposure. It is important for midwives to be considering this risk at all health care encounters with women of childbearing age. The information must be offered without women (and their partners) specifically seeking it out, as most people do not seek information regarding pregnancy-related issues until they are already pregnant.

The benefits of preconception care are many and varied: It allows identification of medical illness; assessment of psychological, financial, and life goal readiness; and discussion of workplace and environmental hazards. In addition, a woman's or a couple's genetic makeup and habits that might negatively affect the fetus can be evaluated and possibly corrected before conception. In some women the risk can be eliminated; in others, risk can be assessed and appropriate measures can be taken to minimize its impact on the future developing fetus. On occasion, the result of preconception care may be a decision not to have children—for example, if a woman discovers she or her partner has a devastating genetic pedigree. For the majority of women and their partners, preconception care will help to identify ways to make positive changes in their lifestyle to improve their overall health as well as the potential to have a healthy baby. Preconception care provides the woman and the couple with information to make informed decisions about their childbearing.

The risk factors for potential obstetric complications are quite varied, and they are present in a large percentage of women. Figure 5-1 shows the results of a preconception survey that was performed at the time of a negative pregnancy test when women were screened for preconception risk factors. This survey demonstrates the scope of issues that may be considered at any visit with a woman of childbearing age [7]. Other research has demonstrated that when women were educated about the need for preconception alterations in their lifestyle, they were more likely to make those changes when they anticipated pregnancy [8].

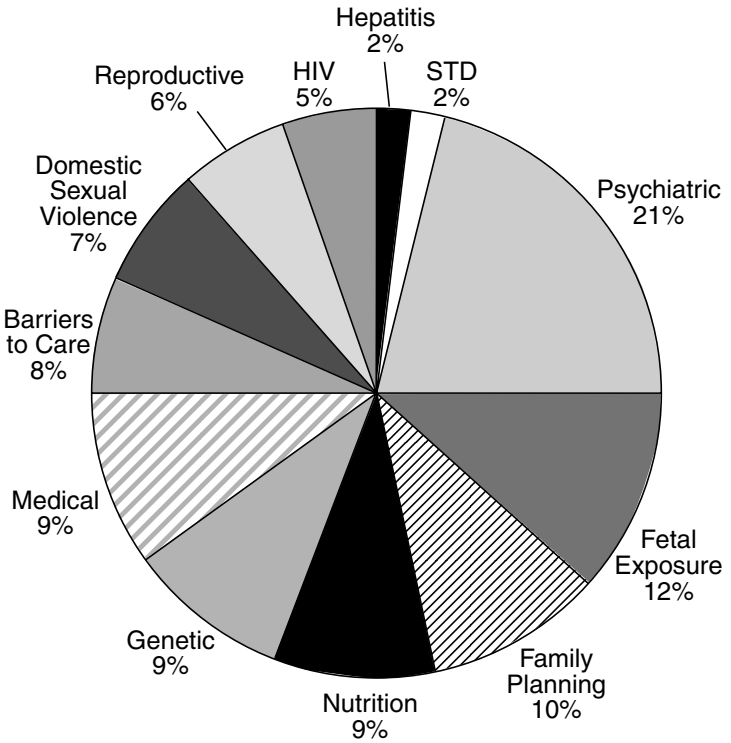

FIGURE 5-1 Preconception risk factors as a percentage of total risks at the time of a negative pregnancy test.

Source: Reprinted with permission from Jack, B. W., Culpepper, L., Babcock, J., Kogan, M. D., and Weismiller, D. Addressing preconception risks identified at the time of a negative pregnancy test: A randomized trial. *J. Fam. Pract.* 1998;47(1):33–38, Dowden Health Media.

Health and Risk Assessment

If a woman and her partner present requesting a comprehensive preconception assessment, the following database should be collected. As previously stated, for most women, the midwife will identify specific components of preconception care as a plan of management is individualized.

Baseline Data

The baseline history, physical and pelvic examination, laboratory tests, and adjunctive studies for a comprehensive health assessment were outlined in Chapter 2. One suggestion for a history form is to use a prenatal history and physical form as this covers the areas of specific importance to pregnancy. The following information pertinent to preconception care can be drawn from this database:

1. Need for treatment of any medical illness
2. Need for treatment of any mental illness
3. Need for counseling/treatment for sexually transmitted diseases
4. Need for HIV testing/counseling
5. Need for discussion of treatment programs for substance abuse:
   - **a.** tobacco
   - **b.** alcohol
   - **c.** prescription medications
   - **d.** illicit drugs
6. Need for self-evaluation of lifestyle, coping skills, and stress reduction
7. Need for psychological, social, or economic support in the presence of
   - **a.** depression or other mental health issues
   - **b.** domestic abuse
   - **c.** homelessness
   - **d.** lack of resources for basic needs

8. Need for nutritional counseling in the presence of
   a. underweight/malnutrition
   b. obesity
   c. inadequate dietary intake of any major food/nutritional source
   d. bulimia
   e. anorexia
   f. hypervitaminosis
9. Need for fitness and exercise counseling/training
10. Need for immunizations/vaccinations
11. Need for genetic screening based on race, ethnicity, or family history
12. Need for a family planning method that is in accord with the woman's or the couple's childbearing plans

Additional Data to Be Obtained

1. Need for vitamin/mineral supplements
2. History of pica
3. Need for specific genetic screening/counseling regarding the following:
   a. sickle cell anemia (African Americans, those of Mediterranean descent)
   b. Tay-Sachs disease (Ashkenazi Jews from Central or Eastern Europe)
   c. thalassemia (Greeks, Italians, Southeast Asians, Filipinos)
   d. familial patterns (fetal/neonatal loss, disease, or abnormality)
   e. hemophilia
   f. Duchenne muscular dystrophy
   g. G6PD (those of Mediterranean descent)
   h. cystic fibrosis
   i. fragile X
4. Exposure to household lead (lead poisoning)
5. Occupational and environmental hazards (teratogens)
6. Involvement of the father-to-be, other family support
7. Readiness for childbearing: psychological, financial, life goals (career, education)
8. Need for dental care
9. Need for mammography (for women over age 40 or who have a family history indicating need for early mammography)
10. Need for special preparation in the presence of specific chronic illness
11. Need for referral for further health assessment, social work assistance, mental health assessment/therapy

Counseling Specific to Preconception Care

The counseling addressed in this section is in addition to any counseling the midwife might provide during or as a result of the comprehensive health assessment. As a midwife you need to remember that you may be providing preconception counseling to single women or lesbian couples as well as to married women or heterosexual partners. Single women and lesbian couples may require further counseling specific to their unique issues (see Chapter 11).

Preconception counseling begins with discussion of the woman's or the couple's psychological readiness to bear and raise children. This discussion includes topics such as whether there is room in the relationship for children, rationale for childbearing, stability of the woman and/or the couple emotionally and financially, and expectations of the experience of childbearing and parenting. Previous assessment of existing or potential physical, sexual, or emotional abuse in the relationship should be reevaluated, as such abuse often begins or escalates with pregnancy [5, 9].

The timing of childbearing as it relates to the woman's or the couple's efforts to complete an education or begin a career, as well as the separate and combined stresses of these activities, should be explored. With adolescents, a discussion of completing high school and their plans for college or vocational training, along with provision of a reliable birth control method, may provide an alternative to early childbearing.

When to Stop Contraceptive Methods

Talk of planning a family should include a discussion of timing a pregnancy in relation to discontinuing a family planning method and how this is done, as it varies from method to method (see Chapters 16 through 20). The importance of keeping track of menstrual periods should be emphasized, as it is critical for dating a pregnancy. Encouraging a woman to keep a menstrual calendar is a good practice. Birth spacing should be discussed, and the importance of early and continuing prenatal care should be mentioned at every opportunity.

Common questions include how long it is necessary to be "off the pill" before attempting to conceive. It is generally recommended that a woman not get pregnant during the first month after stopping oral contraceptives. After she has had one

menstrual cycle, she has most likely resumed spontaneous ovulation. It is important to emphasize that this recommendation is related to optimizing dating of a pregnancy; there is not a concern about teratogenic effects of oral contraceptives.

If a woman has been using long-term hormonal methods such as injections or implants, she should be advised that it may take several months before regular ovulation occurs. She and her partner should be encouraged to prevent conception with a barrier method until she has regular menses in order to date the pregnancy accurately. Again, no harmful effects to the fetus would be anticipated if conception occurred soon after cessation of these methods.

For women who have irregular menses, predicting ovulation timing and therefore dating of a pregnancy may be difficult. For these women, basal body temperature charting or ovulation predictor kits may be useful. They may also benefit from evaluation by a fertility specialist if pregnancy does not occur within 12 months of unprotected intercourse.

Nutrition

Maintaining good nutritional status before becoming pregnant is an essential preconception care topic. Achieving ideal body weight, controlling eating disorders and pica, and developing nutritionally balanced dietary habits are all important preparation for growing a healthy baby and the prevention of low birth weight. Identification of nutritional concerns may lead to education by the midwife regarding minor dietary changes. Referral to a nutritionist may be necessary for women dealing with major nutritional deficits or obesity. For women who may be dealing with an eating disorder, psychologic evaluation is advisable, and the woman should be encouraged to delay pregnancy until she is in care and consuming a healthy diet.

Special consideration should be given to the recommendation from the Centers for Disease Control and Prevention (CDC) in 1992 that all women of childbearing age take folic acid supplements to ensure a consumption of at least 0.4 mg a day in order to reduce the risk of having a baby with spina bifida or other neural tube defects [10, 11]. Most over-the-counter multivitamins have 0.4 mg of folic acid in them, so there is no need for expensive vitamin supplements; generic preparations are sufficient. Prescriptive prenatal vitamins are usually formulated with 1.0 g of folic acid. Some women like the idea of using a prenatal supplement during the preconception period, which is well accepted. Because ingesting a consistently adequate quantity from food sources is difficult, supplementation is required. If a woman is highly motivated to consume the folic acid from more natural sources, she may be encouraged to do so. Dietary sources of folic acid are identified in Chapter 6, p. 112.

For those women who have previously had an infant with a neural tube defect, the recommended dosage of folic acid is 4.0 grams daily for at least 1 month prior to conception and through 12 weeks of pregnancy. The CDC cautions against a total folate consumption of more than 1 mg per day for women who do not have this specific increased requirement [10]. The midwife should assess any other vitamin pills or multivitamin pills the woman takes to determine folic acid content and to ascertain hypervitaminosis.

Genetic Screening

The baseline history should have revealed any specific need for genetic screening/counseling based on race, ethnicity, and family history. In all genetic counseling the key is to determine the chance that any one baby born to a particular woman and a particular man will have a genetic disease. Therefore it is essential to involve the father-to-be. If a specific risk factor is identified, or if the future parents have serious concerns, referral to a genetic counselor is recommended.

Dental Care

The woman should be advised to take care of any needed dental work that requires radiation exposure, sedation, anesthesia, or gum surgery prior to pregnancy. Research has demonstrated an increase in preterm labor and birth when women have significant periodontal disease [12]. The increased blood volume during pregnancy and resulting hyperemia in the gums will cause excessive bleeding if gum surgery is required when she is pregnant. If a woman plans to breastfeed, the elapsed time from conception to weaning will likely extend well beyond a year. Therefore, dental work other than routine preventive care is best done prior to pregnancy.

Medical Risk Factors

Medications

For women with epilepsy, chronic hypertension, psychoses, malaria, and other diseases treated with drugs that are teratogenic to the fetus, the midwife's pre-

TABLE 5-1	FDA Labeling Criteria for Drugs During Pregnancy

A Controlled studies in women fail to demonstrate a risk to the fetus in the first trimester, and the possibility of fetal harm appears remote.

B Animal studies do not indicate a risk to the fetus; there are no controlled human studies, or animal studies do show an adverse effect on the fetus, but well-controlled studies in pregnant women have failed to demonstrate a risk to the fetus.

C Studies have shown the drug to have animal teratogenic or embryocidal effects, but no controlled studies are available in women, or no studies are available in either animals or women.

D Positive evidence of human fetal risk exists, but benefits in certain situations (e.g., life-threatening situations or serious diseases for which safer drugs cannot be used or are ineffective) may make use of the drug acceptable despite its risks.

X Studies in animals or humans have demonstrated fetal abnormalities, or evidence demonstrates fetal risk based on human experience, or both, and the risk clearly outweighs any possible benefit.

conception care should include collaboration with the physician who is treating the disease regarding the risk to the fetus and whether other nonteratogenic drugs exist for treatment [13]. In addition, the possible teratogenic effect of any medications taken during pregnancy is always a concern [14]. Both prescription and over-the-counter medications a woman may be taking should be evaluated for potential teratogenic effects, and the continuing need for the medication should be assessed. It is very important that women do not just stop taking medication because they are pregnant as this may negatively effect their medical or mental health [15]. Many medications are safe during pregnancy. For others, the risk/benefit ratio of medication use and pregnancy should be discussed prior to conception whenever possible. Therefore, a plan must be in place for use of any specific medication in the preconception period and during the early stages of organogenesis [16]. The Food and Drug Administration (FDA) has identified five labeling categories for use in pregnancy (Table 5-1) that assist in determining the risk of harm from specific medications. Table 5-2 identifies medications that are known teratogens that should be avoided during pregnancy.

Diabetes

When blood glucose levels are consistently elevated at the time of conception and early organogenesis, there is a significantly increased risk for development of major congenital anomalies. Therefore, women with Type I or Type II diabetes mellitus are prime candidates for preconception counseling [17, 18]. Their plan of care should focus on achieving and maintaining good control of their glucose levels in order to reduce the incidence of congenital malformations and low birth weight babies. If the woman is currently diet controlled or using an oral hypoglycemic agent, she should anticipate using insulin during pregnancy [18]. The woman with diabetes should have her preconception visit with a high-risk obstetrician or endocrinologist who will manage the diabetes during her pregnancy.

In addition to stabilizing blood sugar levels, the preconception period is an optimal time to have a full health assessment in order to identify any high-risk factors that may be related to diabetes. This usually includes physical assessment for diabetic retinopathy, nephropathy, coronary artery disease, and hypertension [18].

Women with a history of gestational diabetes should be informed that they are at increased risk for abnormal carbohydrate metabolism during future pregnancies. Adherence to a balanced diet and a moderate plan of exercise prior to and throughout the pregnancy may minimize the risk of gestational diabetes or at least decrease the complications [18].

Cardiac Disease

The woman with known or suspected cardiac disease should be strongly counseled to plan the timing of pregnancy with a cardiologist and obstetrician. Cardiac disease may represent a minimal risk such as with mitral valve prolapse, or may be a life-threatening risk, such as that caused by pulmonary hypertension. During the preconception period, the woman's cardiac status must be assessed and she and her family appraised of the implications that pregnancy may carry. Risk is based on three main factors: (1) the cardiac lesion, (2) the baseline functional compromise, and (3) the possibility of complications during pregnancy [19]. For a few cardiac lesions, the risk of maternal mortality is so high that termination of the pregnancy would be recommended for the mother's sake. Pulmonary hypertension, dilated cardiomyopathy, Marfan's syndrome, and any uncorrectable cardiac lesion in functional classes III or IV refractory to medical management are examples of cardiac diseases that have a serious risk of maternal mortality during pregnancy. Certainly, advance planning to avoid pregnancy would be preferable to facing the dilemma of risking both the mother's and the baby's life.

For many women with cardiac disease, the possibility of multiple office and hospital visits as well

TABLE 5-2 Medications That Have Moderate to High Teratogenicity

Drug (Class)	Generic (Trade) Names	FDA Pregnancy Category	Trimester When Most Teratogenic	Fetal/Infant Effects
Androgen	Danazol (Danocrine)	X	2nd, 3rd	Virilization of females and ambiguous genitalia
Angiotensin-converting enzyme (ACE) inhibitors	Captopril (Capoten) Enalapril (Vasotec)	C	All	Fetal hypotension syndrome, fetal kidney hypoperfusion, anuria, oligohydramnios, pulmonary hypoplasia
Angiotensin II receptor blockers	Candesartan Cilexetil (Atacand) Irbesartan (Avapro)	D	2nd, 3rd	Fetal and neonatal hypotension, skull hypoplasia, anuria, renal failure and death
Antibiotics	Aminoglycosides: Spectinomycin Gentamicin Streptomycin	D	All	8th nerve toxicity, discoloration of teeth, altered bone growth
	Tetracycline	D		Bone and teeth staining
Anticoagulants	Warfarin (Coumadin)	X	All	Hypoplastic nasal bridge (1st trimester) CNS malformations (2nd trimester) Risk of bleeding (3rd trimester)
Anticonvulsant	Carbamazepine	C	1st	Neural tube defects
	Phenytoin	D		Hydantoin syndrome
	Trimethadione	D		
	Valproic acid	D		
Anti-infective	Iodine	D	All	Congenital goiter, transient hypothyroidism
Antineoplastic	Aminopterin	X	1st	Multiple unspecified malformations and low birth weight
	Busulfan	D	1st	
	Cyclophosphamide	D	1st	
	Cytarabine	D	1st	
	Methotrexate	D	All	
	Tamoxifen	D	All	
Antituberculosis therapy	Isoniazid	C	All	Shown to have an embryocidal effect in rats and rabbits when given in pregnancy; no well-controlled studies in pregnant women
	Rifamycin	C	All	CNS abnormalities with chronic use
Antiviral (HIV)	Efavirenz (Sustiva)	C	All	Teratogenic in primate lab animals; no well-controlled human data
Benzodiazepine	Lorazepam (Ativan)	D	3rd	Neonatal dependence with chronic use
	Clonazepam (Klonopin)	C		
	Chlordiazepoxide (Librium)	D		
	Oxazepam (Serax)	D		
	Diazepam (Valium)	D		
Chelating agent	Penicillamine	D	1st	Cutis laxa, other congenital anomalies
Dermatologic preparation	Minoxidil	C	2nd, 3rd	Newborn hirsutism
Hallucinogen	Phencyclidine	X	All	Abnormal neurologic exam, including poor suck reflex and poor feeding
Hypoglycemic agents	Chlorpropamide	C	All	Prolonged neonatal hypoglycemia

TABLE 5-2 Medications That Have Moderate to High Teratogenicity (*continued*)

Drug (Class)	Generic (Trade) Names	FDA Pregnancy Category	Trimester When Most Teratogenic	Fetal/Infant Effects
Prostaglandin analog	Misoprostol (Cytotec)	X	All	Embryocidal in early pregnancy; may cause preterm labor and birth
Retinoid, systemic	Isotretinoin (Accutane)	X	All	CNS, cardioaortic, ear, and clefting defects; microtia, anotia, thymic aplasia, brachial arch and aortic arch abnormalities; certain congenital heart malformations
Retinoid, topical	Tretinoin (Retin-A)	C	All	Very unlikely to attain therapeutic topical exposure to retinoids
Sedative	Thalidomide	X	1st, 2nd	Phocomelia, limb reduction
Thyroid drugs	Propylthiouracil	D	All	Goiter
	Methimazole	D	All	Aplastic cutis

Source: Adapted from Reynolds, H. D. Preconception care: an integral part of primary care for women. *J. Nurse-Midwifery* 43(6):452.

as close medical scrutiny should be anticipated. Therefore, advance planning for workplace issues, health insurance, child care for other children as well as for medical care will help to optimize the outcome of pregnancy for both mother and infant.

Genetic issues may also come into play for women with cardiac disease as some disorders may be the result of inherited heart disease [16]. Therefore, genetic counseling may be indicated as part of the preconception assessment.

Seizure Disorder

The preconception care of a woman with a seizure disorder includes detailed history taking regarding her frequency of seizures and the medications being used. This is another area where physician consultation is required to assess the woman's risk for pregnancy complications and to evaluate medical therapy. The most commonly used medications for control of seizures are teratogenic to the fetus. If she has not had seizures in several years, there may be an opportunity to decrease the overall dose of medications, at least for the early pregnancy period. Whenever possible, the use of a single medical therapy is advocated [20]. If seizures are frequent or not well controlled, however, there should be strong emphasis on seizure control prior to pregnancy as this may worsen during gestation. This is also a diagnosis that requires detailed counseling of the parents-to-be regarding risks to mother and infant. In addition to evaluation of the seizure disorder, it is recommended that women with neurologic disorders such as epilepsy increase their dose of folic acid to 1 mg daily [11].

Hypertension

Most women with chronic hypertension can anticipate the birth of a normal, health baby. The primary goals in the preconception period are avoiding use of ACE inhibitors and angiotensin II receptor antagonists (see Table 5-2). Women should also be educated about their risk for preeclampsia and fetal growth restriction.

Thyroid disorders

Because hyperthyroidism is known to be associated with congenital malformations, adequate treatment must be undertaken prior to conception. Similarly, hypothyroidism is associated with dwarfism and other anomalies. For both hypothyroidism and hyperthyroidism, the goal is for the woman to be euthyroid prior to pregnancy. Medical consultation and follow-up is indicated in order to establish a plan for assessment of thyroid levels and potential medications during pregnancy. If a woman is taking propylthiouracil or methimazole prior to pregnancy, medication changes are recommended as both drugs are rated as Category D (see Table 5-2). For most women with thyroid disorders, midwifery care is quite appropriate with consultation.

Infectious Diseases

The preconception period is an ideal time to assess women for infectious diseases (see Chapters 8, 15

and 24). For rubella and varicella, a nonimmune lab result can easily be handled with vaccine prior to pregnancy, thereby eliminating any risk during pregnancy (and thoughout life). Toxoplasmosis and cytomegalovirus can be screened for. In this case, a positive titer, indicating previous exposure, allows for reassurance of minimal risk, and a negative titer gives the opportunity to give appropriate warnings. Hepatitis B vaccine can be offered. HIV screening and other STD testing can also be completed. If a woman becomes pregnant within 3 months following this testing, there may not be a need to repeat the STD screens at the first prenatal visit.

For women with a history of genital herpes, counseling can be done regarding the approach to this infection during pregnancy. Women at risk for tuberculosis may be screened with PPD. If they have previously had a positive PPD, or BCG vaccine, a chest x-ray can be done if indicated.

Phenylketonuria

For a woman with phenylketonuria (PKU), the best chance of protecting her child from the effects of her disease (over 90 percent of such children exhibit mental retardation and over 70 percent exhibit microcephaly) lies in going back on dietary therapy before conception and continuing on the diet throughout pregnancy [21]. Many of these women have abandoned or are not in strict compliance with their dietary plan. Nutritional assistance as well as a comprehensive medical evaluation is advisable.

Previous Obstetric Complications

A woman who has been pregnant before may have concerns about the potential for recurrence of complications associated with a previous pregnancy. The best predictor for preterm birth is a previous preterm birth. Other risk factors that may repeat in subsequent pregnancies include gestational diabetes, hypertensive disorders, placenta previa, dysfunctional labor, and low birth weight. Complications such as an incompetent cervix, large uterine fibroids, or a previous eclampsia may indicate a need to plan for appropriate intervention in another pregnancy to help ensure the best outcome.

In addition to medical/obstetric risk factors, women may have concerns from previous birth experiences regarding vaginal versus cesarean birth, use of analgesia, positions for giving birth, support of care providers, and many other issues regarding the birthing process. It is important to question the woman and help her determine if there are ways to increase her satisfaction with the birth process. Conversely, she may have had an excellent experience and want assistance in ensuring a similarly positive outcome in future pregnancies.

Advanced Maternal Age

A woman who has delayed childbearing or who is having additional children after age 35 may have age-related concerns. The preconception period is the best time to answer questions and address concerns. The issues after age 35 certainly include an increased risk of genetic disorders [22]. In addition, as women age, their risk for gestational diabetes, hypertension, and other chronic diseases increases. Therefore, genetic counseling and a comprehensive medical assessment are important.

For the woman planning her first pregnancy after the age of 35, infertility may be a greater concern. Major changes in an established lifestyle also occur for couples of advanced age, a topic that may need to be addressed by the midwife.

Environmental and Workplace Issues

Exposure to teratogens at home, in the environment, and in the workplace is a major concern. Lead poisoning from lead paint in the home should be investigated. The woman may be exposed to a myriad of chemicals, temperature extremes, heavy metals, radiation, infectious agents, and stress factors in the home or workplace that may negatively affect a developing fetus and cause congenital anomalies. Preconception care includes counseling a woman to identify such risks and ascertain their teratogenic potential prior to pregnancy.

The presence of lead in the home can be the cause of lower IQs in children. This is a preventable public health concern [23]. Table 5-3 lists screening questions to assess the risk of lead-based products in the home environment.

The workplace may be the route of exposure to harmful chemicals, irradiation, or biologic risks such as viruses [24]. These may directly effect the worker, and they can be transmitted to other members of their family. For instance, lead in the workplace may be carried on one's clothing, skin, or hair and cause lead toxicity to a sexual partner or children. Exposure to viral illnesses may result in transmission to family members. Tables 5-4 and 5-5 summarize the lists of potential workplace exposures that have been published by the CDC.

TABLE 5-3 Assessing the Risk of High-Dose Exposure to Lead

Do you—

Live in or regularly visit a house with peeling or chipping paint built before 1960?
Live in or regularly visit a house built before 1960 with recent, ongoing, or planned renovation or remodeling?
Have a child being followed or treated for lead poisoning (that is, blood lead ≥15 μg/dL)?
Have a job or hobby that involves exposure to lead?
Live near an active lead smelter, battery recycling plant, or other industry likely to release lead?

Source: From Summers, L., and Price, R. A. Preconception care: an opportunity to maximize health in pregnancy. *J. Nurse-Midwifery* 38(4):196, 1993. Reprinted by permission.

TABLE 5-4 Chemical and Physical Agents That Are Reproductive Hazards for Women in the Workplace

Agent	Observed Effects	Potentially Exposed Workers
Cancer treatment drugs (e.g., methotrexate)	Infertility, miscarriage, birth defects, low birth weight	Health care workers, pharmacists
Certain ethylene glycol ethers such as 2-ethoxyethanol (2EE) and 2-methoxyethanol (2ME)	Miscarriages	Electronic and semiconductor workers
Carbon disulfide (CS2)	Menstrual cycle changes	Vicose rayon workers
Lead	Infertility, miscarriages, low birth weight, developmental disorders	Battery makers, solderers, welders, radiator repairers, bridge painters, firing range workers, home remodelers
Ionizing radiation (e.g., x-rays and gamma rays)	Infertility, miscarriages, birth defects, low birth weight, developmental disorders, childhood cancers	Health care workers, dental personnel, atomic workers
Strenuous physical labor (e.g., prolonged standing or heavy lifting)	Late pregnancy miscarriage, premature delivery	Many types of workers

Source: From Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health. *The Effects of Workplace Hazards on Female Reproductive Health*. Pub. No. 90-104. February 1999.

TABLE 5-5 Disease-Causing Agents That Are Reproductive Hazards for Women in the Workplace

Agent	Observed Effects	Potentially Exposed Workers	Preventive Measures
Cytomegalovirus (CMV)	Birth defects, low birth weight, developmental disorders	Health care workers, workers in contact with infants and children	Good hygienic practices such as hand washing
Hepatitis B virus	Low birth weight	Health care workers	Vaccination
Human immunodeficiency virus (HIV)	Low birth weight, childhood cancers	Health care workers	Practice universal precautions
Human parvovirus (B19)	Miscarriage	Health care workers, workers in contact with infants, children	Good hygienic practices such as hand washing
Rubella (German measles)	Birth defects, low birth weight	Health care workers, workers in contact with infants, children	Vaccination before pregnancy if no prior immunity
Toxoplasmosis	Miscarriage, birth defects, developmental disorders	Animal care workers, veterinarians	Good hygienic practices such as hand washing
Varicella-zoster virus (chicken pox)	Birth defects, low birth weight	Health care workers, workers in contact with infants, children	Vaccination before pregnancy if no prior immunity

Source: From Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health. *The Effects of Workplace Hazards on Female Reproductive Health*. Pub. No. 90-104. February 1999.

TABLE 5-6 Male Reproductive Hazards in the Workplace*

Type of Exposure	Observed Effects: Lowered Number of Sperm	Abnormal Sperm Shape	Altered Sperm Transfer	Altered Hormones/Sexual Performance
Lead	X	X	X	X
Dibromochloropropane	X			
Carbaryl (Sevin)		X		
Toluenediamine and dinitrotoluene	X			
Ethylene dibromide	X	X	X	
Plastic production (styrene and acetone)		X		
Ethylene glycol monoethyl ether	X			
Welding		X	X	
Perchloroethylene			X	
Mercury vapor				X
Heat	X		X	
Military radar	X			
Kepone†			X	
Bromine vapor†	X	X	X	
Radiation† (Chernobyl)	X	X	X	X
Carbon disulfide				X
2,4-Dichlorophenoxy acetic acid (2,4-D)		X	X	

* Studies to date show that some men experience the health effects listed here from workplace exposures. However, these effects may not occur in every worker. The amount of time a worker is exposed, the amount of hazard to which he is exposed, and other personal factors may all determine whether an individual is affected.

† Workers were exposed to high levels as a result of a workplace accident.

Source: From Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health. *The Effects of Workplace Hazards on Male Reproductive Health*. Pub. No. 96-132. January 1997.

Preconception Issues for Men

Data regarding male influences on the health of their infants are still limited. The most current information regards the role of genetics. For any man with a personal or family history of a genetic disorder, there may be an increased risk of transmission to a child. Genetic counseling prior to pregnancy can allow a man and his partner to be aware of the risk for him individually and the two of them as a couple to have a child with a chromosomal abnormality.

There is also information that links alcoholism and cigarette smoking of fathers with low birth weight infants [25, 26]. Older men have an increased risk of children with Down syndrome and other age-related chromosomal anomalies. Both sperm production and motility can be decreased by smoking, use of alcohol, illicit drugs, and some pharmaceuticals, thereby diminishing fertility [26].

In addition to lifestyle issues and genetic risk factors, some chronic diseases—most frequently diabetes, hypertension, and autoimmune disorders—may affect a man's fertility. Other medical factors such as previous trauma, sexually transmitted diseases, chemotherapy, or radiation therapy may also affect fertility. A thorough physical assessment is recommended for a man with any concerns. The issue of reproductive risks should be specifically raised with his primary care physician.

Workplace or environmental exposure may be of concern to some men [27]. Table 5-6 summarizes the possible risks and suggestions for dealing with them. Psychosocial issues are also important but often overlooked for men. Any history of depressive symptoms, anxiety, or other mental health issues should also be considered when planning for a family. Men often bear responsibility for financial stability in families and find this to be quite stressful when anticipating the birth of a child. An opportunity for open discussion of this and relationship changes and demands during pregnancy may reveal a need for assistance prior to conception.

For men, the preconception period is an ideal time for routine screening for HIV and other STDs as well as screening for sickle cell trait/disease or other known inheritable diseases. Identification of

medical and genetic risk factors as well as unhealthy habits are important and obvious applications of preconception care.

Other Considerations

The preconception period is also an ideal time for women/couples to consider their access to and availability of health care. This pertains to a range of issues such as selecting a health care provider—do they wish to see a midwife, general OB/GYN, family practice physician, or a maternal-fetal medicine specialist? It is a time to encourage evaluation of risk factors (or lack of), personal philosophy of birth, desire for personal involvement and decision-making as well as an understanding of the differences between potential providers [28].

The choice of birth place is important, and often not considered until pregnancy is established. However, this factor as well as the payment for the provider may be controlled by the insurance carrier. If couples investigate these options preconceptually, they may be able to make the arrangements for the birth provider and environment they need and prefer.

Recognition of the scope of practice and advantages of midwifery care is often still a well-kept secret from the public. Preconception classes can be a good opportunity to provide information to couples who seek it as well as to gain exposure as a knowledgeable health care provider. Table 5-7 outlines a class based on the Public Health Service Consensus Panel [1]. This class can be presented in a two- to three-hour format with time allowed for questions and discussion. This is an excellent opportunity to market your practice in particular and midwifery in general.

Intervention

Intervention includes providing the means to meet the needs identified during the health and risk assessment and providing counseling specific to preconception care. During the course of this assessment and counseling, the potential for education of the woman and couple is immense. Information about

TABLE 5-7 Expecting the Best: A Preconception Class

1. Assessing psychological readiness
   - a. the choice to bear children
   - b. alternatives to pregnancy
   - c. the timing of pregnancy
   - d. assessing and coping with psychosocial risks
2. Assessing physical readiness
   - a. achieving/maintaining ideal weight
   - b. initiating/continuing regular exercise
   - c. evaluation of medical problems
   - d. routine screening for all women
     - (1) hemoglobin or hematocrit
     - (2) Rh factor
     - (3) rubella titer
     - (4) urine dipstick for protein and sugar
     - (5) Pap smear
     - (6) gonococcal culture
     - (7) syphilis
     - (8) hepatitis B
     - (9) HIV (offer)
     - (10) illicit drug screen (offer)
   - e. additional screening for some women
     - (1) tuberculosis skin test
     - (2) chlamydia culture or rapid screen
     - (3) toxoplasmosis
     - (4) CMV
     - (5) herpes simplex
     - (6) varicella
     - (7) hemoglobinopathies
     - (8) Tay-Sachs
     - (9) parental karyotype
     - (10) mammography
   - f. dental exam
3. Examination/concerns of the father
4. Creating a positive environment for conception
   - a. nutrition
   - b. substance avoidance
     - (1) cigarettes
     - (2) alcohol
     - (3) caffeine
     - (4) drugs: over-the-counter, recreational, prescribed
   - c. environmental pollutants, occupational hazards
5. Discontinuing family planning methods and timing conception
   - a. menstrual history, menstrual charting, and maximizing fertility
   - b. discontinuing oral contraceptive pills and spermicides
   - c. safer sex
   - d. infertility
6. Special concerns
   - a. genetic counseling
   - b. prenatal diagnosis
   - c. DES exposure
   - d. chronic medical problems
7. Choosing a care provider and birth place
8. Before preconception clinic visit
   - a. medical history form
   - b. nutritional history form (7-day diet recall)
   - c. stress evaluation scale
   - d. lab tests

Source: From Summers, L., and Price, R. A. Preconception care: an opportunity to maximize health in pregnancy. *J. Nurse-Midwifery* 38(4):198, 1993. Reprinted by permission.

the woman's body and how to care for it for best health and the correction of misconceptions are basic components of preconception care education. The midwife can also provide the woman or couple with recommendations for positive health behaviors and suggest lifestyle changes if indicated. The midwife needs to be knowledgeable about and have established contacts with a variety of treatment and counseling resources (primary care providers, mental health centers, genetic counseling centers, drug treatment centers, smoking cessation programs, outreach programs, support groups, fitness and exercise centers, nutritional counseling services, women's shelters, to name a few) and be ready to make the necessary referrals. The provision of preconception care is a natural bridge between the well-woman gynecologic care encompassed in the primary care of women and midwifery care during pregnancy. Information about the course of pregnancy from the preconception preparations the couple makes to birth represents the ultimate in "early childbearing education."

References

1. Public Health Service Expert Panel on the Content of Prenatal Care. *Caring for Our Future: The Content of Prenatal Care*. Washington, DC: U.S. Public Health Service, 1989, p. 25.
2. *Healthy People 2000: National Health Promotion and Disease Prevention Objectives*. Washington, DC: U.S. Public Health Service, 1991.
3. *Healthy People 2010: National Health Promotion and Disease Prevention Objectives*. Washington, DC: U.S. Public Health Service, 1999.
4. Centers for Disease Control and Prevention/ National Center for Chronic Disease Prevention and Health Promotion. *Safe Motherhood: Promoting Health for Women Before, During, and After Pregnancy*, 2002.
5. Beck, L. F., Morrow, B., and Lipscomb, L. E. Prevalence of selected maternal behaviors and experiences, Pregnancy Risk Assessment Monitoring System (PRAMS), 1999. *MMWR* 51(SS02):1–26 (April 26) 2002.
6. Klima, C. S. Unintended pregnancy: consequences and solutions for a worldwide problem. *J. Nurse-Midwifery* 43(6):483–491 (November/ December) 1998.
7. Jack, B. W., Culpepper, L., Babcock, J., et al. Addressing preconception risks identified at the time of a negative pregnancy test: a randomized trial. *J. Fam. Pract*. 47(1):33–38 (July) 1998.
8. Hellerstedt, W. L., Pirie, P. L., Lando, H. A., et al. Differences in preconceptional and prenatal behaviors in women with intended and unintended pregnancies. *Am. J. Public Health* 88(4):663–666 (April) 1998.
9. Martin, S. L., Mackie, L., Kupper, L. L., et al. Physical abuse of women before, during and after pregnancy. *JAMA* 285(12):1581–1584 (March 28) 2001.
10. Centers for Disease Control and Prevention. Recommendations for the use of folic acid to reduce the number of cases of spina bifida and other neural tube defects. *MMWR* 41 (RR-14):1–5, 1992.
11. Iqbal, M. M. Prevention of neural tube defects by periconceptual use of folic acid. *Pediatr. Rev*. 21:58–66, 2000.
12. Jeffcoat, M. K., Geurs, N. C., Reddy, M. S., et al. Periodontal infection and preterm birth: results of a prospective study. *J. Am. Dent. Assoc*. 132(7):875–880 (July) 2000.
13. Reynolds, H. D. Preconception care: an integral part of primary care for women. *J. Nurse-Midwifery* 43(6):445–453 (November/December) 1998.
14. Brent, R. L. Addressing environmentally caused human birth defects. *Pediatr. Rev*. 22(5):153–165 (May) 2001.
15. Einarson, A., Selby, P., and Koren, G. Discontinuing antidepressants and benzodiazepines upon becoming pregnant: beware of the risks of abrupt discontinuation. *Can. Fam. Physician* 47:489–490 (March) 2001.
16. Brundage, S. C. Preconceptional health care. *Am. Fam. Physician* 65(12):2507–2514 (June 15) 2002.
17. Cefalo, Robert C. Preconception care and the risk of congenital anomalies in the offspring of women with diabetes mellitus: a meta-analysis. *Obstet. Gynecol. Survey* 57(2):71–72 (February) 2002.
18. American Diabetes Association. Preconception care of women with diabetes. *Diabetes Care* 25(S1):S82–S84 (January) 2002.
19. Gei, A. F., and Hankins, G. D. Cardiac disease and pregnancy. *Obstet. Gynecol. Clin. North Am*. 28(3):465–512 (September 1) 2001.
20. American College of Obstetricians and Gynecologists. Seizure disorders in pregnancy. *ACOG Educational Bulletin* No. 231. (December) 1996.

21. Jack, B. W., and Culpepper, L. Preconception care. *J. Fam. Pract.* 32(3):309, 1991.

22. Anderson, A. M. M., Wohlfahrt, J., Christens, P., et al. Maternal age and fetal loss: population-based register linkage study. *BMJ* 320:1708–1712, 2000.

23. Summers, L., and Price, R. A. Preconception care: an opportunity to maximize health in pregnancy. *J. Nurse-Midwifery* 38(4):188–198 (July/August) 1993.

24. Centers for Disease Control and Prevention/ National Institute for Occupational Safety and Health. *The Effects of Workplace Hazards on Female Reproductive Health*. Pub. No. 99-104. February 1999.

25. Frey, Keith A. Preconception care by the nonobstetrical provider. *Mayo Clin. Proc.* 77(5):469–473 (May) 2002.

26. Haug, K., Irgens, L. M., Skaerven, R., et al. Maternal smoking and birthweight: effect modification of period, maternal age, and paternal smoking. *Acta Obstet. Gynecol. Scand.* 79:485–489, 2000.

27. Centers for Disease Control and Prevention/ National Institute for Occupational Safety and Health. *The Effects of Workplace Hazards on Male Reproductive Health*. Pub. No. 96-132. January, 1997.

28. Summers, L., and Gegor, C. Preconception care and counseling. *Postgrad. Obstet. Gynecol.* 15(4):1–8 (February) 1995.

CHAPTER

6

Nutrition in Women's Health

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Proper nutrition is essential to human growth, development, and well-being. It is in fact impossible to separate health and nutrition. Four of the ten top leading causes of death among American women—coronary heart disease, certain types of cancer, stroke, and diabetes—have dietary factors associated with them [1]. Furthermore, the prevalence of osteoporosis and extremes in body weight continues to increase and have reached epidemic proportions. It is projected that overweight and obesity will soon replace smoking as the leading contributors to morbidity and mortality in the United States [2]. Measures to reduce this disease burden are relatively simple and well researched: maintaining a healthy weight; eating a well-balanced, nutritious diet; not smoking; and exercising regularly. However, survey data from the American Dietetic Association (ADA) reveal that while women seem to recognize the relationship between diet and health, only about one-third of them actually implement dietary strategies to reduce their risk of nutritionally related progressive chronic disease [3].

It is essential that midwives incorporate the promotion of healthy nutrition into their clinical and preventive health visits as well as their treatment plans for diseases that have dietary factors associated with them. This must be done in a clear manner that avoids conflicting messages and that provides clients with specific steps that can realistically be incorporated into their everyday lives. In order to do this, midwives must have an understanding of basic nutrition principles and of nutritional concerns specific to their client population. Midwives must then be able to translate this knowledge into effective educational messages and nutritional recommendations and interventions.

This chapter will facilitate these efforts by providing an overview of the basic principles of nutrition with an increased focus on health concerns and nutrients that are of particular relevance to women's health, including nutrition and reproductive health, nutrition and disease, overweight and obesity, and eating disorders. Also included are recommendations on nutritionally related preventive health screening and general guidelines on nutritional evaluation and nutritional counseling. This chapter does not address nutrition during pregnancy or lactation, topics to be addressed in depth in other chapters.

Principles of Nutrition

Nutrients are the chemical components of food. Humans need over 40 different nutrients for good health. These nutrients are grouped into five major classes: (1) proteins, (2) fats, (3) carbohydrates, (4) vitamins, and (5) minerals. Water is also a necessary nutrient, but it does not fit into any of the above categories. Protein, fat, carbohydrates, and water are referred to as macronutrients while vitamins and minerals are referred to as micronutrients. Protein, fat, and carbohydrates contain calories and are the energy-providing nutrients for the human body. Water, vitamins, and minerals provide no calories but are necessary, among other things, for the body to be able to utilize the energy provided by fat, carbohydrates, and protein.

Humans should obtain both macronutrients and micronutrients from a diet composed of a vari-

ety of foods rather than from nutritional supplements. This diet must be balanced in a way that prevents nutritional deficiencies and excesses. Variety is essential both to guarantee proper intake of all necessary nutrients and in order to benefit from the protective effects of certain dietary components against diseases such as cancer and heart disease, which research suggests are due to combinations of substances in foods and food groups rather than to the effect of a single substance [4]. The sections that follow review intake recommendations for major nutrients, which can be used as a guide in the planning of a balanced diet, and describe in detail the five major nutrient classes.

Recommended Nutrient Intake

The federal government has issued a series of recommendations based on research data to guide health professionals and the American public in the task of designing a diet that provides adequate and well-balanced intake of the nutrients discussed above. These guidelines include Recommended Dietary Allowances (RDAs), U.S. Recommended Daily Allowances (U.S. RDAs), Reference Daily Intakes (RDIs), Daily Reference Values (DRVs), and Daily Values (DVs). This alphabet soup of recommendations can be quite difficult for patients to decipher and translate into food choices. The midwife should, therefore, have a basic understanding of these terms in order to assist clients in determining with what frequency and in what quantities each nutrient should be consumed.

The Recommended Dietary Allowances (RDAs) are guides for estimating nutritional needs for all people of similar age and gender. They were established in the 1940s by the first Food and Nutrition Board of the National Academy of Sciences and are updated every four to five years. Less than half of the over 40 necessary nutrients have an established RDA. It should be noted that RDAs are not daily allowances. Our bodies store most nutrients for later use, and it is normal that our intake of specific nutrients will vary from meal to meal and day to day based on the foods consumed. The RDA for a specific nutrient, therefore, should be the average intake over a 3- to 7-day period. It should also be kept in mind that RDAs were designed to apply to groups (initially to American soldiers during World War II) rather than to individuals, and they are therefore meant for meal planning for healthy groups of people, such as elementary school or college students eating in a school cafeteria. The RDAs are set quite high so as to meet the needs of almost all (97 to 98 percent) of individuals in a group, and thus may be too high for individual needs.

The Food and Drug Administration (FDA) used the RDAs to create the U.S. Recommended Daily Allowances (U.S. RDAs) in 1973. Designed as nutrient standards for use on nutrition labels on foods and on vitamin and mineral supplements, calculation of the U.S. RDAs were based on the highest 1968 RDA value for each nutrient in the appropriate age and gender category. Until the National Labeling Education Act of 1990 was passed, food labeling using U.S. RDAs was voluntary. With passage of that legislation, however, the government increased regulation of food labels and also called for a reexamination of the U.S. RDAs.

Partly due to the need to eliminate the longstanding confusion created by the similarity in the two terms (RDA and U.S. RDA), and also in order to set recommended levels for nutrients not covered by the U.S. RDA, the FDA in 1993 decided both to change the name of the U.S. RDA to Reference Daily Intakes (RDIs) and to create new reference values for nutrients that did not have an RDA. Daily Reference Values (DRVs) set standard levels for sodium, carbohydrate, fat, and dietary fiber intake. Initially, the RDIs for all the nutrients except protein remained the same as the U.S. RDA, but since 1993 the values for certain nutrients have been revised and updated.

The RDIs and DRVs are currently used to calculate Daily Values (DVs). Starting in 1994, Daily Values must appear on the labels of FDA-regulated products (including vitamin and mineral supplements) and are meant to help consumers use the food label information to plan a healthy diet. Using Daily Values, they can determine what percentage of recommended nutrient intake a particular food provides (based, unless otherwise stated, on a diet of 2000 calories). For example, the DV for fat (based on a 2000-calorie diet) is 65 grams. A food item that contains 10 grams of fat, therefore, provides approximately 15 percent Daily Value for fat. DVs also help set upper or lower limits for descriptive terms such as "low fat" that are often used on food labels. It must be noted that DVs are not meant to set levels of nutrients to be consumed every day, but rather to help determine how particular foods fit in to an overall healthy diet.

The Institute of Medicine's Food and Nutrition Board developed Dietary Reference Intakes (DRIs), a new set of standards that refer collectively to three reference values developed by the Board using the latest available research knowledge on the role of

nutrients in human health: (1) the Estimated Average Requirement (EAR), (2) the Recommended Dietary Allowance (RDA), and (3) the Tolerable Upper Intake Level (UL). The EAR is the intake value that is estimated to meet the requirement defined by a specified indicator of adequacy in 50 percent of an age- and gender-specific group. At this level of intake, the remaining 50 percent of the specified group would not have its needs met. The RDA is the dietary intake level that is sufficient to meet the nutrient requirements of nearly all individuals in the group. The UL is the maximum level of daily nutrient intake that is unlikely to pose risks of adverse health effects to almost all of the individuals in the group for whom it is designed. An important characteristic of the DRIs is that they not only aim at determining minimum nutrient intake levels necessary to prevent nutritional deficiencies, but they also strive to set standards to decrease chronic diseases such as osteoporosis and cancer. (See Tables 6-1–6-3.)

The standards outlined above are used by a range of agencies and individuals for a variety of purposes—from meal planning for military forces and determining eligibility for federal programs such as food stamps and WIC, to creating food labels and educational materials on nutrition such as the food pyramid, and determining the need for fortification of food products. Midwives should understand how to appropriately use these standards in clinical practice when conducting nutritional education, evaluation, and interventions both for groups of women and for individual patients. It is of foremost importance for the midwife to remember that these standards are guidelines derived from group data and that they were not created to serve as the sole guideline in determining individual daily nutritional needs. Midwives conducting an assessment of a woman's diet must elicit information on the types of foods in her diet; on dietary patterns (which include religious, socioeconomic and cultural factors that impact food choice); on lifestyle practices such as drug and tobacco use and exercise or activity level; on anthropometric data such as weight, height, and blood pressure; and on coexisting diseases or disease risks. Using this information in conjunction with the standards outlined above and guidelines on ideal body weight (see the section on weight and body fat measurements below), the midwife will be able to assist a woman in adjusting her diet in a manner that avoids caloric and nutritional deficiencies and/or excesses and that promotes wellness and disease prevention.

TABLE 6-1 Daily Values

Daily Values (DVs) are made up of two sets of dietary guidelines:

1. **Daily Reference Values (DRVs)**—guidelines for intake of the following nutrients:
   - Fat (including saturated fat)*
     No more than 30% of total daily calories; saturated fat should comprise no more than 10% of daily calories**
   - *Cholesterol*
     No more than 300 mg per day
   - *Carbohydrates**
     60% of daily calories
   - *Protein**
     10% of daily calories (for adults and children over the age of 4)
   - *Fiber**
     11.5 g per 1000 daily calories
   - *Sodium*
     No more than 2400 mg per day
   - *Potassium*
     No more than 3500 mg per day
2. **Recommended Daily Intakes (RDIs)**—guidelines for intake of certain essential vitamins and minerals (independent of total caloric intake):
   - *Vitamin A:* 5000 International Units (IU)
   - *Vitamin C:* 60 mg
   - *Thiamin (vitamin B_1):* 1.5 mg
   - *Riboflavin (vitamin B_2):* 1.7 mg
   - *Niacin (vitamin B_3):* 20 mg
   - *Calcium:* 1000 mg (1.0 g)
   - *Iron:* 18 mg
   - *Vitamin D*
   - *Vitamin E:* 30 IU
   - *Vitamin B_6:* 2.0 mg
   - *Folic acid:* 0.4 mg (400 mcg)
   - *Vitamin B_{12}:* 6 mcg
   - *Phosphorus:* 1000 mg (1.0 g)
   - *Iodine:* 150 mcg
   - *Magnesium:* 400 mg
   - *Zinc:* 15 mg
   - *Copper:* 2 mg
   - *Biotin:* 0.3 mg (300 mcg)
   - *Pantothenic acid:* 10 mg

* These DRVs depend upon total caloric intake. Please refer to Table 6-2 on calculating DRVs based on caloric intake.

** The National Cholesterol Program of the National Institutes of Health (NIH) now considers 7% to be the cutoff for the maximum number of calories that should come from saturated fat.

Source: Institute of Medicine Food and Nutrition Board.

TABLE 6-2 Calculating Caloric-Dependent DRVs (Fat, Carbohydrates, Protein, Fiber)

To calculate DRVs based on total caloric intake, the following conversion factors are used:

- *Fat:* 9 calories per g
- *Carbohydrate:* 4 calories per g
- *Protein:* 4 calories per g

Sample calculation for carbohydrates in a 2000 calorie diet:

Recommended DRV for carbohydrates is 60% of daily caloric intake (from Table 6-1).

2000 calories × 60% = 1200 calories.

1200 calories ÷ 4 calories per g = 300 g of carbohydrates per day.

Source: Institute of Medicine Food and Nutrition Board.

TABLE 6-3 Dietary Reference Intakes

- *Estimated Average Requirement (EAR):* Intake value that is estimated to meet the requirement defined by a specified indicator of adequacy in 50% of an age- and gender-specific group.
- *Recommended Dietary Allowance (RDA):* Dietary intake level that is sufficient to meet the nutrient requirements of nearly all individuals in the group.
- *Tolerable Upper Intake Level (UL):* Maximum level of daily nutrient intake that is unlikely to pose risks of adverse health effects to almost all of the individuals in the group for whom it is designed.

Source: Institute of Medicine Food and Nutrition Board.

Protein

Protein is the basic component of cells and is needed for cellular growth, replacement, and repair. Enzymes—the substances responsible for controlling the processes that keep the human body functioning—are composed of protein. Hormones, hemoglobin, and antibodies are also composed partially or entirely of protein. Protein is in turn composed of organic compounds known as amino acids. The different arrangements of amino acids into proteins determine the particular properties of the protein.

There are approximately 20 amino acids that are necessary for human growth and metabolism. The body is able to produce the majority of these necessary amino acids. There are, however, approximately nine amino acids that must be provided by foods. These are known as the essential amino acids. Foods of animal origin such as meat, fish, eggs, and dairy products provide all of these essential amino acids and are known as complete proteins. Proteins derived from plants such as legumes, nuts, and grains are known as incomplete proteins because they lack certain essential amino acids. It is possible, however, with proper meal planning to combine different plant foods to obtain all the essential amino acids from a vegetarian diet.

Proteins cannot be stored in the body and must therefore be consumed daily in order to avoid the body breaking down nonessential tissue such as muscle to supply proteins vital for survival. While protein intake deficiencies are common in the developing world, most Americans consume quantities of protein well in excess of the RDA. The average American woman, for example, consumes approximately 70 grams of protein per day [5], which is much more than the RDA for protein for most nonpregnant, nonlactating women 25 to 51 years of age.

There are two ways to estimate desirable protein intake for healthy, nonpregnant, nonlactating adult women:

1. Approximately 10 percent of total caloric intake should be from protein (Daily Reference Value).
2. Women should consume 0.8 grams of protein per kilogram of ideal body weight (Recommended Dietary Allowance).

Table 6-4 contains a list of foods rich in complete and incomplete proteins.

Carbohydrates

Carbohydrates, which can be found in grains, vegetables, fruits, and sugars, are the major dietary source of energy. They are also necessary for the digestion of proteins and for certain brain functions. Sugars are known as the simple carbohydrates, and starches and fiber as the complex carbohydrates (including glycogen, the animal starch that serves as a storage molecule for glucose). Sugars may be single molecules (monosaccharides) such as glucose, fructose, and galactose or double molecules (disaccharides) such as sucrose, maltose, and lactose. Glucose, a monosaccharide, is the body's main energy source. These simple carbohydrates provide a readily available source of energy for the body. Starches—found in potatoes, whole-grain bread, corn, brown rice, and pasta—and fiber found in grains, vegetables, and fruits are polysaccharides composed of long straight chains or branched chains of monosaccharide units.

TABLE 6-4 Food Sources of Protein

Food	Quantity	Amount of Protein (grams)
Complete Proteins		
Lentils	1 cup (cooked)	30
Beef, chuck, roasted	3 oz	28
Pork, center loin	3 oz	27
Turkey	3 oz	27
Chicken breast	3 oz	26
Flounder	3 oz	25
Tuna, canned	3 oz	24
Beef, lean ground	3 oz	22
Scallops	3 oz	16
Cottage cheese	1/2 cup	15
Ham	3 oz	15
Eggs	2 large	12
Shrimp	3 oz	11
Yogurt	1 cup	8
Milk, any type	8 oz	8
Cheddar cheese	1 oz	7
Incomplete Proteins		
Tofu	1/2 cup	10
Green peas	1 cup	9
Peanut butter	2 tbsp	8
Egg noodles	1 cup	7
Brown rice	1 cup	5
White rice	1 cup	4
Bread, whole wheat	1 slice	3

Source: Varney, H., Kriebs, J. M., and Gegor, C. L. *Varney's Pocket Midwife*. Sudbury, MA: Jones and Bartlett Publishers, 1998.

All carbohydrates except insoluble fibers are broken down by the body into the basic sugars and absorbed in the bloodstream. Glucose, galactose, and fructose can be used immediately by the body or can be stored in the liver or muscle tissue in the form of glycogen, which is then converted to glucose whenever there is a need for reserve energy.

Dietary fibers are polysaccharides that are different from starches in that they are joined by chemical links that cannot be digested by the enzymes in the small intestine. These fibers are either soluble or insoluble fibers. Soluble fibers are digested by bacteria in the large intestine, while insoluble fibers are not. The typical American diet is characterized by being low in dietary fiber. Fiber intake among adults in the United States averages about 15 grams. That is about half the recommended amount [6]. Research has revealed that dietary fiber is associated with a decreased risk of heart disease (probably through lowering total cholesterol and LDL levels), diabetes, diverticulitis, and constipation [7, 8]. Although earlier research seemed to suggest that increased fiber intake was protective against colon cancer, more recent data, including evidence from the Nurses' Health Study, indicate that fiber intake is unrelated to colon cancer [9]. The Nurses' Health Study did, however, confirm earlier findings on the role of dietary fiber in reducing the risk of diabetes, heart disease, and diverticular diseases of the colon, thus underscoring the importance of a diet rich in fiber [10].

It is recommended that carbohydrates make up at least 55 to 60 percent of daily caloric intake. Individuals should try to maximize intake of nonstarchy, nonrefined complex carbohydrates, especially fiber, and to minimize intake of the simple sugars and certain starchy foods such as white rice and white potatoes. Simple sugar intake should be 10 to 15 percent of total caloric intake. A desirable intake of fiber is a minimum of 20 to 35 grams per day or 11.5 grams per 1000 calories.

Fats

Fats are also a source of energy and provide more calories per gram than do protein or carbohydrates. Fats are composed of fatty acids and have various roles in the human body. They are involved in the transport and digestion of the fat-soluble vitamins and are part of cell structure. Stored body fat helps in temperature regulation by serving as insulation and helps to protect vital organs by providing a cushioning effect. Excessive dietary fat intake—in particular, high intake of saturated fat—is related to increased rates of chronic disease and increased morbidity and mortality from these diseases.

There are four types of fats in food which differ from each other in the chemical structure of their fatty acids:

1. Cholesterol
2. Saturated fat
3. Monounsaturated fat
4. Polyunsaturated fat

Cholesterol, a fatlike substance, is present in all animal tissue. There are two types of cholesterol: (1) dietary cholesterol, which is found in foods of animal origin such as meat and eggs, and (2) blood cholesterol, which is a waxy, fatlike substance manufactured by the body and stored in the liver. The body uses blood cholesterol to make estrogen, progesterone, and bile. Cholesterol is also an important component of cell membranes. High levels

of cholesterol in the blood, however, promote the production of fatty plaques in arterial walls causing them to lose elasticity and narrow—a disease process known as arteriosclerosis.

Cholesterol cannot be dissolved in the blood and must therefore be carried by fatty proteins called lipoproteins. The main type of this carrier lipoprotein is known as low-density lipoprotein (LDL). An excess of circulating LDL forms fatty plaques in the arteries. Blood LDL-cholesterol level is, therefore, used as a predictor of heart attacks. The type of fats and oils that we consume is an important determinant of LDL levels. Research evidence suggests that high intake of saturated fat is associated with a rise in LDL levels and therefore in the risk for coronary heart disease and heart attacks [11, 12].

High-density lipoprotein (HDL) is another type of carrier molecule of cholesterol in the body. HDL carries excess cholesterol away from the arteries and back to the liver and is thus known as the "good" cholesterol. A high level of HDL appears to have a protective effect against coronary heart disease and heart attacks [13]. In women, unlike in men, it appears that HDL levels may be more predictive of the risk for cardiovascular disease than total cholesterol levels [14]. Exercise is strongly associated with higher levels of HDL in the body and, therefore, of lower risk of cardiovascular disease [15].

The National Institutes of Health (NIH) and the American Heart Foundation recommend that the daily dietary intake of cholesterol should be below 300 milligrams. It is also recommended that total serum cholesterol should be below 200 milligrams per deciliter of blood and that HDL level should be higher than 35 milligrams per 1000 milliliters of blood.

Another way in which fats are transported through the blood to tissues is in the form of triglycerides. The body also uses triglycerides as a means of storing fat. It is still unclear whether a high triglyceride level is an independent cause of heart disease because many individuals with high triglyceride levels also have high LDL cholesterol and low HDL cholesterol, which are known risk factors for heart disease [16]. It does appear, however, that high triglyceride levels are more predictive of cardiovascular disease risk in women than in men [15]. It is recommended that the level of triglycerides in the blood be below 200 milligrams per deciliter of blood although there are no current recommendations for routine screening of triglyceride levels.

Saturated fats come from both animal and plant sources. They are often solid at room temperature and are known to raise the amount of cholesterol in the bloodstream. In fact, research evidence indicates that serum cholesterol level is affected more by intake of dietary fat than by intake of dietary cholesterol. Saturated fats are found in meat fat, butter, whole milk products, coconut oil, palm oil, and palm kernel oil. Of the saturated fats, transfatty acids seem to have the most detrimental effect on blood cholesterol levels [17]. Transfatty acids are formed when food manufacturers partially hydrogenate (saturate) liquid oils in an effort to make the oils stay fresh longer. These acids are most commonly found in deep-fried foods, doughnuts, cookies, pies, shortening, and margarine. The American Heart Association recommends that less than 10 percent of daily caloric intake should be from saturated fats.

Polyunsaturated fats are found mainly in vegetable oils such as safflower, sunflower, corn, soybean, flaxseed, and canola oils in the form of omega-6 fatty acids. They are also the main fats found in seafood in the form of omega-3 fatty acids. Research has shown that eating polyunsaturated fats instead of saturated fats decreases the level of LDL cholesterol in the blood and is therefore protective against heart disease [11].

Monounsaturated fats are also found mainly in vegetable oils such as olive, canola, and peanut oils. Like polyunsaturated fats, research indicates that consumption of monounsaturated fats may also decrease LDL cholesterol when used in the place of saturated fats [11].

In summary, the most recent research on fat suggests that the type of fat consumed is as important if not more important than the quantity of fat intake. As was outlined above, research evidence suggests that replacing saturated and trans unsaturated fats with unhydrogenated monosaturated and polyunsaturated fats is more effective in preventing coronary heart disease than simply reducing total fat intake. It is also important to note that even though a woman's total cholesterol level may not be elevated, her lipid profile may still indicate that she is at high risk for cardiovascular disease. Women with normal or high LDL levels, low HDL levels, and high triglyceride levels seem to be particularly at risk [16].

Tables 6-5 and 6-6 contain summaries of recommended fat and cholesterol intake and recommended blood levels for cholesterol and triglycerides.

TABLE 6-5	Summary of Recommendations on Fat and Cholesterol Intake

- No more than 30% of total calories should be from fat
- 7–10% of total calories from saturated fats
- 10–15% of total calories from monounsaturated fats
- 10% of fats from polyunsaturated fats
- Less than 300 mg of cholesterol

TABLE 6-6	Recommended Blood Levels for Cholesterol and Triglycerides

- Total blood cholesterol less than 200 mg/dl
- HDL cholesterol more than 35 mg/dl
- LDL cholesterol less than 130 mg/dl
- Triglycerides less than 200 mg/dl

Source: National Heart, Lung, and Blood Institute of NIH

Vitamins and Minerals

Vitamins and minerals, which are often referred to as micronutrients, are organic substances used by the body as catalysts for intracellular metabolic reactions. The human body can synthesize some vitamins, but not in sufficient quantities. All necessary vitamins and all minerals must be supplied in essential amounts through daily dietary intake. Vitamins fall into two main categories: (1) fat-soluble and (2) water-soluble vitamins. (Table 6-7 lists each category.) As the body regulates vitamin levels, it stores excess fat-soluble vitamins in body fat and excretes water-soluble vitamins through urine. It is important to remind women that since the body accumulates fat-soluble vitamins, megadoses of these vitamins can lead to potentially dangerous or lethal toxic effects. Vitamin A, for example, is a known teratogen, so pregnant women must be careful not to exceed the recommended intake of this vitamin. Tables 6-8 and 6-9 list Recommended Dietary Intakes for selected vitamins and minerals as well as their function in the body, food sources, and potential toxic effects.

As is discussed in greater detail in the section on nutrient intake guidelines earlier in this chapter, there are recommended levels for micronutrient intake to meet the known nutritional needs of most healthy individuals. It is important to emphasize that these recommendations are calculated to be well over the requirements of most individuals and that most women in normal health can meet most of their micronutrient requirements through eating well-balanced meals without the need for supplements.

TABLE 6-7	Vitamins Categorized by Solubility

Fat-Soluble Vitamins

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K

Water-Soluble Vitamins

- Vitamin C
- B vitamins
  - Thiamin (B_1)
  - Riboflavin (B_2)
  - Niacin (B_3)
  - Vitamin B_6
  - Pantothenic acid
  - Vitamin B_{12}
  - Biotin
  - Folic acid (folate)

Essential Minerals

- Calcium
- Chloride
- Chromium
- Copper
- Fluoride
- Iodine
- Iron
- Magnesium
- Manganese
- Molybdenum
- Phosphorus
- Potassium
- Selenium
- Sodium
- Zinc

However, calcium, iron, and folic acid merit special attention in this chapter because women often need them in quantities higher than those provided through the usual American diet. Modifications in diet or supplementation may be necessary therefore to avoid both deficiencies in these micronutrients and the concomitant adverse health effects from these deficiencies. Furthermore, as more research becomes available on the role of micronutrients in disease prevention, it is possible that the recommended levels for other nutrients may be increased to levels higher than those consumed in the average American diet and thus make supplementation of vitamins and

TABLE 6-8 Dietary Reference Intakes for Selected Vitamins for Nonpregnant, Nonlactating Women

Vitamin	Function	RDA/Adequate Intake for Women		Food Sources	Adverse Effects of Excessive Consumption	Other
A Given in retinal activity equivalents (RAEs)	Required for normal vision, gene expression, reproduction, embryonic development, and immune function	9–13 y 14–70 y >70 y	600 mcg/day 900 mcg/day 900 mcg/day	Liver, dairy products, egg yolks, fish, carrots, green leafy vegetables, pumpkins, sweet potatoes	Teratological effects and liver toxicity (from preformed vitamin A only)	Individuals with high alcohol intake are especially susceptible to adverse effects of excess.
D (calciferol) 1 mcg calciferol = 40 IU vitamin D	Maintains serum calcium and phosphorus (important for bone formation and maintenance)	9–50 y 50–70 y >70 y	5 mcg/day 10 mcg/day 15 mcg/day	Fortified dairy products and cereals, fish liver oils, egg yolks	Hypercalcemia, GI distress, anorexia, headache, nausea, vomiting, metallic taste in mouth	Patients on glucocorticoid therapy may need additional vitamin D.
E	Major function appears to be as a nonspecific chain-breaking antioxidant	9–13 y 14–70 y >70 y	11 mg/day 15 mg/day 15 mg/day	Vegetable oils, unprocessed cereal grains, nuts, fruits, vegetables, meats, wheat germ	None reported from vitamin E naturally occurring in foods but hemorrhagic toxicity possible from excess intake of vitamin E in supplements	Patients on anticoagulants need to be monitored when taking vitamin E supplements.
K	Coenzyme during the synthesis of many proteins involved in blood clotting and bone metabolism	9–13 y 14–18 y 19–70 y >70 y	60 mcg/day 75 mcg/day 90 mcg/day 90 mcg/day	Green leafy vegetables, brussels sprouts, cabbage, plant oils, margarine	None identified	Patients on anticoagulant therapy should monitor vitamin K intake.
C (ascorbic acid)	Cofactors for reactions requiring reduced copper or iron metalloenzyme and as a protective antioxidant	9–13 y 14–18 y 19–70 y >70 y	45 mg/day 65 mg/day 75 mg/day 75 mg/day	Citrus fruits, tomatoes, potatoes, broccoli, brussels sprouts, spinach	GI disturbances, kidney stones, excess iron absorption	Smokers and nonsmokers regularly exposed to smoke may require additional vitamin C.
B_6	Coenzyme in the metabolism of amino acids and glycogen	9–13 y 14–18 y 19–50 y 50–70 y >70 y	1.0 mg/day 1.2 mg/day 1.3 mg/day 1.5 mg/day 1.5 mg/day	Fortified cereals, whole grain breads, organ meats, meat, poultry, legumes	No adverse effects from vitamin B_6 in food. Sensory neuropathy has occurred from high intakes from supplement forms.	
B_{12} (cobalamin)	Coenzyme in nucleic acid metabolism; prevents megaloblastic anemia	9–13 y 14–70 y >70y	1.8 mcg/day 2.4 mcg/day 2.4 mcg/day	Fortified cereals, meat, fish, shellfish, poultry, dairy products	None identified	Patients older than 50 may need to supplement dietary sources of vitamin B_{12}.
Folate (folic acid)	Coenzyme in nucleic acid metabolism; prevents megaloblastic anemia	9–13 y 14–70 y >70 y	300 mcg/day 400 mcg/day 400 mcg/day	Enriched cereals, green leafy vegetables, enriched whole grain bread, fortified foods	Masks neurological complications in people with vitamin B_{12} deficiency.	Maternal folate intake is inversely related to the risk of neural tube defects in the fetus.

Sources: National Academy of Sciences. *Dietary Reference Intakes for Calcium, Phosphorous, Magnesium, Vitamin D, and Fluoride*, 1997; *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B_6, Folate, Vitamin B_{12}, Pantothenic Acid, Biotin, and Choline*, 1998; *Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium and Carotenoids*, 2000; and *Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc*, 2001. Washington, DC: National Academy Press.

TABLE 6-9 Dietary Reference Intakes for Selected Minerals for Nonpregnant, Nonlactating Women

Mineral	Function	RDA/Adequate Intake for Women		Food Sources	Adverse Effects of Excessive Consumption	Other
Calcium	Essential role in blood clotting, muscle contraction, nerve transmission, and bone and tooth formation	9–18 y 19–50 y 50–70 y >70 y	1300 mg/day 1000 mg/day 1200 mg/day 1200 mg/day	Milk, cheese, yogurt, corn tortillas, calcium-set tofu, kale, broccoli	Kidney stones, hypercalcemia, renal insufficiency	Amenorrheic women have reduced net calcium absorption.
Iron	Used to make hemoglobin, which transports oxygen to all body tissues	9–13 y 14–18 y 19–50 y 50–70 y >70 y	5 mg/day 10 mg/day 15 mg/day 8 mg/day 8 mg/day	Fortified dairy products and cereals, fish liver oils, egg yolks	Gastrointestinal distress	Recommended intake assumes 75% of iron is from heme iron sources. Those consuming vegetarian diets may need up to twice the suggested iron intake than someone consuming a nonvegetarian diet.
Iodine	Component of thyroid hormones	9–13 y 14–70 y >70 y	120 mcg/day 150 mcg/day 150 mcg/day	Processed food, iodized salt	Elevated thyroid stimulating hormone (TSH concentration)	Individuals with autoimmune thyroid disease, previous iodine deficiency, or nodular goiter are distinctly susceptible to the adverse effects of excess iodine.
Zinc	Component of multiple enzymes and proteins; involved in the regulation of gene expression	9–13 y 14–18 y 19–70 y >70 y	8 mg/day 9 mg/day 8 mg/day 8 mg/day	Fortified cereals, red meats, certain seafood	Reduced copper status	Zinc absorption is lower for those consuming vegetarian diets than for those eating nonvegetarian diets.

Sources: National Academy of Sciences. *Dietary Reference Intakes for Calcium, Phosphorous, Magnesium, Vitamin D, and Fluoride*, 1997; *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B_6, Folate, Vitamin B_{12}, Pantothenic Acid, Biotin, and Choline*, 1998; *Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium and Carotenoids*, 2000; and *Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc*, 2001. Washington, DC: National Academy Press.

minerals necessary for certain women. In June of 2002, the American Medical Association released a statement saying that pending strong evidence from randomized trials, "it appears prudent for all adults to take vitamin supplements" to reduce the risk of chronic diseases. Please refer to the section on supplements later in this chapter for more information and guidelines on vitamin and mineral supplementation.

Calcium

Calcium is essential for the formation, development, and maintenance of teeth and bones. Although opinion is divided as to when peak bone mass is achieved, research indicates that the majority of adult bone mass is established by the age of 20 [18]. Maximizing peak bone mass during this time is now believed to be the most important step in the prevention of osteoporosis, a disease characterized by reduced bone mass, increased bone fragility, and subsequent increased susceptibility to fractures. Osteoporosis affects more than 30 million Americans, most of whom are women [19].

A majority of American women do not get enough calcium; furthermore, the prevalence of calcium deficiency, which can be measured indirectly through the prevalence of osteoporosis, has been increasing [20]. A major contributor to this rise in the rates of osteoporosis is inadequate calcium intake during adolescence. A recent national survey indicates that 85 percent of adolescent females do not consume the Recommended Daily Allowance for calcium [21]. This is due in part to a perception that all dairy products are high in fat and to the fact that many teens replace milk with regular or diet soda. The current recommended intake for calcium for adolescent females is 1300 milligrams per day. This reflects an adjustment made in 1997 to the RDA based on the recommendations made by the National Institutes of Health's Consensus Development Conference on Optimal Calcium Intake. It is crucial for midwives to educate all women, but in particular adolescents, on the importance of adequate calcium intake during childhood and throughout adolescence.

Appropriate calcium intake by postmenopausal women may also be important in protecting against osteoporosis. Calcium supplementation and high intake of dietary calcium among postmenopausal women have been shown in certain studies to increase bone mass density (BMD), reduce bone loss, and decrease the number of fractures [22]. More recent results from the Nurses' Health Study cast some doubt on the true effect of dietary calcium intake on the rate of bone fractures in women [23]. However, although calcium alone may not be able to treat or prevent osteoporosis, it is nonetheless an important component of overall bone health, and women do need to ensure adequate intake of calcium throughout the life cycle to help protect against osteoporosis. Adequate vitamin D is also important for bone health because it allows calcium to be absorbed from the intestine and made available in the circulation for bone formation.

Without any interventions, postmenopausal women can lose 10 to 40 percent of their bone mass between the ages of 50 and 60 [22]. Estrogen or hormone replacement therapy (ERT/HRT) has been shown to partially prevent bone loss and has been considered the most effective means to reduce rates of bone loss and fractures in postmenopausal women [20, 24]. Two recent findings should be noted, however: (1) a combination of HRT, exercise, and adequate calcium intake was shown to be more effective than HRT alone in reducing bone loss [25, 26] and (2) data released by the Women's Health Initiative on hormone replacement therapy suggest that the risks of breast cancer, heart disease, stroke, and blood clots from HRT may outweigh its long-term benefits [27]. In the next few years clinicians may significantly alter their recommendations on the use of HRT for the long-term prevention of diseases such as osteoporosis. Alternative prevention measures for osteoporosis, including the important role of regular exercise in reducing the rates of osteoporosis and osteoporosis-related fractures, should be strongly emphasized with women. Some women who are at particularly high risk for either osteoporosis or osteoporosis-related fractures may benefit from medications other than HRT to prevent and/or treat osteoporosis. Chapter 13, which discusses midlife health, includes more detailed information both on osteoporosis and on hormone replacement therapy.

Recommendations for calcium intake for females of all ages can be found in Table 6-9. The preferred source of calcium is from dietary sources, such as those listed in Table 6-10.

Dairy products are an important source of calcium and, in a typical American diet, their use may constitute the difference between getting enough calcium or not [20]. It should be kept in mind, however, that many dairy products are high in fat and can contribute to cardiovascular disease. Clinicians should thus exercise caution when recommending an increase in these foods. Nonfat and low-fat dairy products that are now readily available in most grocery stores are excellent choices that help reduce fat intake while helping to ensure adequate intake of

TABLE 6-10 Food Sources of Calcium

Food	Quantity	Amount of Calcium (mg)
Ricotta cheese	1 cup	669
Sardines	3 1/2 oz	437
Yogurt, low-fat plain	1 cup	415
Yogurt, low-fat fruit varieties	1 cup	350
Collard greens	1 cup	357
Milk, low-fat 1%	8 oz	300
Tums E-X	1 tab	300
Milk, whole	8 oz	288
Spinach, cooked	1 cup	278
Molasses, blackstrap	2 tbsp	274
Tofu, firm made with calcium sulfate	4 oz	250–265
Cheese, Swiss	1 oz	272
Cheese, provolone	1 oz	214
Cheese, cheddar	1 oz	204
Cheese, mozzarella	1 oz	185
Sesame seeds	2 tbsp	176
Ice cream, vanilla, 16% fat	1 cup	151
Salmon, canned with bones	3 oz	133
Cheese, American	1 oz	124
Tofu, regular made with calcium sulfate	4 oz	120–392
Tofu made with nijare	4 oz	80–146
Cottage cheese	4 oz	70
Hummus	1/2 cup	62
Almonds, blanched	1 oz	50
Chickpeas	1/2 cup	40
Broccoli	1/2 cup	36

calcium and vitamin D as well as other nutrients necessary for bone health. It is also possible for women to get enough calcium from non-dairy food sources and from supplements. Adequate consumption of calcium and dairy products has been shown to have benefits beyond bone health, possibly lowering the risk of high blood pressure [28] as well as colon cancer [29, 30]. While the blood pressure benefits appear fairly small, the protection against colon cancer seems somewhat larger, and most of the benefit comes from having just one glass of milk per day. Getting more than this amount, however, does not seem to further lower risk.

For individuals who do not or cannot obtain enough calcium from dairy products—for example, vegetarians or vegans or those who are lactose intolerant or who choose to avoid dairy products due to their high-fat content—calcium-fortified foods or calcium supplements may be indicated. Those individuals with lactose intolerance can obtain much of their calcium through aged hard cheeses or fermented milk products such as yogurt, which have very low or negligible amounts of lactose.

If calcium supplementation is necessary or desired, the amount of calcium from supplements should be determined based on the amount of dietary intake of calcium. In other words, the baseline amount of dietary calcium intake should be calculated and the rest of necessary calcium intake should come from supplementation. If more than 500 milligrams of supplemental calcium are necessary, the total dosage should be split into 250 to 500 milligram increments. Research suggests that the absorption of calcium from supplements is increased if the supplements, except for calcium carbonate, are taken between meals [31]. The total amount of calcium supplemented should not exceed 1000 milligrams daily because iron and zinc absorption may be inhibited. Doses of up to 2000 milligrams, however, are believed to be safe in most individuals. Excessive calcium intake is associated with kidney stones, hypercalcemia, and renal insufficiency.

It is important for midwives to assess calcium intake among their client population, particularly among their adolescent, pregnant, lactating, and postmenopausal patients. Midwives can elicit infor-

mation on daily consumption of dairy products as a quick means of determining whether calcium intake is appropriate. A more detailed diet history is warranted if dairy product consumption is low or absent, for it most likely signals insufficient calcium intake. For women whose calcium intake is inadequate and for those who are choosing to reduce their fat intake by reducing or eliminating their intake of dairy products, focused nutritional counseling should be conducted and calcium supplements may be necessary. The midwife should provide advice on the proper type and dosage of these supplements. Table 6-11 shows the amount of elemental calcium in common supplements.

Iron

Iron is a metallic element that is used by the body primarily to make hemoglobin, the component in red blood cells responsible for the transport of oxygen to all body tissues. Iron deficiency can lead to anemia—a reduction in the number of circulating red blood cells to the extent that the hemoglobin content of blood is less than that required to meet the oxygen needs of the body. (For additional discussions of anemia, see Chapters 7 and 24.) It must be noted that iron deficiency is only one cause of anemia and that treatment for anemia must be specific to its cause.

Women of reproductive age (from menarche through menopause) whether pregnant or not are at higher risk than men for iron deficiency and iron deficiency anemia. Nonpregnant women of childbearing age are at increased risk due to iron loss during menstruation, particularly if coupled with inadequate dietary intake of iron [20]. Pregnant women are also at increased risk for iron deficiency due to the increased iron requirements of pregnancy as well as to inadequate dietary intake of iron. Iron requirements in pregnancy and anemia in pregnancy are discussed in depth in Chapter 24; the section below is meant to address iron needs in nonpregnant, nonlactating women.

TABLE 6-11 Amount of Elemental Calcium in Common Supplements

Calcium carbonate	40%
Calcium citrate	24%
Calcium lactate	14%
Calcium gluconate	9%

At 40% elemental calcium, a 500-mg tablet yields 200 mg of calcium.

Research indicates that only one-fourth of all females of reproductive age meet the recommendations for dietary iron intake [20]. Due to adaptive mechanisms of the body, this deficiency may not translate into iron deficiency anemia. For example, while an estimated 15 to 20 percent of menstruating women are deficient in iron [32], research data reveal that the prevalence of iron deficiency anemia among females 12 to 49 years old is only about 4 percent [33].

In cases where either iron deficiency or iron deficiency anemia is suspected, a complete blood count (CBC) and iron indices should be ordered. The following changes are consistent with an iron deficiency anemia:

- Decreased hemoglobin
- Decreased hematocrit
- Decreased red blood cells (RBC)
- Decreased mean cell volume (MCV)
- Normal or decreased mean cell hemoglobin (MCH)
- Normal mean cell hemoglobin concentration (MCHC)
- Normal or decreased reticulocyte counts
- Decreased iron/ferritin
- Less than 15% transferrin saturation

Iron depletion, which precedes and is more common than iron deficiency anemia, may be evident in the lab results before any anemia develops.

Both iron depletion and iron deficiency anemia should be addressed through interventions aimed at correcting the deficiency and replenishing stores [33]. Iron depletion and iron deficiency anemia can both be addressed through diet and/or iron supplementation. Before initiating therapy, however, it may be necessary for the midwife to refer a client to a nutritionist for a full evaluation, including a thorough diet history and counseling or, in the case of profound anemias or anemias refractory to diet or iron supplementation, to a physician.

Because iron is best absorbed in dietary form and because iron supplements are associated with gastrointestinal distress, it is preferable if possible to address inadequate iron intake through dietary modification rather than through supplementation. Iron is present in two forms in foods: (1) heme iron and (2) nonheme iron. Heme iron is found in animal products and is absorbed by the body more efficiently than nonheme iron, which is primarily derived from plant products. Tables 6-12 and 6-13 list good dietary sources of heme and nonheme iron.

TABLE 6-12 Food Sources of Heme Iron

Food	Quantity	Amount of Iron (mg)
Clams	3 oz	24
Oysters	3 oz	11
Chicken liver, cooked	3 oz	7
Beef liver, cooked	3 oz	6
Mussels	3 oz	6
Beef, chuck, braised	3 oz	3
Beef, tenderloin, roasted	3 oz	3
Turkey, dark meat, roasted	3 oz	2
Beef, eye of round, roasted	3 oz	2
Turkey, light meat, roasted	3 oz	1
Tuna, fresh bluefin, cooked, dry heat	3 oz	1
Chicken, leg, meat only, roasted	3 oz	1
Crab, blue crab, flaked and pieces, cooked, moist heat	1 cup	1
Chicken, breast, roasted	3 oz	1
Halibut, cooked, dry heat	3 oz	0.9
Pork, loin, meat only, broiled	3 oz	0.8
Tuna, white, canned in water	3 oz	0.8

TABLE 6-13 Food Sources of Nonheme Iron

Food	Quantity	Amount of Iron (mg)
Ready-to-eat cereal, 100% fortified	3/4 cup	18.0
Ready-to-eat cereal, 50% fortified	3/4 cup	9.0
Soybeans, mature, cooked, boiled	1 cup	8
Lentils, cooked, boiled	1 cup	6
Molasses, blackstrap	2 tbsp	6
Kidney beans, cooked, boiled	1 cup	5
Pinto beans, cooked, boiled	1 cup	5
Lima beans, cooked, boiled	1 cup	4
Navy beans, cooked, boiled	1 cup	4
Black beans, cooked, boiled	1 cup	4
Oatmeal, instant, fortified	1/2 cup	4
Prunes, dried	6 oz	4
Prune juice	8 oz	3
Spinach, cooked, boiled	1/2 cup	3
Tofu, firm	1/2 cup	2
Black-eyed peas, cooked, boiled	1 cup	2
Spinach, frozen, cooked, boiled	1/2 cup	1
Whole wheat bread	1 slice	1
White bread, enriched	1 slice	1

Iron supplementation may be necessary in cases where there is a profound anemia or where adequate dietary intake is not feasible. If iron supplementation is to be undertaken, the midwife should provide proper education to ensure the maximum benefit from the supplements and to avoid or minimize side effects. Women should be reminded that iron poisoning is the most common type of poisoning among children; therefore, iron supplements must be kept out of reach of children. The amount of iron supplement necessary will depend on the severity of the anemia. Doses usually range from 30 to 120 mg of elemental iron provided in divided doses. Meat and ascorbic acid–rich (vitamin C) foods such as citrus fruits enhance the absorption of iron; coffee, tea, and milk are iron inhibitors.

Calcium and magnesium also interfere with iron absorption. Therefore, supplemental iron should preferably be taken between meals with a glass of orange juice and not at the same time that a multivitamin supplement is taken. Side effects of iron supplementation—including nausea, constipation, diarrhea, abdominal cramping, and black or tarry stools—should be discussed with women as should ways to minimize and cope with them.

Folic Acid

Folic acid, also known as folate or folacin, is a coenzyme in the metabolism of nucleic and amino acids. Research has demonstrated that inadequate folate intake is strongly linked with neural tube defects in a developing fetus. Due to the fact that formation of the neural tube occurs in the earliest stages of pregnancy, often before a woman is even aware of a pregnancy, it is recommended that all women who are of childbearing age and capable of becoming pregnant consume 400 micrograms of folic acid daily, either in the form of supplements or through folate-fortified foods in addition to their usual intake of dietary folate. If a woman is already pregnant, the RDI for folic acid is 600 micrograms. This intake should continue at least through the sixth to eighth week of pregnancy, but preferably throughout pregnancy. Women who have had a child with a neural tube defect should consume 4 mg of folic acid daily starting at least one month prior to conception and continuing through the first three months of pregnancy [34].

Since January 1998, the FDA has required U.S. food manufacturers to fortify certain food with folate in order to facilitate adequate intakes of this nutrient by women of reproductive age. The foods required to be fortified are enriched bread, rolls, and buns; all enriched flour including bromated and self-rising flours; enriched corn grits and cornmeals; enriched farina and rice; and all enriched macaroni and noodle products, including vegetable macaroni, vegetable noodle, and nonfat milk macaroni products. In addition, breakfast cereals can add folic acid up to 400 micrograms per serving. It should be kept in mind that, with the exception of women with a history of a fetus or child with a neural tube defect, total daily intake of folic acid from all sources should be below 1 milligram. Intakes above that amount may mask symptoms of pernicious anemia, a form of vitamin B_{12} deficiency that left untreated can lead to severe permanent nerve damage.

Weight and Body Fat Measurements and Overweight and Obesity

One of the most important steps a woman can take to maintain her health and prevent chronic disease is to maintain a healthy weight. Obesity has been linked with increased incidence of dyslipidemia, hypertension, Type II diabetes, coronary artery disease, stroke, gallbladder disease, gout, osteoarthritis, sleep apnea, and colon cancer [35]. Women who are obese are also at increased risk of poor pregnancy outcomes, miscarriage, polycystic ovarian syndrome, and breast and endometrial cancers [22, 36].

Recent results from the Centers for Disease Control and Prevention's National Health and Nutrition Examination Survey (NHANES III) indicate that overweight and obesity are on the rise among all age groups in the United States. The same data reveal that 35 percent of American adults of ages 20 to 74 years are overweight and that an additional 27 percent of adults are obese [37]. Women, and in particular minority women, are disproportionately affected by this epidemic and have the highest prevalence of both overweight and obesity across nearly all age groups and income levels. Data show that 33 percent of non-Hispanic whites, 52 percent of non-Hispanic blacks, and 50 percent of Hispanic women are overweight [38].

Although overweight and obesity are often used as interchangeable terms, they do in fact refer to different conditions. The National Center for Chronic Disease Prevention and Health Promotion defines overweight as an excess in body weight in relation to height. Obesity, on the other hand, is defined as an excessively high amount of body fat in relation to lean body mass. Being overweight does not always mean having an excess in body fat. Professional athletes, for example, may have little body fat but may weigh more than others of their same height due to larger muscle mass. In the general population, however, being overweight and having an excess of body fat are usually coexisting conditions.

There are several methods commonly used to determine desirable weights for individuals and to define clinical obesity. One such method, exemplified by the Metropolitan Life Insurance tables, is based on population averages. These tables provide desirable weight ranges for women and men of different height and body frame sizes. The recommended weight ranges are based on weights that have been associated with greater longevity. This

method to determine desirable weight is fraught with problems, including the fact that the data were derived from purchasers of life insurance—not from a random cross-section of the U.S. population—and include the weight of clothes and shoes. Another significant problem with this method is that it does not account for degree of body fat, which is a factor that more accurately predicts propensity for weight-related disease.

The Body Mass Index (BMI), on the other hand, is highly predictive of degree of body fat and is the federally recommended measurement to classify overweight and obesity [39]. Table 6-14 illustrates how to find a person's BMI. BMI is calculated by dividing a person's body weight in kilograms by the square of his or her height in meters (kg/m^2) or by multiplying an individual's weight in pounds by 703 and then dividing by the height in inches squared ($lbs \times 703/in^2$). Table 6-15 shows BMI calculations in pounds and inches. Although exact cutoff values to define overweight and obesity are still being debated, research has clearly demonstrated that in adults, a BMI greater than 25 to 27 is associated with increased morbidity and mortality. At a BMI of 27, for example, the risk for diabetes and hypertension is three times greater than normal and the risk for high serum cholesterol level is two times greater than normal [5]. The most recent U.S. federal guidelines define overweight as a BMI of 25 to 29.9 and obesity as a BMI of 30 and above [35]. Table 6-16 provides classifications for BMI that can be used to assist in conjunction with BMI calculation to determine whether or not an individual is at an appropriate weight for his or her height.

A drawback of the BMI measurement is that it yields no information on the distribution of fat in the body, which is also an important determinant of health risk. Upper-body obesity, in which there is an excess of abdominal fat, is associated with increased risk of heart disease, hypertension, and diabetes [35]. This type of obesity is referred to as android obesity. Because progesterone encourages fat to accumulate preferentially in the lower body, women are less likely than men to develop upper-body obesity. This does not mean, however, that women are immune to upper-body obesity. There are two ways to assess excess abdominal fat. One is to perform a measurement of waist circumference. To do this, the clinician should use a tape measure to measure the distance around the smallest area below the rib cage and above the umbilicus. For women, a waist measurement greater than 35 inches (88 centimeters) is considered a predictor of risk factors and ailments associated with obesity [35]. Waist-to-hip ratio (WHR) is another way of assessing fat distribution. It is determined by dividing waist circumference by hip circumference. Hip circumference is obtained by measuring the distance around the largest extension of the buttocks. A WHR of 1.0 or greater is considered to be associated with an increased risk of adverse health consequences [40]. It should be noted that overall obesity is more closely related to increased risk of morbidity and mortality than either increased waist circumference or increased waist-to-hip ratio. These measurements should therefore be used in conjunction with BMI to evaluate an individual's risk for overweight and obesity related diseases. Furthermore, in individuals with a BMI ≥ 35 kg/m^2, waist circumference and waist-to-hip ratio add little to no predictive power for disease risk.

The National Institutes of Health recommends a ten-step approach for primary care providers in treating overweight and obesity:

1. Measure height and weight.
2. Measure waist circumference.
3. Assess comorbidities.
4. Determine whether a patient needs treatment.
5. Assess whether a patient is ready and motivated to lose weight.
6. Determine which diet should be recommended.
7. Determine and discuss a physical activity goal.
8. Review a weekly food and activity diary.
9. Provide the patient with literature on physical activity, behavioral change, and diet modification. Provide guidelines for food and activity diary.
10. Record the goals that have been set with the patient and follow up to assess progress on a regular basis.

These steps include body weight, height, and BMI assessments as well as an assessment of risk status and of daily food intake and physical activity. Behavioral, exercise, diet, pharmacological, and surgical interventions are then outlined based on an individual's risk profile and degree of overweight and/or obesity.

Much focus has been placed in the media and among the general population on the concept of calorie counting. Calories, kcalories, or kilocalories are a measure of the energy content in foods. One kilocalorie is the heat needed to raise the temperature of one kilogram of water by one degree Celsius. In general, caloric intake should be the same as

TABLE 6-14 Body Mass Index Chart

To calculate Body Mass Index (BMI), find the appropriate height in the column labeled "Height," then move across to a given weight. The number at the top of the column is the BMI at that height and weight. Pounds have been rounded off.

	Normal						Overweight					Obese										Extreme Obesity												
BMI	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**
Height (inches)	*Body Weight (pounds)*																																			
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172	177	181	186	191	196	201	205	210	215	220	224	229	234	239	244	248	253	258
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	212	217	222	227	232	237	242	247	252	257	262	267
60	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179	184	189	194	199	204	209	215	220	225	230	235	240	245	250	255	261	266	271	276
61	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185	190	195	201	206	211	217	222	227	232	238	243	248	254	259	264	269	275	280	285
62	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191	196	202	207	213	218	224	229	235	240	246	251	256	262	267	273	278	284	289	295
63	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197	203	208	214	220	225	231	237	242	248	254	259	265	270	278	282	287	293	299	304
64	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204	209	215	221	227	232	238	244	250	256	262	267	273	279	285	291	296	302	308	314
65	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240	246	252	258	264	270	276	282	288	294	300	306	312	318	324
66	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216	223	229	235	241	247	253	260	266	272	278	284	291	297	303	309	315	322	328	334
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230	236	242	249	255	261	268	274	280	287	293	299	306	312	319	325	331	338	344
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236	243	249	256	262	269	276	282	289	295	302	308	315	322	328	335	341	348	354
69	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236	243	250	257	263	270	277	284	291	297	304	311	318	324	331	338	345	351	358	365
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250	257	264	271	278	285	292	299	306	313	320	327	334	341	348	355	362	369	376
71	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250	257	265	272	279	286	293	301	308	315	322	329	338	343	351	358	365	372	379	386
72	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258	265	272	279	287	294	302	309	316	324	331	338	346	353	361	368	375	383	390	397
73	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265	272	280	288	295	302	310	318	325	333	340	348	355	363	371	378	386	393	401	408
74	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272	280	287	295	303	311	319	326	334	342	350	358	365	373	381	389	396	404	412	420
75	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279	287	295	303	311	319	327	335	343	351	359	367	375	383	391	399	407	415	423	431
76	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295	304	312	320	328	336	344	353	361	369	377	385	394	402	410	418	426	435	443

Source: Adapted from *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report.*

TABLE 6-15 Body Mass Index Calculations

$$\frac{\text{Weight in kilograms}}{(\text{Height in meters})^2}$$

$$\frac{\text{Weight in pounds} \times 703}{(\text{Height in inches})^2}$$

TABLE 6-16 Classifications for Body Mass Index (BMI)

	BMI
Underweight	<18.5 kg/m^2
Normal weight	18.5–24.9 kg/m^2
Overweight	25–29.9 kg/m^2
Obesity (Class 1)	30–34.9 kg/m^2
Obesity (Class 2)	35–39.9 kg/m^2
Extreme obesity (Class 3)	≥40 kg/m^2

Source: From National Institutes of Health—National Heart, Lung, and Blood Institute. *The Practical Guide to Identification, Evaluation, and Treatment of Overweight and Obesity in Adults*, 2000.

caloric output. Table 6-17 contains the general guidelines for caloric intake for moderately active women. It should be kept in mind that these recommendations are based on averages and are not the best indicator of individual caloric needs. Body frame size and amount of average physical daily activity are two of the many factors that can affect caloric needs (see Table 6-18). Dietary therapy, the cornerstone of treatment of overweight and obesity, aims at a moderate reduction in caloric intake to achieve a slow, progressive, weight loss of one to two pounds per week as well as modification in the composition of the client's diet to minimize risk factors for disease. A reduction in caloric intake of 500 to 1000 calories per day from a woman's current level is usually sufficient to achieve the desired weight loss. Moderate caloric reduction is usually all that is necessary although in some cases more marked reduction may be necessary. During the period of active weight loss, it may be necessary to drop daily caloric intake to a level that is lower than what will be needed to maintain desired weight level. For women, this usually means a diet containing 1000 to 1200 kcal/day. The level of caloric intake should not be too low (less than 800 kcal/day is too low), and the overall goal should be to aim for the target caloric intake that will be required to maintain weight at a desired level. Individuals planning to start calorie-cutting diets should first consult with a dietician to assess caloric needs and to determine what level of calorie restriction is safe. Practitioners should keep in mind that women who are pregnant, lactating, or acutely ill should not be placed on diets that restrict calories.

TABLE 6-17 General Guidelines for Caloric Intake for Moderately Active Females

- 11 to 18 years of age: 2200 calories/day
- 19 to 24 years of age: 2100 calories/day
- 25 to 50 years of age: 2300 calories/day
- 51 years of age or older: 1900 calories/day
- Pregnant women (second and third trimesters): Add 300 calories/day
- Nursing mothers: Add 500 calories/day

TABLE 6-18 Factors Affecting Necessary Caloric Intake

- Body size
- Age
- Height
- Weight
- Activity level/Base Metabolic Rate (BMR)
- Pregnancy status
- Lactation status

In addition to diet therapy, a woman will need a physical activity regimen, behavioral therapy, and sometimes pharmacotherapy or surgery to achieve the necessary weight loss. The midwife who determines that a woman needs to be placed on a low calorie diet or on medications for weight loss should consult with or refer the woman to a dietician or physician. Consultation or referral is always indicated in the case of women who are extremely obese, those who need a very low calorie diet, or those who have untreated or uncontrolled comorbidities such as hypertension or diabetes.

Cardiovascular Disease

Coronary heart disease (CHD) and stroke, the two leading causes of death among American women, kill more women than all forms of cancer combined [22, 41]. Nonetheless, a U.S. Gallup poll found that only 4 percent of women perceive heart disease as a major health threat while 46 percent perceived that breast cancer posed the most significant threat to their health [42]. Midwives should educate women about the fact that coronary heart disease and stroke are important women's health issues and help their clients, particularly those at higher risk

for these diseases, learn ways to prevent these conditions from developing.

It has been demonstrated that lifestyle changes, including changes in diet, can significantly reduce the risk of developing coronary heart disease or complications from the same. Nutritional interventions, along with smoking cessation, exercise, and treatment of hypertension, hypercholesterolemia, and diabetes, form the cornerstone of CHD prevention [43]. As was detailed in earlier sections of this chapter, research data have demonstrated that upper body obesity, elevated serum triglycerides, and low levels of high-density lipoproteins (HDLs) are all strongly associated with increased risk of heart disease in women. Recent studies also suggest that the type of fat consumed may have a larger effect on risk of CHD than the amount of fat consumed. In particular, the Nurses' Health Study found that replacing saturated and transunsaturated fats with unhydrogenated monounsaturated and polyunsaturated fats is more effective in preventing CHD than reducing overall total fat intake [11]. Transfatty acids are believed to have a particularly negative impact on serum lipid profile by raising bad cholesterol and lowering the good cholesterol. Findings from the Nurses' Health Study also support earlier research evidence that a high intake of whole grains especially soluble fiber reduces blood lipids and the risk of heart disease [44]. Other nutrients that have shown some promise in reducing the risk of heart disease include vitamin E, omega-3 fatty acids found in certain fish, folate, and vitamins B_6 and B_{12} [22].

Menopause, specifically the loss of estrogen, causes negative changes in a woman's serum lipid profile (elevation in LDLs and triglycerides and lowering of HDL). These findings led many clinicians to recommend hormone replacement therapy (HRT) to women in order to prevent coronary heart disease. Results from the Women's Health Initiative (WHI) study on estrogen/progestin replacement, the largest randomized controlled study on the subject, suggests that, contrary to what was previously thought, HRT does not reduce nonfatal heart attacks or coronary heart disease–related deaths [27]. While WHI researchers did not find an increase in the number of cardiovascular-related deaths among women using HRT, there was an increase in the rates of coronary heart disease, breast cancer, stroke, and pulmonary embolism in the group receiving HRT as compared to the group receiving a placebo. HRT, therefore, is currently no longer recommended for the purpose of secondary prevention of CHD.

In summary, there are several ways in which nutrition is related to cardiovascular disease risk. Certain nutrients seem to have a direct effect on the risk of heart disease by causing alterations in lipid profiles and by serving as antisclerotic and antioxidizing agents. Proper nutrition also helps to reduce the rates of obesity and diabetes, both of which are risk factors for cardiovascular disease. In conjunction with smoking cessation and exercise, proper nutrition is a key component of cardiovascular health in both men and women.

Cancer

Cancer is the second leading cause of death among American women, with lung cancer ranking as the main cause of cancer-related mortality in women, followed by breast and colorectal cancers [1]. Smoking cessation is the single most important step to reduce lung cancer, which is therefore not considered a nutritionally related cancer. However, research has implicated diet in the etiology of both breast and colorectal cancers.

Breast Cancer

Although it has been established that a family history of breast cancer, early menarche, late menopause, and nulliparity are risk factors for the development of breast cancer, the role of nutrition in the etiology of breast cancer is not as clear. There are a series of nutritionally mediated factors that are believed to increase risk of breast cancer but for which the data are inconclusive. There has been significant controversy, for example, on whether high fat intake and breast cancer are related. The most recent studies on the subject from the Nurses' Health Study did not find a direct correlation between high fat intake or type of fat intake and breast cancer rates [45, 46]. However, among the same women, fat intake—in particular, fat from meats—was found to be strongly associated with colon cancer, suggesting that fat is indeed a carcinogen [47, 48]. It appears, however, that although there may not be a direct link between dietary fat and breast cancer, there may be an indirect effect of fat on breast cancer rates through an increase in body weight. It appears that among premenopausal women there exists an inverse relation between obesity and breast cancer, while in

postmenopausal women, higher BMI is associated with increased risk of breast cancer [49]. This is likely due to the fact that in postmenopausal women, estrogens, which are associated with development and progression of breast cancer, are synthesized from androgens in adipose tissue. In fact, when obesity and fat intake were considered together in one study, there was an association between obesity and breast cancer that was independent of fat intake [50].

While the exact relationship between dietary fat and breast cancer risk remains unclear, it has been clearly demonstrated that diets high in fruits and vegetables are protective against breast cancer. Although it is not yet possible to say with absolute certainty what specific chemicals in fruits and vegetables offer this protective effect, research evidence points to vitamins and vitamin precursors such as carotenoid [51, 52]. Fruits and vegetables also contain fiber, which is believed to offer protection against breast cancer by binding estrogen in the intestine and removing it from circulation [53]. Studies have also demonstrated that women with greater dietary intakes of vitamins A, C, and E, as well as fiber, have a reduced risk of premenopausal breast cancer [54]. It should be noted, however, that a large intake of these vitamins as supplements does not appear to protect against breast cancer in women whose requirements of these vitamins are met through an appropriate diet.

Alcohol intake is also thought to increase the risk of breast cancer. A meta-analysis of research data on the subject has revealed a 30 to 40 percent higher risk of breast cancer in women who consumed 30 grams of alcohol daily (the equivalent of 1.5 ounces of spirits, 1.5 glasses of wine, or 2 cans of beer) than in those who are nondrinkers [55].

Colorectal Cancer

As discussed in the section on carbohydrates earlier in this chapter, recent studies suggest that dietary fiber may not offer the protection against colorectal cancer once believed [9]. However, diets rich in fruits, vegetables, and fibers should nonetheless be encouraged because substances other than fiber found in these foods such as alpha and beta-carotene, terpineol, and lycopene are believed to offer protection against colorectal cancer [56]. Folate and fish oils may also be protective against colorectal cancer. Conversely, high intakes of fat and saturated fat, especially those found in meats, have been found to increase the risk of cancer of the large intestine [57, 58]. There is increasing research evidence that alcohol intake also increases the risk of colorectal cancer [59].

Reproductive Tract Cancers

There are several nutritionally related factors believed to be associated with the etiology of cervical, endometrial, and ovarian cancers. In particular, it appears that diets rich in folate, vitamin C, and carotenoids are protective against these gynecological cancers [22]. Studies also suggest that high total fat consumption, especially of animal-derived fat, increases the risk of endometrial cancer, [60] while complex carbohydrates seem to reduce the risk [61, 62]. High fat and low fiber intake also appear to increase the risk of ovarian cancer [63].

Diabetes

Every year, about twice the number of women who die from breast cancer die of complications related to diabetes mellitus. This disease, characterized by abnormal glucose metabolism, is the seventh leading cause of death in the United States [1]. The relationship between diabetes and nutrition is extensive and complex. The risk factors for Type II diabetes, which accounts for 90 to 95 percent of diagnosed cases of diabetes, include obesity, central adiposity, impaired glucose tolerance, and dyslipidemia [64]. Nutritional interventions are therefore key elements of treatment for diabetes, along with exercise and glycemic control through diet and/or medications.

Due to the advent of insulin and oral glucose-lowering medications, the extreme dietary carbohydrate restrictions that have historically characterized nutrition therapy for diabetes are no longer necessary. On the other hand, it is impossible to achieve optimal glycemic control, the main goal of therapy to minimize complications from diabetes, without dietary modifications. It can generally be said that nutritional therapy for diabetes should aim at achieving a healthy weight, controlling total energy intake, and lowering fat intake. Research has demonstrated, however, that blanket recommendations for carbohydrate and fat intake are not as effective in producing tight glycemic control as are guidelines created (preferably by a registered dietician) to meet the individual age, size, weight, physical activity level, cultural, economic, and comorbidity characteristics of each patient [65].

Nutrition, the Menstrual Cycle, and Fertility

Nutrition affects and is affected by the menstrual cycle. Studies suggest that caloric intake varies during the menstrual cycle, peaking once in the luteal phase and once in the follicular phase, and reaching a nadir during ovulation and menses [66]. Average caloric intake during the luteal phase is higher than during the follicular phase [66]. These changes are thought to coincide with cyclical fluxes in a woman's base metabolic rate (BMR).

Extremes in body weight have been shown to reduce fertility. Although threshold levels for weight or percentage body fat above or below which normal menstrual cycling is disrupted have not been clearly identified, various studies have demonstrated that marked weight loss, particularly quick weight loss, often lead to anovulation and amenorrhea. Similarly, women whose body fat percentage is low and who are at less than 80 to 87 percent of Ideal Body Weight (IBW) have been shown to become amenorrheic [67]. It is believed that this dysfunction is related to disruption of normal hypothalamic function, which leads to abnormal secretion of gonadotropin-releasing hormone (GnRH). Obesity (defined as a BMI of 27 or greater) has also been associated with anovulation [68]. This effect is most likely if weight gain occurs quickly. Once more, it is believed that changes in a woman's hormone milieu triggered by obesity, including an increase in androgen levels, lead to hypothalamic dysfunction.

Adolescence

Adolescence (defined here as ages 11 to 21) is a time of such significant increase in the need for energy and nutrients that nutrition issues of adolescence merits its own section in this chapter and the special attention of midwives who care for these young women. Adolescence marks the life-cycle period of highest total nutritional needs and a period of physical growth second only to that which occurs during the first year of life. During the adolescent years, individuals gain 50 percent of their adult body weight and up to 40 percent of their adult skeletal mass [69]. Inadequate nutrition during this time can therefore have long-term consequences by compromising peak bone mass, stunting growth, and delaying sexual maturation. Furthermore, adolescence is a time of increased concern over weight gain and appearance, especially among teenage girls. Independent eating habits develop during this stage as teens spend more time (including more mealtimes) outside the home. During this stage, peers often have a greater influence on eating behavior than do parents. These factors all place teens at a higher risk for developing unhealthy eating habits, including eating disorders.

One issue of particular concern among this population is inadequate intake of minerals and vitamins. National surveys reveal that American adolescent girls consume inadequate amounts of iron, calcium, magnesium, phosphorous, and zinc. These surveys also demonstrated intakes of vitamin A, vitamin E, vitamin B_6, and folate below recommended dietary allowances [21]. The importance of adequate calcium intake during adolescence is addressed earlier in the chapter as is iron deficiency and iron deficiency anemia. In addition to inadequate vitamin and mineral intake, adolescent diets in the United States are also characterized by high total fat consumption, high intake of saturated fats, sodium, cholesterol, and refined sugars and by low intake of fiber, fruits, and vegetables. Of particular significance is the fact that many teenage girls stop drinking milk at the very time that their need for calcium is at its peak [70].

Health professionals should include a nutritional assessment in the care plan of their adolescent patients. This assessment should include body height and weight measurements to determine if a teenager is either suffering from, or is at risk for, either low weight or overweight. Adolescents below the third percentile for height and either below 5 percent or above 85 percent of their normal BMI need further evaluation. The health of skin, nails, hair, and teeth should be assessed—discoloration or brittleness of these body tissues often signal nutritional deficiencies and/or eating disorders. Adolescent females should be screened every five to ten years for iron deficiency anemia, and teenage girls at high risk for anemia (for example, pregnant or substance-abusing teens or those living in a situation of neglect or abuse) should receive yearly screening. The midwife can play a key role in educating teens (and their parents when applicable) about normal growth and about growth measurements and preparing teens for the changes in physical appearance that are

normal and expected during adolescence. The midwife can also provide reassurance to the adolescent client of the normalcy of fat accumulation during adolescence, particularly in the thighs, hips, and buttocks [69].

Healthy eating behaviors should be discussed and encouraged with particular attention to meeting the increased energy and nutrient requirements of adolescence. Teenage girls need to be reminded of the increased need for calcium and iron, and examples of dietary sources of these nutrients should be provided. The importance of physical activity should be reinforced and the harmful effects of tobacco, alcohol, and other substance abuse reviewed. Adolescent females, particularly those who are sexually active, need to be told of the need for adequate folic acid intake to protect against birth defects in the event of pregnancy. The midwife should continuously evaluate teenagers in their care for the signs of unhealthy eating habits and for the signs and symptoms of eating disorders, keeping in mind that the most common ages for onset of eating disorders are 13 to 14 and 17 to 18 years [71]. Pregnancy also puts adolescents at increased nutritional risk, and it is crucial that midwives caring for pregnant adolescents conduct a thorough nutritional evaluation of all pregnant adolescents and/or refer them for a nutrition consult with a registered dietician.

In summary, the midwife who cares for adolescents must conduct an ongoing evaluation of these young women's nutritional status and provide guidance that facilitates the adoption of healthy eating behaviors. The midwife must stress that habits developed during the teenage years are likely to affect lifelong eating practices, and that several nutritionally related disease processes such as obesity, osteoporosis, and arteriosclerosis can start during adolescence. The midwife must then provide teenagers with concrete and realistic examples of how to improve their diets. However, because it is often hard for them to think beyond the here and now, it is especially important when working to change adolescent eating habits to highlight the immediate benefits of a nutritious diet, such as increased ease in maintaining a healthy weight and the healthier appearance of skin, hair, and teeth. Finally, the midwife must make adequate referrals for evaluation by a physician of adolescents suffering from nutritional disorders, including obesity, eating disorders, and profound nutritional deficiencies such as iron deficiency anemia.

Nutrition During Menopause and Beyond

Changes in nutritional needs are among the many changes that accompany aging. Energy requirements decrease with advancing age while, paradoxically, macronutrient needs stay the same or increase. The decrease in energy requirements seen with advancing age is believed to be due mostly to a reduction in the amount of metabolically active tissue in the body, a reduction in general physical activity, and altered hormone production [72].

While prospective studies show that many women experience an increase in weight and in abdominal and total fat as they age, these changes are often wrongly attributed to menopause [73]. Among perimenopausal women, age, genetics, and physical activity appear to be the largest determinants of the total amount of body fat. There is evidence, however, that the estrogen deficiency that accompanies menopause may contribute to redistribution of fat to the abdominal area, a factor that increases the risk for heart disease, diabetes, and hypertension [74, 75]. A diet low in fat and regular participation in physical activity can slow this process.

As was discussed earlier in this chapter, there is a marked decline in bone density and a concomitant vulnerability to osteoporosis among women following menopause. Osteoporosis is defined as a bone mineral density (BMD) value that is more than 2.5 standard deviations below that of an average young adult [76]. While the most important step in preventing osteoporosis is to maximize peak bone mass during adolescence and early adulthood, there is general consensus that adequate calcium intake, especially when coupled with adequate intake of vitamin D and weight-bearing exercise during the postmenopausal years, can help to maintain bone density. Experts recommend 1500 mg of calcium per day for postmenopausal women who are not taking estrogen and 1000 mg per day for those who are. Dietary sources of calcium are preferred, but calcium supplementation is also effective.

In the 1990s, phytoestrogens—plant compounds similar in chemical structure to estrogen—received much attention in the media due to studies that seemed to suggest that these substances could relieve menopausal symptoms and possibly help prevent breast cancer, osteoporosis, and cardiovascular disease in postmenopausal women and could therefore be used as an alternative to hormone replacement therapy (HRT). More recent research, however, challenges many of these earlier findings

and suggests caution when recommending phytoestrogen-rich foods to women at risk for breast cancer [77, 78]. While some research seemed to suggest that isoflavonoids—phytoestrogens found in soy-based foods—were related to reduced breast cancer risk [79], further research seems to suggest that this protective effective may be due to other nutrients, such as fiber, found in the phytoestrogen-rich foods under investigation [80, 81]. Moreover, it has been demonstrated that the phytoestrogens found in soy can cause breast cell hyperplasia and may increase the risk for breast cancer in women at high risk for developing estrogen-sensitive cancers [82]. Until clearer information is available, concentrated phytoestrogens, such as those found in supplements, should be avoided by women with breast cancer, women at high risk for developing breast cancer, and women taking tamoxifen [83]. Furthermore, while a diet that includes a variety of phytoestrogen-rich foods such as legumes, vegetables, and grains should be encouraged, concentrated phytoestrogen supplements are not currently a medically recommended alternative to hormone replacement therapy.

Midwives caring for menopausal and postmenopausal women should include a nutritional assessment as part of their well-woman visits. Special attention must be paid to determining whether there is adequate intake of necessary nutrients and to screen for signs and symptoms of nutrient deficiency—especially of calcium, iron, zinc, and vitamins D, B_6, B_{12}, E, and C. It is important to counsel women on the fact that they cannot rely on supplements to adequately meet their nutrient needs. Midwives must keep in mind other factors, such as illness, social isolation, or medication regimes that may interfere with adequate nutrition among individuals in this population. After assessing the client's nutritional needs, the midwife can then help design a varied diet for these women that avoids foods with "empty" calories—i.e., foods that are calorie rich but nutrient poor. Women with certain nutritionally related medical problems that are more common with increasing age—for example, hypertension, hypercholesterolemia, Type II diabetes, and kidney failure—may benefit from a nutritional consult with a registered dietician. Elderly women—particularly those who are mostly homebound, living alone, or socially isolated—may also need a social work referral so that they can learn about and enroll in special nutrition programs such as home-delivered or congregate meal plans targeted at this population.

Eating Disorders

Eating disorders are complex, nutritionally related psychiatric conditions that disproportionately affect women. Approximately 90 to 95 percent of cases of eating disorders occur among adolescent girls and young adult females [84]. While anorexia nervosa and bulimia nervosa are commonly described as discrete entities, in actuality there is extensive overlap between these conditions. Research suggests, for example, that up to 50 percent of women with a diagnosis of anorexia nervosa will eventually develop bulimic symptoms [5]. The latest edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) recognizes this overlap and categorizes anorexia nervosa and bulimia nervosa (and more recently, binge eating) as subtypes of a larger entity of disordered eating [85]. The term "nervosa" serves to differentiate these disorders from anorexia and bulimia of nonpsychiatric origin.

The DSM-IV also provides diagnostic criteria for both anorexia nervosa and bulimia nervosa that are outlined in Tables 6-19 and 6-20. These clearly delineated diagnostic criteria belie the complex eti-

TABLE 6-19 DSM-IV Criteria for the Diagnosis of Anorexia Nervosa

- Refusal to maintain body weight at or above a minimally normal weight for age and height (e.g., weight loss leading to maintenance of body weight less than 85% of that expected; or failure to make expected body weight gain during period of growth, leading to body weight less than 85% of that expected).
- Intense fear of gaining weight or becoming fat, even though underweight.
- Disturbances in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or denial of the seriousness of the current low body weight.
- In postmenarcheal females, amenorrhea (the absence of at least three consecutive menstrual cycles).

Specific Type

- *Restricting type:* During the current episode of anorexia nervosa, the person has not regularly engaged in binge-eating or purging behavior (i.e., self-induced vomiting; misuse of laxatives, diuretics, enemas).
- *Binge eating/purging type:* During the current episode of anorexia nervosa, the person has regularly engaged in binge eating or purging behavior (i.e., self-induced vomiting; misuse of laxatives, diuretics, enemas).

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TABLE 6-20 DSM-IV Criteria for the Diagnosis of Bulimia Nervosa

- Recurrent episodes of binge eating. An episode of binge eating is characterized by the following:
  - Eating, in a discrete period of time (e.g., within any two-hour period) an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances.
  - A sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating).
- Recurrent inappropriate compensatory behavior in order to prevent weight gain, such as self-induced vomiting; misuse of laxatives, diuretics, enemas, or other medications; fasting; or excessive exercise.
- Binge eating and inappropriate compensatory behaviors both occur, on average, at least twice a week for three months.
- Self-evaluation unduly influenced by body shape and weight.
- The disturbance does not occur exclusively during episodes of anorexia nervosa.

Specific Types

- *Purging type:* The person regularly engages in self-induced vomiting or the misuse of laxatives, diuretics, or enemas.
- *Nonpurging type:* The person uses other inappropriate compensatory behaviors, such as fasting or excessive exercise, but does not regularly engage in self-induced vomiting or the misuse of laxatives, diuretics, or enemas.

Source: Reprinted with permission from the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, Text Revision. Copyright 2000 American Psychiatric Association.

ology of these disorders. Disordered eating appears to be a manifestation of an interaction of biologic, sociocultural, and psychological factors. Persons suffering both from anorexia and bulimia nervosa are more likely to have family histories of affective disorders, and they are more likely than individuals from the general population to have first-degree relatives who have also suffered/are suffering from eating disorders [86]. Anorexia nervosa seems to be associated with dysregulation of the hypothalamic-pituitary-adrenal axis. Similarly, bulimia is associated with a dysregulation in the serotonin-mediated satiety regulation. It is unclear, however, whether these imbalances are the cause or the result of these eating disorders. There are similar psychological factors associated with both anorexia and bulimia nervosa. These include low self-esteem, fear of loss of control, perfectionism, and conflict-resolution problems within the family. Finally, sociocultural factors, especially the cultural push for thinness, are cited as etiological factors for eating disorders. A now famous study demonstrated that in the last couple of decades the average bust and hip size of Miss America pageant winners has decreased while the weight of the average American woman has increased by five pounds [87]. All these factors are believed to interact in a manner that predisposes certain individuals to develop dissatisfaction with their body size and begin on a cycle of dietary restraint and eventual eating disorders.

Although these eating disorders can be seen in individuals of all ages and race and in either gender, the most likely "portrait" of the person with an eating disorder is that of a young (usually under 30, although onset is most common during adolescence), white (approximately 90 percent), woman (approximately 95 percent) of normal intelligence. The prevalence of anorexia nervosa is believed to be between 0.7 and 1 percent while prevalence of bulimia nervosa is cited as 4 to 10 percent, with some estimates as high as 20 percent [86].

Due to the extremely complex etiology of eating disorders, successful treatment requires a multidisciplinary effort by a team of health professionals, preferably with special training in the field. Treatment usually includes a correction of nutritional deficits, psychotherapy, and nutritional counseling. The role of the midwife in addressing eating disorders is primarily to be able to recognize the signs and symptoms of these disorders (see Table 6-21) and to make appropriate consultations and referrals for medical management. The referring midwife can serve as the liaison

TABLE 6-21 Signs and Symptoms of Eating Disorders

Anorexia	Bulimia
Severe weight loss, emaciation	Near normal weight in most cases
Acceptance of appearance as normal	Dizziness
Poor sleep habits	Fainting
Cold intolerance	Increased thirst
Constipation	Muscle cramps
Anemia (mild)	Constipation
Restlessness/Sleep disturbance	Tooth damage, loss of enamel
Pale, dry skin	Reflux esophagitis
Loss of scalp and pubic hair and/or lanugo	Petachiae in and around eyes
Brittle, dry nails	
Tooth disease/decay	

between the woman, family, and various health care providers and should also serve as the woman's advocate, but medical consultation is always indicated for confirmed cases of eating disorders.

Nutrition and Vegetarianism

In the last several decades, an increasing number of individuals have adopted vegetarian eating styles. There is a variety of reasons why people choose to become vegetarians, and about as many different styles of vegetarians. Some people believe it is unethical to kill animals for food or clothing. Others believe that animals present an inefficient and environmentally unsound way to meet human protein needs. Still others practice some form of vegetarianism to maintain cultural or religious beliefs. In the United States, many individuals choose to restrict their intake of animal products for health reasons. Regardless of the reason why someone has chosen a vegetarian style of eating, it is important for health care providers to assess whether or not vegetarian clients are meeting all their nutritional needs. Part of this assessment is determining the degree of dietary limitation. Vegans limit their nutritional intake to foods derived from vegetables, fruits, cereal grains, and nuts, avoiding all animal products. Lacto-ovo-vegetarians incorporate eggs and dairy products in their diets [5].

Health care providers often extol the benefits of a diet that limits intake of meat and animal fat without providing proper guidance on how to ensure proper nutrition from a vegetarian diet. The fact that several government nutritional guidelines such as the USDA's Food Pyramid presuppose that individuals are omnivores, makes it especially important for health care professionals to provide clients with ways to healthfully incorporate a diet that is mainly plant-based.

As was detailed in earlier sections of this chapter, reducing or eliminating meat intake reduces the risk of developing many chronic diseases by reducing caloric, fat, cholesterol, and sodium intake. Vegetarian diets are richer in fiber, complex carbohydrates, and substances such as antioxidants that are also believed to reduce the risk of many chronic diseases. It is important, however, for individuals who wish to adopt a vegetarian eating style, especially those who have little knowledge of nutrition, to have guidance in ensuring that their diet meets their nutritional needs. There are certain nutrients that are more likely to be deficient in vegetarian diets. Particular attention needs to be paid to ensure adequate intake of calcium, iron, zinc, and vitamins D and B_{12} [88]. This is especially true for those choosing a vegan eating style, for adolescents, and for women who are pregnant, lactating, elderly, or ill. These individuals also need to pay special attention to maintaining adequate protein intake. Because individual plant foods do not provide complete proteins, special meal planning is necessary to ensure a mix of grains and legumes that will provide the essential amino acids. The assistance of a registered dietician is especially helpful when conducting nutritional assessment or counseling with these women. The midwife can also recommend that vegetarian clients consult vegetarian cookbooks, the Seventh Day Adventist Dietetic Association Guide, or another resource tailored to the needs of vegetarians. In addition to proper meal planning, nutritional supplements or the addition of fortified foods may also be necessary, particularly in times of "nutritional stress" such as illness.

Nutrition and the Female Athlete

Female athletes are another population at higher risk for nutritional deficiencies and eating disorders [89]. Due in great part to rapid weight loss, dietary restrictions, and significant decreases in body fat that often accompany athletic training and competition, these women are also more prone to dehydration, menstrual dysfunction, osteoporosis, and anemia [90]. Yeager et al. coined the term "female athlete triad" to describe the concurrence of disordered eating, amenorrhea, and osteoporosis seen in many female athletes [91]. Midwives might care for these women when they come in for annual exams or for workups of amenorrhea or infertility. It is important, therefore, for midwives to be aware of this triad so that they can recognize clients who may be suffering from or prone to these conditions and take appropriate steps to either prevent these disorders or obtain appropriate treatment for these women.

Individualized nutritional guidance should be provided for female athletes by registered dieticians or by physicians who are knowledgeable in the field. Many women receive nutritional counseling from their coaches and trainers, but this counseling may not always be accurate or given with the best interest of the woman in mind. As with all clients, the midwife must carry out an assessment of the basic nutritional status of women who are athletes, and carry out appropriate referrals or consultations.

Alcohol and Nutrition

Alcohol abuse or alcoholism negatively impacts nutrition in two general ways: (1) by decreasing the quantity and quality of food intake and (2) by interfering with digestion, storage, metabolism, and excretion of essential nutrients. As a result of this combination of poor diet, decreased nutrient absorption, and disruption in liver function, alcoholics may experience deficiencies of thiamin, riboflavin, niacin, and folate as well as vitamins B_6, B_{12}, C, A, D, and K. Wernicke-Korsakoff syndrome, which is characterized by paralysis of the eye muscles, poor muscle coordination, impaired memory, and damaged nerves is common among chronic alcoholics and results from inadequate intake and absorption of thiamin. Heavy drinkers who substitute alcohol for their normal food intake can also suffer from protein-energy malnutrition. Long-term alcohol abuse can lead to cirrhosis of the liver, a progressive disease in which there is fatty infiltration of liver tissue and a resulting disruption in liver function. Approximately 50 percent of those individuals with cirrhosis will eventually die of the disease [92]. While the liver is particularly vulnerable to the toxic effects of alcohol, virtually every body system is also affected. There is a link between chronic alcohol use and increased rates of arthritis; cancers of the liver, pancreas, rectum, breast, mouth, pharynx, larynx, and esophagus; fetal abnormalities; heart disease; hypergylcemia; hypoglycemia; infertility in both men and women; kidney disease; neuropathy; obesity; and depression [93]. There can also be significant adverse consequences of single-episode intoxication or binge drinking, including lethal respiratory depression, coronary artery spasm, and myocardial infarction as well as motor vehicle and other accidents, suicide, homicide, and sexual assault.

Midwives should assess alcohol intake with both their pregnant and nonpregnant clients and educate them about both the short-term and long-term effects of alcohol abuse. Pregnant women should be informed about fetal alcohol syndrome and reminded that there is no level of alcohol consumption that has been determined as safe during pregnancy. In addition to asking women whether or not they consume alcohol and in what frequency and quantity, midwives can use the CAGE Questionnaire (see Table 6-22) or the TWEAK Questionnaire (see Chapter 12) to screen for alcohol dependence. If the midwife suspects or confirms that a woman has an alcohol dependence, arrangements should be made for appropriate treatment and counseling.

TABLE 6-22 CAGE Alcoholism Screening Questionnaire

C Have you ever felt you need to **C**ut down on your drinking?
A Have people **A**nnoyed you by criticizing your drinking?
G Have you ever felt bad or **G**uilty about your drinking?
E Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover (**E**ye-opener)?

Source: Mayfield, D., McLeod, B., and Hall, P. The CAGE questionnaire: validation of a new alcoholism instrument. *Am. J. Psych.* 131:1121–1123, 1974.

A positive answer to any one of these questions warrants further investigation and more than one positive answer is highly indicative of an alcohol abuse problem.

Nutritional Guidelines

There are numerous resources that offer nutritional guidelines, however, both midwives and their clients need to be careful not to follow nutritional advice that may not be research-based or medically sound. For example, there are many Web sites that claim to offer nutritional advice but are actually just fronts for private companies peddling the latest fad diet or diet pills and tonics.

In 2000, the Office of Disease Prevention and Health Promotion of the Department of Health and Human Services in conjunction with the USDA's Center for Nutrition Policy and Promotion released the most recent General Dietary Guidelines for Americans. These guidelines have been published since 1980 and are revised every five years by law based on the recommendations from a scientific advisory group composed of 11 nongovernmental experts. These latest guidelines are grouped within three areas called the "ABCs" of good health: (1) *Aiming* for fitness by aiming for a healthy weight and being physically active each day; (2) *Building* a healthy base by using the Food Pyramid (Figure 6-1) to guide food choices, choosing a variety of grains, fruits, and vegetables daily, and by keeping food safe to eat through proper food preparation and storage; and (3) *Choosing* sensibly by choosing a diet that is low in saturated fat and cholesterol and moderate in total fat, choosing beverages and foods to moderate intake of sugars, choosing and

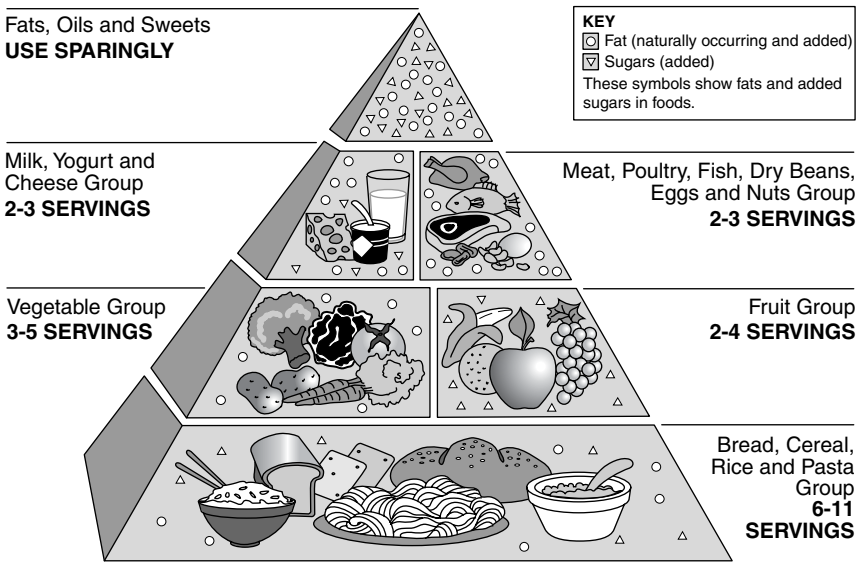

FIGURE 6-1 U.S. Department of Agriculture's Food Pyramid.
Source: USDA and the U.S. Department of Health and Human Services, 1992.

preparing foods with less salt, and moderating intake of alcoholic beverages.

While most components of these guidelines enjoy support from health and nutrition experts, the use of the USDA's Food Pyramid to guide food choice remains controversial. Many health professionals believe that the Food Pyramid, which was released in 1992, is a great improvement over the preexisting model of four food groups of equal weight: (1) meat, poultry, fish; (2) grains; (3) dairy; (4) fruits and vegetables. Some of these same professionals feel, however, that the Food Pyramid is nonetheless still flawed. They argue that the USDA, due to pressure from meat and dairy lobbying groups, still places too high a focus on meat and dairy products [94]. In 1991, the Physicians Committee for Responsible Medicine proposed a redefinition of the main food groups as (1) fruits, (2) grains, (3) vegetables, and (4) legumes. They proposed that meat and dairy be optional and that servings from these two groups should, in any case, be smaller than those proposed by the government. These proposed changes were based on research data that demonstrate that the American diet, which is high in animal fat and protein and low in fiber, increases the risk of obesity, cancer, and heart disease. More recently, Dr. Walter Willett, chair of the Harvard School of Medicine Department of Nutrition and one of the lead researchers for the Nurses' Health Study, has proposed the adoption of a new, research-based food pyramid (Figure 6-2). Dr. Willett argues that the USDA Food Pyramid is flawed in that it treats all fats as equally bad, all complex carbohydrates as equally good, and all proteins as equal in nutritional value. Furthermore, he believes that it promotes too high an intake of dairy products [95].

While the USDA dietary guidelines and approved health claims for food packaging have been continuously updated to incorporate new research findings, the Food Pyramid has not. As a result, some of these guidelines and claims seem to contradict the USDA Food Pyramid. It is not surprising, therefore, that the public is often confused about what foods they should choose to maintain good health. In general, the midwife should help women assess whether their current diet is appropriate to ensure adequate intake of all necessary nutrients while maximizing intake of foods, such as fruits and vegetables, that promote health and minimizing those, such as saturated fats, that promote disease. The section below includes a more detailed summary of research-based dietary guidelines and screening recommendations that can be used by midwives when conducting nutritional evaluation, education, and counseling.

Women should be reminded that proper nutrition begins with exclusive breastfeeding starting, if it is not medically contraindicated, in the first few hours after birth and continuing through five to six months of life before supplemental foods are introduced. It is also essential to stress that healthy eating habits begin in infancy and are reinforced through childhood and adolescence. Parents should

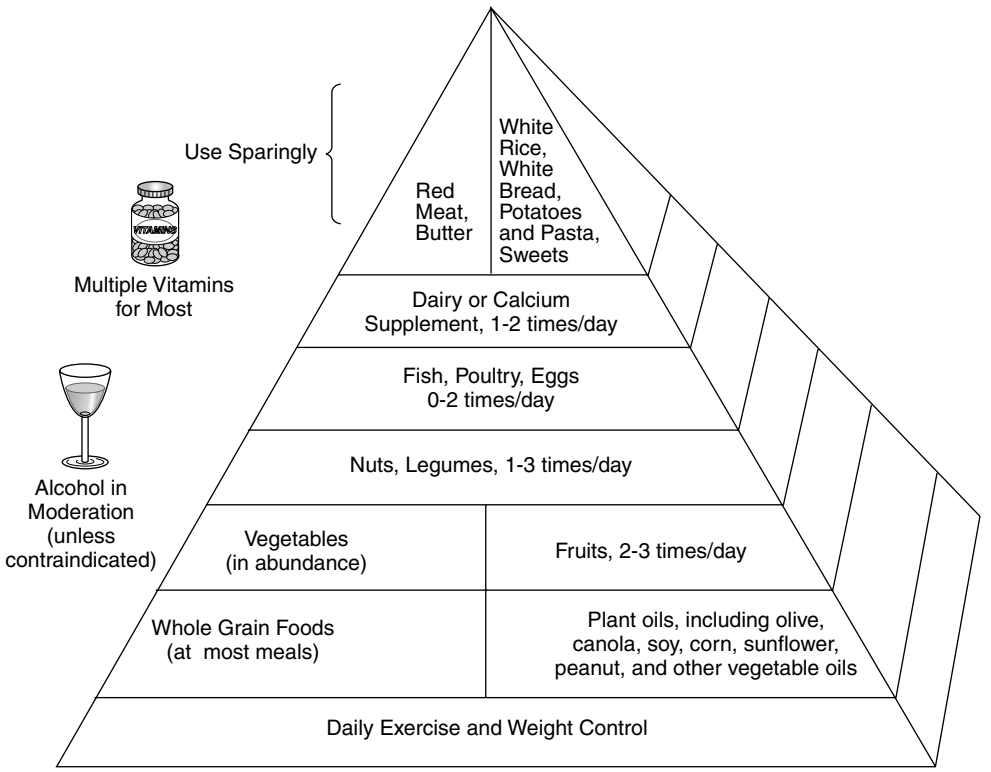

FIGURE 6-2 Dr. Walter Willett's Food Pyramid.

Source: Reprinted with permission of Simon & Schuster Source, a division of Simon & Schuster Adult Publishing from *Eat, Drink, and Be Healthy* by Walter C. Willett, M.D. Copyright © 2001 by the President and Fellows of Harvard College.

be aware that one of the best ways to ensure that their children eat appropriately is to eat appropriately themselves. This guarantees that the proper foods will be available in the home and that their children have a positive model to imitate. Proper nutrition requires planning and knowledge of what constitutes a healthy diet. Midwives can provide essential education on these topics to their clients both as part of their routine well-woman care visits and their prenatal and postpartum care. Midwives should also provide nutritional advice that will help women prevent nutritionally related disorders and certain chronic diseases. This advice should include the following:

- Eat a variety of foods and strive to obtain most if not all of necessary nutrients from dietary sources rather than from supplements. You can use one of the food pyramids discussed earlier (Figures 6-1 and 6-2) as a guide on what proportions of each food group you should strive to consume daily. Remember that not all foods are of nutritional value. Sugars, sweets (soft drinks, candies, cakes, and cookies), some types of oils, foods high in saturated fats (cream, lard, butter), and alcoholic beverages supply what are often referred to as "empty" calories for they are of little or no nutritional value.
- Eat a diet that provides a healthy balance of nutrients. Regardless of the actual number of calories required by an individual, it is recommended that for a healthy, nonpregnant, and nonlactating woman, approximately 15 percent of total energy intake be in the form of protein, at least 55 percent in the form of carbohydrates, and 30 percent or less in the form of fat. As was mentioned in an earlier section, less than 30 percent of fat intake should be in the form of saturated fats, which should account for less than 10 percent of total caloric intake. It is also recommended that less than 10 to 15 percent of total caloric intake should be in the form of sugars.
- Engage in an exercise program or in regular physical activity beyond that required for activities of daily living, including work.
- Quit smoking. Enrollment in a smoking cessation program can help in this endeavor, as may, in some circumstances, pharmacological agents.
- Maintain a healthy weight. BMI tables are helpful to determine what this weight should be.
- Moderate or eliminate alcohol intake. Women should strive not to drink more than one drink

per day (12 ounces of regular beer, 5 ounces of wine, 1.5 ounces of 80-proof distilled spirits).

- Eat a diet that is low in fat, particularly one that is low in saturated fat and cholesterol. More specifically, your fat intake, which should be no more than 10 percent of your total caloric intake, should include the following:
  - Less saturated fat (found in meat, full-fat dairy products, and tropical oils)
  - More monounsaturated fats (found in olive oil and avocados)
  - More polyunsaturated omega-3 oils (fish, walnuts, and flaxseed and canola oils)
  - Fewer transfatty acids (found in hydrogenated oils)
  - Eat a diet rich in a variety of fruits and vegetables. You should strive to consume at least five servings of fruits and vegetables every day. The majority of these servings should be of fresh fruits and vegetables.
- Eat fish containing omega-3 fatty acids—particularly tuna, salmon, or swordfish—at least once a week. Other good sources of these heart-protective substances are flaxseed oil, canola oil, and English walnuts.
- Maximize your intake of complex carbohydrates and minimize your intake of simple sugars (white sugar, brown sugar, raw sugar, honey, and syrups). Good sources of starches include breads, cereals, pasta, rice, dry beans and peas, and starchy vegetables such as potatoes, corn, and lima beans. Minimize white bread, rice, and potatoes.
- Maximize your intake of good sources of fiber, including whole grain breads and cereals, pasta, and vegetables and fruits with edible skins, such as apples and squash.
- Minimize intake of foods that supply mostly "empty" calories and few necessary nutrients. These include sugars, sweets, fats and oils, and foods high in sugars, fats and oils, and alcoholic beverages.
- Minimize your intake of salt and sodium. Be particularly careful of "hidden" sources of salt and sodium, such as deli meats and canned soups and vegetables.

During all well-woman visits, the midwife should also assess a woman's weight-for-height status and determine if she is underweight, appropriate weight, or overweight. The midwife should also assess abdominal circumference and waist-to-hip ratio as explained earlier in the chapter. Blood pressure measurements should be checked on every woman and the midwife should inquire about dietary practices and exercise habits. Table 6-23 provides a list of questions that can be used to elicit important information regarding a woman's nutrition and eating habits. The midwife can ask the woman to fill out a food and exercise diary for the three days to one week before her well-woman visit to facilitate nutritional counseling. Midwives should also conduct nutritionally related screening tests as indicated (see the following section on screening) and determine the appropriateness of any current dietary supplementation or the need for the initiation of dietary supplementation.

If serious nutritional problems are detected or suspected, the midwife should refer the woman to a registered dietician or other nutrition professional who can conduct the necessary assessment and interventions. It may also be necessary, as in the case of profound anemias or eating disorders, to refer the woman to a physician. Midwives can also refer women as appropriate to WIC or other food programs.

Screening

The Department of Health and Human Service's Public Health Service has created the U.S. Preventive Services Task Force (USPSTF), which conducts ongoing review of research on a variety of health conditions and concerns affecting the U.S. population. This task force periodically issues recommendations on preventive health measures, including screening to help guide clinicians who provide preventive health services to their patients. The nutrition-related screening recommendations made by the USPSTF are summarized below.

Lipid Screening (Cholesterol and Triglycerides) The third, and most recent, USPSTF report recommends that women 45 years old or older have their cholesterol levels tested routinely. The USPSTF does not, however, specify how frequently screening should occur and leaves that to the discretion of health care providers. Midwives should determine if their clients who are 45 years old or older have had a recent (within the last five years) cholesterol screening and order one if necessary. For younger women, screening is recommended if there are risk factors for heart disease, such as smoking, diabetes, high blood pressure, or a family history of heart disease or high cholesterol. In addition to obtaining a total cholesterol level (TC), the level of HDL cholesterol should also be measured. There is currently insufficient evidence, according to the USPSTF, to recommend for or against routinely measuring triglycerides.

TABLE 6-23 Guideline Questions for a Nutritional Assessment

Measure weight, height, and blood pressure and calculate BMI.

Ask the following:

1. Are you currently taking any medications or undergoing treatment for any health problem?
2. Do you smoke? If so, how much do you smoke in one day?
3. Do you drink alcohol at all? If so, how much do you drink in one day? In one week? (Use CAGE Questionnaire if appropriate.)
4. Do you use any street drugs?
5. Do you exercise? If so, how often and for how long? What type of exercise?
6. How many meals do you eat in one day?
7. How often do you snack during the day?
8. How many times do you eat out during one week? (Include all carry-out and fast food.)
9. How many glasses of fluid do you drink in one day? How many glasses of water do you drink in one day?
10. Are you allergic to any foods? If so, what happens when you eat this particular food?
11. Are you on a diet? If so, what kind of diet? How long have you been on it and with what results?
12. Do you take any of the following:
    - Multivitamins
    - Calcium supplement
    - Iron supplement
    - Folic acid supplement
    - Diet pills
    - Laxatives
    - Power drinks/diet drinks (such as Ensure, Slimfast, etc.)
13. Which of the following terms would you use to describe your current weight?
    - High
    - Just right
    - Low
14. Do you or a first-degree family member (mother, father, brothers, or sisters) suffer from any of the following medical conditions?
    - Hypertension (high blood pressure)
    - Diabetes (high blood sugar)
    - Heart disease
    - Kidney disease
    - Liver disease
    - Anemia, sickle cell disease
    - Immune disorder such as lupus or HIV infection
    - Cancer
    - Crohn's disease, irritable bowel syndrome, ulcerative colitis

Ask patient to conduct a three-day diet/exercise recall by doing the following:

1. Write down everything you eat AND drink in one day including all snacks (no matter how small).
2. Write down any physical activity beyond your activities of daily living (for example, include a half-hour walk but do not include housework or walking done during your job).

Plasma Glucose The USPSTF does not make a recommendation for or against the routine screening for non-insulin-dependent diabetes mellitus (NIDDM) in nonpregnant, asymptomatic women. Screening for this condition is up to practitioner discretion; nevertheless, based on the possibility of reducing the risk of complications from hyperglycemia through exercise and diet, screening those at high risk for NIDDM is probably warranted. Individuals at risk for NIDDM include those who are obese (particularly obese clients older than 45), those with a strong family history of diabetes, and those who are Native American, African American, or Hispanic. Fasting plasma glucose is considered the optimal screening test for NIDDM. The frequency of testing is up to the practitioner. The midwife should inquire if clients at risk for NIDDM have been recently screened and order a fasting plasma glucose if indi-

cated. Screening should definitely be conducted in women who are symptomatic.

Hematocrit and Hemoglobin Routine screening of nonpregnant women for anemia is not recommended by the U.S. Preventive Services Task Force. Hemoglobin and hematocrit levels should be drawn for women with signs and/or symptoms of anemia.

Bone Densitometry While the USPSTF recommends that all postmenopausal women be counseled on the risks for osteoporosis and on the importance of smoking cessation, regular exercise and adequate calcium intake, the task force has found that there is insufficient evidence to recommend for or against routine screening for osteoporosis with bone densitometry in postmenopausal women. Women who are at high risk for osteoporosis may desire bone densitometry to help determine whether or not to initiate estrogen prophylaxis and or other pharmacologic interventions aimed at treating or preventing osteoporosis and/or osteoporosis-related fractures.

Supplementation

There is much controversy both within and outside of the health professional community regarding the appropriateness and need for dietary supplements. The debate over vitamin supplementation is made more complicated by the numerous studies that seem to indicate on the one hand that intake of certain vitamins, minerals, or other substances in excess of the recommended dietary allowance may be protective against certain diseases, and the warnings that megadoses of vitamins and minerals can be harmful on the other hand. Most nutrition experts do seem to agree that a balanced diet composed of a variety of foods will provide a healthy, nonpregnant, nonlactating adult woman with all the necessary nutrients. There do appear, however, to be some exceptions to this rule, when even a healthy adult woman may need to supplement her diet. Women of reproductive age, for example, need folic acid in excess of what is consumed in the usual American diet in order to prevent certain birth defects in their infants. Similar cases include women who bleed excessively during menstrual periods who may need additional iron to prevent anemia and vegetarians who may need to supplement nutrients such as calcium, iron, zinc, and vitamin B_{12} that are either more readily or exclusively available from animal products. Other individuals who may need supplements are those with certain illnesses or diseases or on certain medications, like diuretics, that may deplete them of necessary nutrients. Women who are at risk for or already suffering from osteoporosis may need to take supplemental calcium and/or vitamin D.

It is more difficult to make recommendations on supplementing a healthy, well-balanced diet in a healthy adult. As more and more studies are released that suggest that certain vitamins and/or vitamin precursors are linked to a reduction in the risk of diseases such as cancer, women are increasingly likely to seek the advice of health professionals on the need for supplementation. An increasing amount of evidence, for example, seems to suggest that intake of vitamin E in amounts far in excess of the current RDA is protective against heart disease [96]. Based in part on findings such as these, the American Medical Association (AMA) has recently recommended that all adults take one multivitamin daily. They say that this practice is justified "by the known and suspected benefits of supplemental folate and vitamins B_{12}, B_6, and D in preventing cardiovascular disease, cancer, and osteoporosis, and because multivitamins at that dose are safe and inexpensive" [97].

Although the passage in 1994 of the Dietary Supplement Health and Education Act has made it possible for the government to establish standards regarding dietary supplements and for persons on their own or in conjunction with a health care provider to decide whether to supplement their diet, certain factors must be kept in mind. In particular, both clients and health care providers must be careful to avoid overdosing. It is a common misconception that overdosing on vitamins and minerals is difficult if not impossible and that the body will simply eliminate any excess of these substances through the urine. In truth, megadoses of certain vitamins and minerals can be risky. For example, excess intake of vitamin A during the first few months of pregnancy has been found to be associated with birth defects, excess intake of vitamin E can interfere with blood clotting, and very high doses of folic acid can mask symptoms of a vitamin B_{12} deficiency.

In order to properly advise women on the need for supplementation, midwives should try to keep current on changes in RDAs as well as on recommendations made by government agencies or by well-respected professional organizations. Midwives can also use the following guidelines in advising clients regarding dietary supplementation [98]:

- Increasing intake of foods rich in the desired nutrients is the most desirable option. Vitamin and mineral supplements cannot make up for poor eating habits.
- Supplements that contain more than 100 to 150 percent of the U.S. Recommended Dietary Allowance (RDA) for each vitamin and mineral should be avoided.
- To prevent toxicity or mineral and vitamin competition, a moderate and balanced intake of vitamins and minerals is recommended. When calculating intake of vitamins and minerals, all supplemental sources must be taken into account. Remember that "power" drinks often contain vitamin and mineral supplements and that many foods are fortified with vitamins and minerals.
- Women should not take more than one multivitamin daily in any form.
- With the exception of vitamin E, synthetic supplements of vitamins are treated in the same way as supplements derived from natural sources by the body. The only real difference is in price. Natural vitamin E, however, is more potent and absorbed better than its synthetic counterpart.

In summary, it is recommended that clients use nutritional supplements only after seeking the advice and guidance of a health professional who can assess the need for the supplement, guide the person in choosing the proper dose and formulation of the substance to be supplemented, and monitor the person both for success of the supplementation and for possible side effects or interactions with medications or other supplements.

Conclusion

The midwife should have a good working knowledge of the basics of nutrition and on any nutritionally related recommendations (such as the need for adequate folic acid intake in women of reproductive age) that are relevant to the client population she cares for. In addition, the midwife should incorporate a basic nutritional assessment as part of each well-woman visit and should always be vigilant for signs or symptoms of nutritional disorders or diseases, such as diabetes and heart disease that are affected by, and affect, nutritional status. This nutritional assessment should include an inquiry about eating habits; tobacco, alcohol, and illicit drug use; the use of dietary supplements; chronic medical conditions and any medications being taken for the same; and daily activity levels and exercise habits. The midwife should measure blood pressure, weight, and height and make an evaluation of weight for height status. Necessary lab work should be obtained as indicated by responses to inquiries or by preventive health screening recommendations. Finally, the midwife should evaluate all the information and carry out necessary education, counseling, or interventions—including but not limited to referrals to a physician or registered dietician.

References

1. Centers for Disease Control and Prevention, *National Vital Statistics Reports Deaths: Leading Causes for 1999,* Vol. 49, No. 11, 2000.
2. Department of Health and Human Services. *Overweight and Obesity Threaten U.S. Health Gains. Communities Can Help Address the Problem, Surgeon General Says*. Press Release, HHS News. December 13, 2001.
3. American Dietetic Association. American Dietetic Association survey shows consumers are seeking nutrition information, getting the message, making changes. *Nutrition and You: Trends 2002* http://www.eatright.org/pr/2002/052002a.html
4. Freudenheim, J. L., and Potischman, N. Cancer. In Krummel, D. A., and Kris-Etherton, P. M. (Eds.), *Nutrition in Women's Health*. Gaithersburg, MD: Aspen Publishers, 1996. p. 488.
5. Kessel, M., and Wardlaw, G. *Perspectives in Nutrition*. New York: McGraw-Hill, 2002, p. 214.
6. Van Horn, L. Fiber, lipids, and coronary heart disease. A statement for healthcare professionals from the Nutrition Committee, American Heart Association. *Circulation* 95(12):2701–2704 (June) 1997.
7. Food and Drug Administration, *Food Labeling Health Claims, Oats and Coronary Heart Disease*. Federal Register. Docket 95P-0197. 1996.
8. Brown, L., et al. Cholesterol-lowering effects of dietary fiber: a meta-analysis. *Am. J. Clin. Nutr.* 69(1):30–42 (January) 1999.
9. Fuchs, C. D., Giovannucci, E. L., Colditz, G. A., et al. Dietary fiber and the risk of colorectal cancer and adenoma in women. *N. Engl. J. Med.* 340:169–176 (January) 1999.

10. Willett, W. C. Old beliefs challenged by new data. *Nurses' Health Study Newsletter*, Vol. 6, pp. 5–6 (June) 1999.

11. Hu, F. B., Stampfer, M. J., Manson, J. E., et al. Dietary fat intake and the risk of coronary heart disease in women. *N. Engl. J. Med.* 337:1491–1499 (November) 1997.

12. Kuhn, F. E., and Rackley, C. E. Coronary artery disease in women: risk factors, evaluation, treatment and prevention. *Arch. Intern. Med.* 153:2626–2635 (December) 1993.

13. Kannel, W. B., and Wilson, P. W. Efficacy of lipid profiles in prediction of coronary heart disease. *Am. Heart J.* 124:768–774 (September) 1992.

14. Bass, K. M., Newschaffer, C. J., Klag, M. J., and Bush, T. L. Plasma lipoprotein levels as predictors of cardiovascular death in women. *Arch. Intern. Med.* 84:98–101 (October) 1993.

15. Austin, M. A., and Hokanson, J. E. Epidemiology of triglycerides, small dense low-density lipoprotein as risk factors for coronary heart disease. *Med. Clin. North. Am.* 78:99–115 (January) 1994.

16. Castelli, W. P. Epidemiology of triglycerides: a view from Framingham. *Am. J. Cardiol.* 70:3H–9H (July) 1992.

17. Ascherio, A., and Willett, W. C. Health effects of trans fatty acids. *Am. J. Clin. Nutr.* 66(4 suppl):1006S–1010S (October) 1997.

18. U.S. Department of Health and Human Services. *Healthy People 2010: Understanding and Improving Health*, 2nd ed. Washington, DC: Government Printing Office, November 2000.

19. Looker, A. C., Orwoll, E. S., Johnston, C. C. Jr., et al. Prevalence of low femoral bone density in older U.S. adults from NHANES III. *J. Bone Miner. Res.* 12:1761–1768 (November) 1997.

20. U.S. Department of Health and Human Services. *Healthy People 2010: Food and Nutrient Consumption in Understanding and Improving Health and Objectives for Improving Health*, 2nd ed., 2 vols. Washington, DC: Government Printing Office, November 2000.

21. Centers for Disease Control and Prevention and NCHS. National Health and Nutrition Examination Survey (NHANES), *Energy and Macronutrient Intakes of Persons Ages 2 Months and Older in the United States: NHANESIII, Phase 1, 1988–1991.* http://www.cd.gov/nchs/products/pubs/pubd/ad/260-251/ad255.htm.

22. American Dietetic Association. Women's health and nutrition—Position of ADA and Dietitians of Canada. *J. Am. Diet. Assoc.* 99:738–751, 1999.

23. Feskanich, D., Willett, W. C., Stampfer, M. J., and Colditz, G. A. Milk, dietary calcium, and bone fractures in women: A 12-year prospective study. *Am. J. Pub. Health* 87:992–997 (June) 1997.

24. Riggs, B. L., O'Fallon, W. M., Muhs, J., O'Connor, M. K., Kumar, R., and Melton, L. J. III. Long-term effects of calcium supplementation on serum parathyroid hormone level, bone turnover, and bone loss in elderly women. *J. Bone Miner. Res.* 13:168–174 (February) 1998.

25. Nieves, J. W., Komar, L., Cosman, F., and Lindsay, R. Calcium potentiates the effect of estrogen and calcitonin on bone mass: review and analysis. *Am. J. Clin. Nutr.* 67:18–24 (January) 1998.

26. Prestwood, K. M., Thompson, D. L., Kenny, A. M., et al. Low dose estrogen and calcium have an additive effect on bone resorption in older women. *J. Clin. Endocrinol. Metab.* 84:179–183, 1999.

27. Rossow, J. E., Anderson, G. L., Prentice, R. L., LaCroix, A. Z., et al. Risks and benefits of estrogen plus progestin in healthy menopausal women: principal results form the Women's Health Initiative randomized controlled trial. *JAMA* 288:321–333 (July) 2002.

28. Cappuccio, F. P., Elliott, P., Allender, P. S., Pryer, J., Follman, D. A., and Cutler, J. A. Epidemiologic association between dietary calcium intake and blood pressure: a meta-analysis of published data. *Am. J. Epidemiol.* 142:935–945 (November) 1995.

29. Hyman, J., Baron, J. A., Dain, B. J., et al. Dietary and supplemental calcium and the recurrence of colorectal adenomas. *Cancer Epidemiol.* 7:291–295 (April) 1998.

30. Martinez, M. E., and Willett, W. C. Calcium, vitamin D, and colorectal cancer: a review of the epidemiologic evidence. *Cancer Epidemiol. Biomarkers Prev.* 7:163–168 (February) 1998.

31. *Optimal Calcium Intake*. NIH Consensus Statement, June 6–8, 1994.

32. Pechet, L. Anemias and other red cell disorders. In Noble, J. (Ed.), *Textbook of Primary Care Medicine*. St. Louis, MO: Mosby-Year Book, 1996, pp. 722–733.

33. Star, W. S. Anemia—iron, folate, and vitamin B_{12} deficiency. In Star, W. L., Shannon, M. T., Lommel, L. L., and Gutierrz, Y. M. (Eds.) *Ambulatory Obstetrics*. San Francisco: UCSF Nursing Press, 1999, pp. 650–670.

34. Centers for Disease Control and Prevention. Use of folic acid for prevention of spina bifida and other neural tube defects: 1983–1991. *MMWR Morb. Mortal. Wkly. Rep*. 40:513–516, 1991

35. National Institutes of Health and National Heart, Lung, and Blood Institute. *The Practical Guide to Identification, Evaluation and Treatment of Overweight and Obesity in Adults*. NIH Publication Number 00-4084, Bethesda, MD: (October) 2000.

36. Pettigrew, R., and Hamilton-Fairley, D. Obesity and female reproductive function. *Br. Med. Bull*. 53:341–358, 1997.

37. CDC National Center for Health Statistics. *Prevalence of Overweight Among Children and Adolescents: United States*. 1999–2000. http://www.cdc.gov/nchs/nhanes.htm.

38. Update: prevalence of overweight among children, adolescents, and adults—United States, 1988–1994. *MMWR Morb. Mortal. Wkly. Rep*. 46:199–202, 1997.

39. Deurenberg, P., Weststrate, J. A., and Seidell, J. C. Body mass index as a measure of body fatness: age and sex specific prediction formulas. *Br. J. Nutr*. 65:105–114 (February) 1991.

40. Lapidus, L., Bengtson, C., and Larsson, B. Distribution of adipose tissue and risk of cardiovascular disease and death: a 12 year follow-up of participation in study of women in Gotherberg, Sweden. *BMJ*. 289:1257–1261 (November) 1984.

41. Hsia, J. A. Cardiovascular diseases in women. *Med. Clin. North Am*. 82:1–19 (January) 1998.

42. USA snapshots: women's top health risks. *USA Today*. May 18, 1995, p. 1D.

43. Krummel, D. A. Cardiovascular disease. In Krummel, D. A., and Kris-Etherton, P. M. (Eds.), *Nutrition in Women's Health*. Gaithersburg, MD: Aspen Publishers, 1996, pp. 383–417.

44. Willett, W. C. Old beliefs challenged by new data. *Nurses' Health Study Newsletter*, Vol. 6, (June) 1999

45. Holmes, M. D., Hunter, D. J., Colditz, G. A., Stampfer, M. J., et al. Association of dietary intake of fat and fatty acids with risk of breast cancer. *JAMA* 281:914–920 (March) 1999.

46. Hunter, D. J., Spiegelman, D., Adami, H.-O., et al. Cohort studies of fat intake and the risk of breast cancer: a pooled analysis. *N. Engl. J. Med*. 334:356–361 (February) 1996.

47. Willett, W. C., Stampfer, M. J., Colditz, G. A., Rosner, B., and Speizer, F. E. Relation of fat, fiber and meat intake to colon cancer risk in a prospective study among women. *N. Engl. J. Med*. 323:1669–1672 (December) 1990.

48. MacLennan, R. Diet and colorectal cancer. *Int. J. Cancer*. (suppl. 10):10–12, 1997.

49. Ziegler, R. G. Anthropometry and breast cancer. *J. Nutr*. 127(suppl. 5):924S–928S (May) 1997.

50. Graham, S., Hellmann, R., and Marshall, J. Nutritional epidemiology of postmenopausal breast cancer in western New York. *Am. J. Epidemiol*. 134:552–566 (September) 1991

51. Longnecker, M. P., Newcomb, P. A., Mittendorf, R., Greenberg, E. R., and Willett, W. C. Intake of carrots, spinach, and supplements containing vitamin A in relation to risk of breast cancer. *Cancer Epidemiol. Biomarkers Prev*. 6:887–892 (November) 1997.

52. Zava, D. T., and Duwe, G. Estrogenic and antiproliferative properties of genistein and other flavonoids in human breast cancer cells in vitro. *Nutr Cancer*. 27(1):31–40, 1997.

53. Rose, D. P. Dietary fiber and breast cancer. *Nutr. Cancer*. 13:1–8, 1990.

54. Zhang, S., Hunter, D. J., Forman, M. R., et al. Dietary carotenoids and vitamins A, C, and E and risk of breast cancer. *J. Natl. Cancer Inst*. 91:547–556 (March) 1999.

55. Smith-Warner, S. A., Spiegelman, D., Shiaw-Shyuan, Y., et al. Alcohol and breast cancer in women: a pooled analysis of cohort studies. *JAMA* 279:535–540 (February) 1998.

56. MacLennan, R. Diet and colorectal cancer. *Int. J. Cancer*. (suppl. 10):10–12, 1997.

57. Mason, J. B., and Levesque, T. Folate: effects on carcinogenesis and the potential for cancer chemoprevention. *Oncol*. 10:1727–1736 (November) 1996.

58. Kato, I., Akhmedkhanov, A., Koenig, K., Toniolo, P. G., Shore, R. E., and Riboli, E. Prospective study of diet and female colorectal cancer: the New York University Women's Health Study. *Nutr. Cancer* 28:276–281, 1997.

59. Freudenheim, J. L., Graham, S., Marshall, J. R., Haughy, B. P., and Wilkinson, G. Lifetime alcohol intake and risk of rectal cancer in western New York. *Nutr. Cancer* 13:101–109, 1990.

60. Freudenheim, J. L., and Potischman, N. Cancer. In Krummel, D. A., and Kris-Eatherton, P. M. (Eds.), *Nutrition in Women's Health*. Gaithersburg, MD: Aspen Publishers, 1996, pp. 463–496.

61. Lissner, L., Kroon, U.-B., Bjorntorp, P., Blosk, L., Wilhelmsen, L., and Silverstolpe, G. Adipose tissue fatty acids and dietary fat sources in relation to endometrial cancer. *Acta.*

Obstet. Gynecol. Scand. 72:481–487 (August) 1993.

62. Levi, F., Franchesi, S., Negri, E., and La Vecchia, C. Dietary factors and the risk of endometrial cancer. *Cancer*. 71:3575–3581 (June) 1993.

63. Engle, A., Muscat, J. E., and Harris, R. E. Nutritional risk factors and ovarian cancer. *Nutr. Cancer*. 51:91–101, 1991.

64. Harris, M. I., Flegal, K. M., Cowie, C. C., et al. Prevalence of diabetes, impaired fasting glucose, and impaired glucose tolerance in U.S. adults. *Diabetes Care* 21:518–524 (April) 1998.

65. American Diabetes Association. Nutritional recommendations and principles for individuals with diabetes mellitus. *Diabetes Care* 21(suppl. 1):S32–S35, 1998

66. Lissner, L., Stevens, J., Levitsky, D. A., Rasmussen, K. M., and Strupp, B. J. Variations in energy intake during the menstrual cycle: implications for food-intake research. *Am. J. Clin. Nutr*. 48:956–962 (October) 1988.

67. Warren, M. P. Effects of undernutrition on reproductive function in the human. *Endoc. Rev*. 4:363–377 (Fall) 1983.

68. Hartz, A. J., Barboriak, P. N., Wong, A., Katayama, K. P., and Rimm, A. A. The association of obesity with infertility and related menstrual abnormalities in women. *Int. J. Obstet*. 3:57–73, 1979.

69. Story, M., and Alton, I. Becoming a woman: nutrition in adolescence. In Krummel, D. A., and Kris-Etherton, P. M. (Eds.), *Nutrition in Women's Health*. Gaithersburg, MD: Aspen Publishers, 1996, pp. 1–34.

70. Skinner, J. D., and Caruth, B. R. Dietary quality of pregnant and nonpregnant adolescents. *J. Am. Diet. Assoc*. 91:718–720 (June) 1991.

71. McDuffie, J. R., and Kirkley, B. G. Eating disorders. In Krummel, D. A., and Kris-Etherton, P. M. (Eds.), *Nutrition in Women's Health*. Gaithersburg, MD: Aspen Publishers, 1996, pp. 58–102.

72. Chernoff, R. Nutritional needs of elderly women. In Krummel, D. A., and Kris-Etherton, P. M. (Eds.), *Nutrition in Women's Health*. Gaithersburg, MD: Aspen Publishers, 1996, pp. 299–319.

73. Wing, R. R., Matthews, K. A., Kuller, L. H., Meilahn, E. N., and Plantinga, P. L. Weight gain at the time of menopause. *Arch. Intern. Med*. 151:97–102 (January) 1991.

74. Tremollieres, F. A., Pouilles, J. M., and Ribot, C. A. Relative influence of age and menopause on total and regional body composition changes in postmenopausal women. *Am. J. Obstet. Gynecol*. 175(6):1594–1600 (December) 1996.

75. Wang, O., Hassager, C., Rayn, P., Wang, S., and Christiansen, C. Total and regional body-composition changes in early postmenopausal women: age-related or menopause-related? *Am. J. Clin. Nutr*. 60(6):843–848 (December) 1994.

76. World Health Organization. *Assessment of Fracture Risk and Its Application to Screening for Postmenopausal Osteoporosis*. Technical Report Series No. 843. Geneva, Switzerland: WHO, 1994.

77. Knight, D., Howes, J. B., and Eden, J.A. The effect of Promensil, an isoflavone extract, on menopausal symptoms. *Climacteric* 2:79–84 (June) 1999.

78. Baber, R. J., Templeman, C., Morton, T., et al. Randomized placebo-controlled trial of an isoflavone supplement and menopausal symptoms in women. *Climacteric* 2:85–92 (June) 1999.

79. Ingram, D., Sanders, K., Kolybaba, M., and Lopez, D. Case-control study of phyto-oestrogens and breast cancer. *Lancet* 350:990–994 (October) 1997.

80. Yuan, J. M., Wang, Q. S., Ross, R. K., et al. Diet and breast cancer in Shanghai and Tianjin, China. *Br. J. Cancer* 71:1353–1358 (June) 1995.

81. Baghurst, P. A., and Rohan, T. E. High-fibre diets and reduced risk of breast cancer. *Int. J. Cancer* 56:173–176 (January) 1994.

82. Jones, J. L., Daley, B. J., Enderson, B. L., Zhou, J. R., and Karlstad, M. D. Genistein inhibits tamoxifen effects on cell proliferation and cell cycle arrest in T47D breast cancer cells. *Am. Surg*. 68(6):575–577 (June) 2002.

83. Schwartz, J. A., Liu, G., and Brooks, S. C. Genistein-mediated attenuation of tamoxifen-induced antagonism from estrogen receptor-regulated genes. *Biochem. Biophys. Res. Commun*. 253:38–43 (December) 1998.

84. Fukagawa, N. Eating disorders: diagnosis and management. *Semin. Pediatr. Gastroenterol. Nutr*. 3:1–2, 1992.

85. American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed. Washington, DC: American Psychiatric Association, 2000.

86. Murphy, M., and Drossman, D. A. Eating disorders. In Noble, J. (Ed.), *Textbook of Primary Care Medicine*. St. Louis, MO: Mosby-Year Book, 1996, pp. 1668–1676.

87. Garner, D., Garfinkel, P., Schwartz, D., and Thompon, M. Cultural expectations of thinness in women. *Psychol. Rep*. 47:483–491, 1980.

88. Haddad, E. Meeting the RDAs with a vegetarian diet. *Top. Clin. Nutr*. 10:7–16, 1995.

89. Clark, N. *Sports Nutrition Guidebook*. Champaign, IL: Leisure Press, 1990. pp. 197–198.

90. American Dietetic Association and the Canadian Dietetic Association. Position statement: nutrition for physical fitness and athletic performance in adults. *J. Am. Diet. Assoc*. 93:691–696 (June) 1993.

91. Yeager, K. K., Agostini, R., Nattiv, A., and Drinkwater, B. 1993. The female athlete triad: disordered eating, amenorrhea, osteoporosis. *Med. Sci. Sports Exerc*. 25:775–777 (July) 1993.

92. Koff, R. S. Liver. In Nobel, J. (Ed.) *Textbook of Primary Care Medicine*. St. Louis, MO: Mosby-Year Book, 1996, pp. 614–634.

93. Whitney, E. N., Catlado, C. B., and Rolfes, S. R. *Understanding Normal and Clinical Nutrition*, 6th ed. Belmont, CA: Wadsworth, 2002, pp. 230–239.

94. Graham, T. O., and MacLean, H. *Every Woman's Health. A Complete Guide to Body and Mind*, 5th ed. Garden City, NY: Doubleday, 1993, pp. 55–106.

95. Willett, W. C. *Eat, Drink, and Be Healthy*. New York: Simon and Schuster, 2001.

96. Chan, A. C. Vitamin E and atherosclerosis. *J. Nutr*. 128:1593–1596, 1998.

97. Fletcher, R. H., and Fairfield, K. M. Vitamins for chronic disease prevention in adults. *JAMA* 287:3127–3129 (June) 2002.

98. Star, W. L., Lomme, L. L., and Shannon, M. T. *Women's Primary Health Care: Protocols for Practice*. Washington, DC: American Nurses' Publishing, 1995.

• • • Additional References

Graham, T. O., and MacLean, H. *Every Woman's Health. A Complete Guide to Body and Mind*, 5th ed. Garden City, NY: Doubleday, 1993.

Kessel, M., and Wardlaw, G. *Perspectives in Nutrition*. New York: McGraw-Hill, 2002.

Krummel, D. A., and Kris-Etherton, P. M. *Nutrition in Women's Health*. Gaithersburg, MD: Aspen Publishers, 1996.

National Institutes of Health—National Heart, Lung, and Blood Institute. *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults*. Washington, DC: National Institutes of Health, 1998.

Star, W. L., Shannon, M. T., Lommel, L. L., and Gutierrez, Y. M. *Ambulatory Obstetrics*, 3rd ed. San Francisco, CA: UCSF Nursing Press, 1999.

U.S. Department of Health and Human Services. *Healthy People 2010: With Understanding and Improving Health and Objectives for Improving Health*, 2 vols., 2nd ed. Washington, DC: Government Printing Office, November 2000.

U.S. Preventive Services Task Force. *Guide to Clinical Preventive Services: Report of the U.S. Preventive Services Task Force*. Washington, DC: Public Health Service, Department of Health and Human Services, 2002.

Wolinsky, I., and Klims-Tavantzis, D. (Eds.). *Nutritional Concerns of Women*. Boca Raton, FL: CRC Press, 1996.

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CHAPTER

7

Primary Care and Midwifery

In 1992, the American College of Nurse Midwives issued a position statement describing the role of Certified Nurse-Midwives in primary care (Figure 7-1) [1]. The document was in part a response to the increasingly politicized nature of health care in the United States. At the time, direct insurance providers were restricting access to women's health care clinicians and health plans, although there was ample evidence that many women preferred to use such clinicians as their primary contact with the health care system. Many midwives have found themselves in the position of being the only person a woman sees on a regular basis. Furthermore, the recommended periodic screens for women of childbearing age were well within the core competencies of midwifery practice even before the addition of primary care.

Primary Care

But what is primary care? The definition most used today was published in 1996 by the Institute of Medicine. It describes primary care as follows:

> The provision of integrated, accessible health care services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the context of family and community. [2]

When one thinks of the women who seek their care from midwives, it is obvious that we can function in this role for some, but not all, of our patients. Women with significant illnesses, or the elderly, may have needs that require medical supervision. On the other hand, healthy women may be well served by having as their primary contact with the health care system a midwife focused on health maintenance, age-appropriate screening, and patient education. One commonly used description of primary care providers is that they can provide 80 percent of the care needed by a person on an annual basis.

The most common reasons for ambulatory care visits have been collected and published by the National Center for Health Statistics (see Table 7-1). Between the ages of 18 and 65, women make relatively more visits to physicians than do men, and Whites make more visits (by about 50 percent) than do Blacks. As age increases, so does the use of medical services [3].

Several small studies of obstetricians and midwives have looked at the range of conditions identified and/or managed in the context of routine care, and found that they included many of the most common conditions seen in primary care practices [4–6]. A survey of 327 midwives taken at the 1993 ACNM annual meeting found that primary care problems were commonly addressed during visits to the midwife. Figure 7-2 demonstrates the breadth of primary care conditions identified by these midwives as early as 1993 as being part of their practices. A survey of obstetrician-gynecologists and HMO medical directors found disagreement as to whether gynecologists provided appropriate services to be considered primary care "gatekeepers" providing most patient services. For example, 43 percent of gynecologists provided immunizations, whereas 100 percent of health plans felt that this was the primary care provider's responsibility.

AMERICAN COLLEGE
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With women, for a lifetime™

Position Statement

Certified Nurse-Midwives and Certified Midwives as Primary Care Providers/Case Managers

It is the position of the American College of Nurse-Midwives that Certified Nurse-Midwives (CNMs) and Certified Midwives (CMs) are providers of primary health care for women and newborns.

Care by CNMs and CMs incorporates all of the essential factors of primary care and case management that include evaluation, assessment, treatment and referral as required. The model of health care practiced by CNMs and CMs is focused on the ambulatory care of women and newborns and emphasizes health promotion, education and disease prevention and sees the woman as central to the process of providing such care.

Care by CNMs and CMs includes preconception counseling, care during pregnancy and childbirth, provision of gynecological and contraceptive services and care of the peri- and post-menopausal woman. With health education as a major focus, the goals are to prevent problems and to assist women in developing and maintaining healthy habits.

CNMs and CMs are often the initial contact for providing health care to women, and they provide such care on a continuous and comprehensive basis by establishing a plan of management with the woman for her ongoing health care. Such care by the CNMs and CMs is inclusive and integrated with the woman's cultural, socioeconomic and psychological factors that may influence her health status.

*Midwifery as used throughout this document refers to the education and practice of certified nurse-midwives (CNMs) and certified midwives (CMs) who have been certified by the American College of Nurse-Midwives (ACNM) or ACNM Certification Council, Inc. (ACC).

Source: Board of Directors

Approved by the ACNM BOD Oct. 31, 1992

Revised: November, 1994 and August, 1997

FIGURE 7-1 ACNM Position Statement: The Nurse-Midwife as Primary Care Provider.
Source: American College of Nurse-Midwives. Reprinted by permission.

Other areas of discrepancy between expectation and services offered included management of anemia, depression, thyroid dysfunction, and diabetes [7].

Among common reasons for outpatient visits reported to the National Center for Health Statistics are general health examinations, cough, abdominal pain, cramps or spasm, fever, skin rash, hypertension, depression, headache, diabetes, back symptoms, chest pain, and nasal congestion. The most frequent examinations included pelvic and breast examinations. Blood pressure was checked at fewer than half the visits. One-third of all visits included no diagnostic or screening procedures [8].

TABLE 7-1 Common Reasons for Visits to Ambulatory Medical Offices by Women in 2000

Primary Diagnosis	Percentage of All Visits
Essential hypertension	4.2
Acute upper respiratory infection	3.6
Diabetes mellitus	2.4
Arthropathies, related disorders	3.1
Normal pregnancy	4.6
Malignant neoplasms	2.6
General medical examination	2.4
Rheumatism, other than back	2.0
Otitis media and eustachian tube	1.7
Spinal disorders	1.8
Chronic sinusitis	1.6
Ischemic heart disease	1.0
Other heart disease	1.1
Gynecologic examination	1.9
Asthma	1.0
Allergic rhinitis	1.1
Acute pharyngitis	1.1

Source: Adapted from Cherry, D. K., and Woodwell, D. A. National ambulatory medical care survey: 2000 summary. *Advance Data from Vital and Health Statistics*, No. 328. Hyattsville, MD: National Center for Health Statistics, June 5, 2002.

During the Robert Wood Johnson–funded study on care to vulnerable populations, about 80 percent of midwifery visits were obstetric in nature [9, 10]. Midwives are clearly not spending all of their time on primary care. However, pregnant women are also found to be anemic, have respiratory infections, or stomach pain, and in the course of a pregnancy, most clinicians defer to the person managing the pregnancy as being the most qualified to treat these and other conditions. The presence of a second patient in utero somehow changes the equation. Therefore, midwives have an obligation to be informed about primary care, to be able to identify and manage common minor illnesses, and to appropriately refer women to another clinician for more complex health problems.

This chapter is not intended to be a comprehensive survey of primary health care for women; it is an introduction to health problems commonly seen in midwifery practices. For this reason, discussion of medical therapies for serious health problems is limited. When general medical problems significantly affect the course of pregnancy, they will be further discussed in Chapter 24, which focuses on antepartal complications.

The U.S. Department of Health and Human Services has developed guidelines for preventive care visits. (These are periodically updated and can be found at www.ahrq.gov/ppip.) Table 7-2 lists the current recommendations for normal-risk adults ages 18 to 75, as of this writing [11]. Immunization recommendations for adults are available online at http://www.cdc.gov/nip/recs/adult-schedule.pdf.

Reviewing the complete database for a health examination (Chapter 2), the midwife can easily see that a comprehensive history and physical can lead to the identification of complex problems. Even if the midwife will not be managing every condition diagnosed, she should be prepared to offer a con-

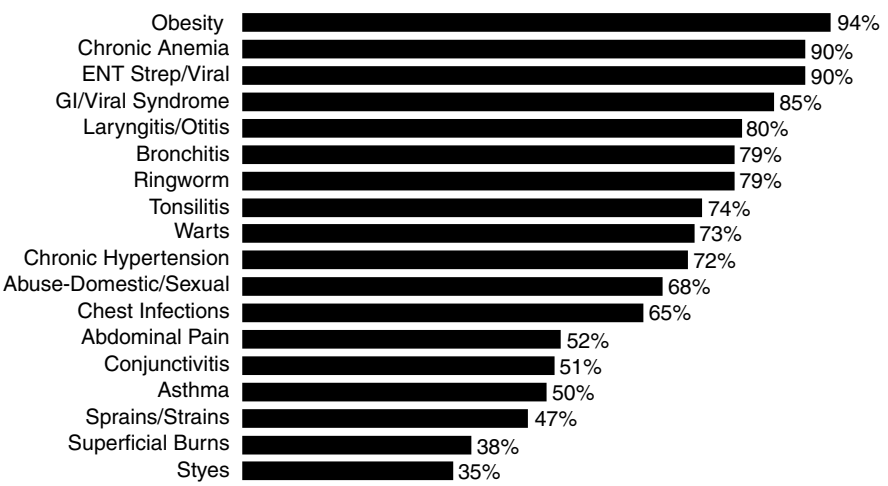


FIGURE 7-2 Percentage of midwives who identify and manage selected health care problems.

Source: Scupholme, A., and Carr, K. C. CNMs and primary care: Practice models and types of services. *Quickening* 24(6):14, 1993. Reprinted by permission of the American College of Nurse-Midwives.

TABLE 7-2	Clinical Preventive Services for Normal-Risk Adults, Recommended by the U.S. Preventive Services Task Force

Screening

Blood pressure, height, and weight: Periodically, ages 18–75
Cholesterol: *Men*, every 5 years, ages 35–75
Women, every 5 years, ages 45–75
Pap smear: Women, every 1–3 years, ages 18–65
Chlamydia: Women, periodically, ages 18–25
Mammography: Women, every 1–2 years, ages 40–75
Sigmoidoscopy: Every 5 years, ages 50–75
And/or fecal occult blood: Yearly, ages 50–75
Alcohol use: Periodically, ages 18–75
Vision, hearing: Periodically, ages 65–75

Immunization

Tetanus-diphtheria (Td): Every 10 years, ages 18–75
Varicella (VZV): Susceptibles only, two doses, ages 18–75
Measles, mumps, rubella (MMR): Women of childbearing age, one dose, ages 18–50
Pneumococcal: One dose, ages 65–75
Influenza: Yearly, ages 65–75

Chemoprevention

Aspirin to prevent cardiovascular events:
Men, periodically, ages 40–75
Women, periodically, ages 50–75

Counseling

Calium intake: Women, periodically, ages 18–75
Folic acid: Women of childbearing age, ages 18–50
Tobacco cessation, drug and alcohol use, STDs and HIV, nutrition, physical activity, sun exposure, oral health, injury prevention, and polypharmacy: Periodically, ages 18–75

Source: Clinical Preventive Services for Normal Risk Adults Recommended by the U.S. Preventive Services Task Force. Put Prevention into Practice, Rockville, MD: Agency for Health Care Quality and Research, June 2002.

sultant a complete assessment of a patient's condition. For example, if after a comprehensive history has been taken, the woman reports no problems on a review of systems, and she then walks comfortably into the exam room and is able to undress and position herself for an examination without assistance or physical difficulty, you have a significant amount of information about her general well-being—including sight, hearing, cranial nerve function, memory and orientation, affect, and gait and range of motion. You can use all the information gained through history, review of systems, and observation to target areas of concern during the physical exam and assessment.

The remainder of this chapter addresses specific medical conditions organized by body systems.

Hematologic Conditions

Anemia and Hemoglobinopathies

Among the most common complaints of women seeking care is the familiar "I'm tired all the time, I must be anemic." While there are many causes of fatigue—from anemia to thyroid disease to stress—this one is the first focus of concern for many women. Signs and symptoms associated with anemia are listed in Table 7-3.

In addition to these, the history and review of systems should include an assessment of menstrual flow, even though women's estimation of their flow has been demonstrated to be inaccurate [12]. Prior diagnosis of anemia merits a description of the circumstances. For example, some women may have been treated for pregnancy-related anemia and believe that they will therefore always be anemic.

The diets of most Americans, with the exception of some vegetarians, include about 15 mg of iron daily, and about 10 percent of that is absorbed. Normal daily iron loss through excretion, sweat, and cellular shedding amounts to 1 mg; the menses add an additional monthly loss which, with pregnancy-

TABLE 7-3	Symptoms and Signs Associated with Significant Anemia

Symptoms

Fatigue, drowsiness
Weakness
Dizziness
Headaches
Malaise
Pica
Poor appetite, changes in food preferences
Changes in mood
Changes in sleep habits

Signs

Pallor
Jaundice
Orthostatic hypotension
Peripheral edema
Pale mucous membranes and nail beds
Smooth, sore tongue
Splenomegaly
Tachycardia or flow murmur
Tachypnea, dyspnea on exertion

related demands, increases the daily iron need among reproductive age women to 2 to 3 mg/day [13].

A complete blood count (CBC) offers the first level of assessment and will differentiate many of the underlying causes of anemia. Defined as a decrease in red blood cell mass, or more correctly in total hemoglobin, the normal hemoglobin level for menstruating women is 12.0, and for pregnant women it is 11.0 g/dL [14]. However, no adverse effects are expected unless the level is <10.0 g/dL [15]. The U.S. Department of Health and Human Services does not recommend screening for anemia as part of routine health care for adults, except among pregnant women [16].

There are a number of confounding factors. Economic status has an effect, in that lower status translates into higher rates of poor nutrition and thus a higher rate of iron deficiency anemia. Race plays a role; for example, Blacks average about 1 g/dL lower hemoglobin levels than Whites regardless of socioeconomic level. Women who smoke (because of competition for oxygen-binding sites on red blood cells) and women living at high altitudes (because of lower oxygen concentration in the atmosphere) demonstrate higher hemoglobin and hematocrit levels as their bodies adapt to maintain adequate oxygenation (see Tables 7-4 and 7-5) [17].

Identifying the cause of decreased hemoglobin will lead to appropriate therapy and in some cases to referral to a specialist. One way to classify anemias is by the size of the red blood cells. Microcytic anemias include iron deficiency, the thalassemias, and anemia of chronic disease. Macrocytic anemias include folate and vitamin B_{12} deficiency, liver disease, increased reticulocyte production, and some effects from medication—for example, from zidovudine (Retrovir). Normocytic anemias commonly reflect acute blood loss or conditions such as sickle cell disease, hemoglobin C, or G6PD. Aplastic anemia, while normocytic, shows pancytopenia. Table 7-6 presents the laboratory values associated with some common anemias. When the hemoglobin is below 10.0 g/dL, a laboratory panel including the CBC, serum folate, serum iron, ferritin, and total iron binding capacity should be ordered, and a hemoglobin electrophoresis performed. Based on the severity of the anemia and its cause, consultation or referral may be indicated. When the hemoglobin indicates severe anemia (<9.0 g/dL) consultation is always appropriate, even if the anemia is clearly caused by iron deficiency.

TABLE 7-4 Smoking Adjustments for Hemoglobin and Hematocrit Cut-Points for Anemia

Smoking Status	Hemoglobin (g/dL)	Hematocrit (%)
Nonsmoker	0.0	0.0
Smoker (all)	+0.3	+1.0
0.5 < 1 ppd	+0.3	+1.0
1.0–2.0 ppd	+0.5	+1.5
>2.0 ppd	+0.7	+2.0

Source: From Centers for Disease Control. Reference criteria for anemia screening. *MMWR Morb. Mortal. Wkly. Rep*. 38:400–404, 1989.

TABLE 7-5 Altitude Adjustments for Hemoglobin and Hematocrit Cut-Points for Anemia

Altitude (ft)	Hemoglobin (g/dL)	Hematocrit (%)
<3000	0.0	0.0
3000–3999	+0.2	+0.5
4000–4999	+0.3	+1.0
5000–5999	+0.5	+1.5
6000–6999	+0.7	+2.0
7000–7999	+1.0	+3.0
8000–8999	+1.3	+4.0
9000–9999	+1.6	+5.0
>10,000	+2.0	+6.0

Source: From Centers for Disease Control. Reference criteria for anemia screening. *MMWR Morb. Mortal. Wkly. Rep*. 38:400–404, 1989.

TABLE 7-6 Laboratory Values in Common Anemias

Laboratory Test	Iron Deficiency	Vitamin B_{12} Deficiency	Folate Deficiency	Thalassemia	Chronic Disease
RBC	low	high	high	normal	normal
Hemoglobin	low	low	low	low	low
MCV	low	high	high	low	normal-low
MCH	low	high	high	low	low
MCHC	low	normal	normal	low	normal-low
Iron	low	high	high	high	low
TIBC	high	normal	normal	normal	low
Ferritin	low	high	high	high	normal-high

Iron Deficiency

The single most common anemia in the United States is iron deficiency, which in most cases is mild and easily reversible. Occult blood loss, excessive menstrual loss, and inadequate nutritional intake are by far the most common causes in adults. In the absence of an identifiable source of bleeding, assessment for gastrointestinal bleeding is warranted; the midwife should inquire about use of aspirin and nonsteroidal anti-inflammatory drugs (NSAIDs). Nutritional deficiencies causing significant iron depletion include restrictive vegetarian diets as well as pica, and a careful diet history is part of the workup. Iron supplementation, either nutritional or with oral medications, should be begun in all cases when the hemoglobin is less than 10.0 g/dL. Adding 1.0 mg of folic acid in cases where the serum folate is low or using a vitamin C–enriched product to facilitate absorption may also be useful. Nutritional counseling should stress the importance of including iron-rich foods in the diet—such as green leafy vegetables, collard greens, egg yolks, raisins, prunes, liver, oysters, and some fortified cereals—as well as the elimination of picas, such as eating ice or nonfood starches. When uncomplicated iron deficiency is the cause of the anemia and oral medications are used, any of several iron preparations, including ferrous sulfate, ferrous fumarate, and ferrous gluconate, can be used. The equivalent of 300 mg of ferrous sulfate taken three times a day is standard. Taking iron preparations with meals will decrease absorption, but it will also improve gastrointestinal side effects such as nausea and reflux. After the hemoglobin level has returned to normal, continued supplementation for three months should adequately replenish iron stores in the body.

Thalassemia

Thalassemias are mendelian recessive inherited disorders of the globin chains that form normal adult hemoglobin (hemoglobin A). In alpha thalassemias, decreased hemoglobin α production causes normal proportions of hemoglobins A, A_2, and F. The beta thalassemias show increases in hemoglobins A_2 and F relative to hemoglobin A on electrophoresis. Alpha thalassemia is most common among those of Chinese and Southeast Asian descent. Beta thalassemia is most common among women of Mediterranean origin, less so among Chinese, Asian, and African women. In both cases, the trait will appear as a microcytic anemia in which the mean cell volume (MCV) is markedly low relative to the hemoglobin level [18]. A handy shortcut to identifying these traits is Mentzer's index: MCV/RBC < 13. Nonetheless, a complete anemia panel is justified to rule out a combination of iron deficiency and hemoglobinopathy. When the diagnosis is established, folic acid supplementation may be desirable but iron therapy is inappropriate, as supplementation will not resolve the problem. A woman with a hemoglobinopathy needs to understand her diagnosis to avoid unnecessary testing in the future and to ensure that before she becomes pregnant she and her partner will be evaluated to decrease the risk of bearing a child with severe hemolytic syndromes such as thalassemia major whose risks for the fetus include hydrops fetalis.

Sickle Cell Disease

Sickle cell trait (hemoglobin AS) is found in about 8 percent of African Americans; although the trait itself does not cause severe health complications, identification of those carrying the sickle trait is important to enable couples planning children to obtain appropriate genetic counseling and testing. Midwives can care for women with sickle trait. The primary complication is an increase in urinary tract infections and hematuria.

Sickle cell disease (homozygous SS disease) is a recessive inherited disorder in which hemoglobin S is produced instead of hemoglobin A. Repeatedly stressed red blood cells form a permanent crescent moon or "sickle" shape; they may then clump and block the microvasculature. Sickle cell crises involve acute episodes of severe pain from ischemia and infarction of tissue and organs. The disease has a multiorgan effect and is associated with a shortened life span as a consequence of renal damage, cardiac damage, infection, and acute chest syndrome.

Hemoglobin S may also be present in heterozygous SC disease or sickle thalassemia, conditions that lead to somewhat milder forms of sickle crisis. For all these disease conditions, genetic counseling for couples planning a child is appropriate. Pregnant women with these diseases should be cared for by a midwife only in close collaboration with a physician experienced in the management of sickle cell disease.

G6PD Deficiency

Glucose-6-phosphate dehydrogenase (G6PD) deficiency is an X-linked genetic disease seen in those of Mediterranean descent and in African Americans. (Being X-linked, it is far more common among men than women.) Hemolysis occurs when the individ-

ual has an infection or receives oxidative drugs. Certain medications commonly used in pregnancy and women's health care that must not be given to individuals with G6PD deficiency include sulfa and sulfa derivatives, nitrofurantoin, toluidine blue, and methylene blue. Fava beans will also produce hemolysis in those with the Mediterranean variant.

The management of care of women with G6PD deficiency includes avoidance of substances that may cause hemolysis. Prompt diagnosis and treatment of any infection will minimize the risk of hemolysis from infection. Surgery can also precipitate an episode of hemolysis. Therefore, the midwife should remind a woman to notify her surgeon and surgical team prior to any elective or required surgery. Genetic counseling and prenatal diagnostic testing should be offered to all women with G6PD deficiency. When caring for a pregnant woman with G6PD deficiency, the midwife should notify the consulting physician so that appropriate care can be provided in the event an operative delivery is needed or the woman requests postpartum surgical sterilization.

Von Willebrand's Disease

Von Willebrand's disease is an autosomal dominant mutation causing defects in a polymer necessary for platelet adhesion. It is a leading cause of menorrhagia, underlying up to 20 percent of cases, particularly among teenagers [19–21]. Bleeding disorders should be suspected if the history a woman describes includes heavy menstrual bleeding in association with increased bruising, nosebleeds, or a family history of bleeding problems. At that point, the midwife should obtain a platelet count and bleeding time and coagulation studies. If the platelets are normal and the bleeding time is prolonged, von Willebrand's disease is a strong possibility. As with any other bleeding abnormality, the midwife should refer the woman to a hematologist for evaluation, although it would be appropriate for the midwife to continue to provide general care. The woman should be advised to avoid aspirin if a diagnosis of von Willebrand's disease is made [18].

The Cardiovascular System

Assessment of cardiovascular status begins with a history and review of systems that assess for hypertension, cardiac events, and vascular changes in the woman and her immediate family. The current surge in acute cardiac events among relatively young adults—spurred on by elevations of cholesterol, poor dietary habits, a sedentary lifestyle, and increased stress—means that thoughtful questioning should include these factors, which are not always considered during a reproductive health visit. Risk factors for cardiac disease include aging (with 20 percent of women over 65 having some form of heart disease), high blood pressure, dyslipidemia, obesity, lack of physical exercise, and smoking.

If the midwife is acting as the primary provider, assessment of heart sounds and of the pulses during the physical examination is as essential as a correctly taken blood pressure. After taking all data into consideration, the midwife is then able to recommend testing or further evaluation. The New York Heart Association classification system for cardiac disease, based on functional limitation, is widely used to describe severity of cardiac disease (see Table 7-7).

Assessment of Heart Sounds and Murmurs

When assessing heart sounds, the midwife should listen for additional sounds and for alterations such as murmurs or clicks. Some are consistent with functional changes. For example, a third heart sound heard over the apex is normal in pregnancy and is common in healthy young adults. One example commonly heard in young, generally healthy women is the click of mitral valve prolapse. Some murmurs, described as innocent, vary with breathing and position change. More serious murmurs may continue throughout systole, or may be heard during diastole, sound louder, or be associated with palpable vibration of the chest wall. Whenever the midwife identifies abnormal or unexplained cardiac sounds, she should refer the woman for consultation and further evaluation, such as a chest x-ray, electrocardiogram, or echocardiogram. In some set-

TABLE 7-7 New York Heart Association Classification of Heart Disease

Class I	Able to maintain normal physical activity levels without pain, shortness of breath, or other symptoms.
Class II	Some limitation of physical activity; will notice symptoms with normal activity levels.
Class III	Physical activity is limited; symptoms occur with even mild activity.
Class IV	Symptoms of congestive heart failure occur even at rest; physical activity is severely limited.

tings, the midwife may order these tests as part of the report sent to the consultant.

Mitral Valve Prolapse

This common abnormality of the mitral valve, in which the leaflets are thickened or have redundant tissue, is generally asymptomatic and carries a low risk of complications. Estimates of incidence vary widely, but as many as 10 percent of young women are reported to have a mitral valve prolapse. Clinical diagnosis can be confirmed with an echocardiogram. In the absence of insufficiency and regurgitation across the valve, bacterial endocarditis prophylaxis is unnecessary before dental or other surgical procedures [22]. However, women with more serious mitral insufficiency or regurgitation require antibiotic prophylaxis prior to surgeries. While uncomplicated prolapse is not a threatening condition, anyone with an identified cardiac condition needs to be referred to a cardiologist for assessment.

Hypertension

Hypertension—arterial disease characterized by persistent high blood pressure—is more common among men, African Americans, and the elderly. Risk increases into the sixth decade of life, by which time as many as 50 percent of the population may be affected, depending on the definitions used. Among the additional risk factors that tie hypertension to cardiac disease are smoking, dyslipidemia, diabetes, and family history.

Although it does not seem that it should be necessary to mention, many clinicians act on blood pressure results that are not accurate because the technique of assessment is incorrect. Blood pressures should always be taken with the cuff at the level of the heart, using a properly sized cuff, after the woman has had several minutes to sit quietly. She should not have ingested tobacco or caffeine for at least 30 minutes. The classification of blood pressures as presented in the *Sixth Report of the Joint National Committee on Prevention, Detection, and Treatment of High Blood Pressure* is shown in Table 7-8 [23]. Blood pressures that fall within the normal range need reevaluation every two years in healthy adults, while those with high normal values should have their blood pressure checked yearly. Stage 1 hypertension should be reconfirmed within two months. Stage 2 hypertension is reevaluated or referred for care within one month. Stage 3 findings require immediate follow-up.

TABLE 7-8 Blood Pressure Measurement and Clinical Evaluation[a]

Category	Systolic (mm Hg)		Diastolic (mm Hg)
Optimal[b]	<120		<80
Normal	<130		<85
High-normal	130–139	or	85–89
Hypertension[c]			
Stage 1	140–159	or	90–99
Stage 2	160–179	or	100–109
Stage 3	>180	or	>110

[a] Not taking antihypertensive drugs and not acutely ill. When systolic and diastolic blood pressures fall into different categories, the higher category should be selected to classify the individual's blood pressure status. In addition to classifying stages of hypertension on the basis of average blood pressure levels, clinicians should specify presence or absence of target organ disease and additional risk factors. This specificity is important for risk classification and treatment.

[b] Optimal blood pressure with respect to cardiovascular risk is below 120/80 mm Hg. However, unusually low readings should be evaluated for clinical significance.

[c] Based on the average of two or more readings taken at each of two or more visits after an initial screening.

Source: National High Blood Pressure Education Program. *The Sixth Report of the Joint National Committee on Prevention, Detection, and Treatment of High Blood Pressure*. National Institutes of Health, November 1997.

Midwives should provide dietary and lifestyle counseling to promote weight loss and physical fitness among persons with high normal blood pressure; weight loss of as little as 10 pounds may have a salutary effect on blood pressure [24]. When caring for women with hypertensive disease, reinforcing the same information contributes to the effectiveness of medication programs. Appropriate dietary changes include increasing intake of fresh fruits and vegetables and low fat dairy products, and decreasing both total and saturated fats [25]. Additional lifestyle changes include weight loss for those with a BMI greater than 27, increasing aerobic exercise, decreasing dietary sodium to less than 2.4 grams daily, decreasing alcohol, consuming adequate potassium, calcium, and magnesium in the diet, and smoking cessation [23].

Drug therapy for hypertension draws on several categories of medication. The most commonly used as first-line medications include thiazide diuretics, ACE inhibitors (e.g., Lotensin, Zestril), and beta-blockers (e.g., Inderal, Lopressor). Most midwives will refer women who need pharmaceuticals to a physician to initiate treatment or alter medication regimens.

Women with hypertension who are considering a pregnancy need to discuss with their clinicians which medications are safe for use during the childbearing year. Changing therapeutic agents is often necessary and should be undertaken by the person responsible for managing the hypertension (see Chapter 24). In addition, women with preexisting hypertension are at increased risk for superimposed preeclampsia during the pregnancy.

Dyslipidemia

Dyslipidemia—elevated cholesterol—is a major risk factor for cardiac disease, and, often, a preventable one. The epidemic of obesity and high dietary fat intake in the United States is one that can usually be addressed with lifestyle changes. The National Heart, Lung, and Blood Institute (NHLBI) recommends beginning cholesterol screening in healthy adults at age 20. Risk of high cholesterol increases with age; more than 40 percent of women over 55 have elevated cholesterol levels [26]. Other risk factors include cigarette smoking, hypertension, diabetes, hypothyroidism, and a family history of early-onset disease. An excellent tool for estimating risk is available at the NHLBI Web site (www.nhlbi.nih.gov/guidelines). Table 7-9 presents the classification of cholesterol levels.

When the midwife identifies hypercholesterolemia as a risk factor, counseling always includes nutritional changes to decrease total and dietary fat to 25 to 35 percent of total calories, to add dietary fiber, to stop smoking, and to increase exercise levels. Management of obesity and dietary fat is discussed further in Chapter 6. Medication therapy can be deferred while a trial of healthy behaviors is undertaken, as long as there is no family history suggestive of genetic predisposition to coronary artery disease and the LDL cholesterol level is less than 160 for women without other cardiac risk factors.

Pharmacologic therapy is instituted based on LDL level and risk profile. Among the medications used for elevated cholesterol are the statins (e.g., Lipitor, Zocor, Pravachol), bile acid sequestrants (cholestyramine), nicotinic acid (niacin), and fibric acids (e.g., gemfibrozil) [27].

TABLE 7-9 Classification of LDL, Total, and HDL Cholesterol (mg/dL)

LDL Cholesterol
<100 Optimal 100–129 Near optimal/above optimal 130–159 Borderline high 160–189 High >190 Very high
Total Cholesterol
<200 Desirable 200–239 Borderline high >240 High
HDL Cholesterol
<40 Low >60 High

Source: National Cholesterol Education Program. *Third Report of the National Cholesterol Education Program (NCEP) on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III)*. National Institutes of Health and National Heart, Lung, and Blood Institute, May 2001. Accessed at www.nhlbi.nih.gov/guidelines/index on 8/2/02.

Respiratory Diseases

Upper Respiratory Infections (URI) and Influenza

Commonly viral in nature, colds and influenza produce significant numbers of calls to any medical office, with patients often asking for antibiotics that will not cure the problem. One study has found that 75 percent of antibiotic prescriptions written in the United States were for acute respiratory infections, of which URI is the most common [28]. Overtreatment as well as inappropriate treatment has led to a rapid increase in the presence of resistant *Streptococcus pneumoniae*, a problem with implications for the management of all respiratory disease, as *S. pneumoniae* is the most common bacterial respiratory pathogen [29].

The diagnosis of URI is made based on the presence of nasal congestion and a clear or white discharge, as well as sore throat, muscle aches, headache, and cough. The symptoms of colds and influenza overlap, although high fever and dry cough are more typical of the "flu" than of a cold. Symptomatic management with rest, increased humidity (hot showers, humidifiers), increased fluids, over-the-counter drugs—including antipyretics, analgesics, and cough suppressants or decongestants as needed—will reduce the severity of symptoms. Ipratropium bromide (Atrovent), an anticholinergic nasal spray, has also been shown to relieve rhinorrhea, sneezing, and congestion. Initial use is two sprays in each nostril, three to four times daily [30]. Atrovent is also available in oral inhaler form as a therapy for obstructive pulmonary dis-

ease. In contrast, the use of antihistamines has not been shown to reduce cold symptoms significantly. Kinins, a group of vasoactive peptides, are implicated in rhinitis symptoms, while histamines are not [31]. Resolution of symptoms should be complete within a week.

Many upper respiratory infections can be avoided through the use of simple hygiene techniques, most particularly the practice of hand washing. The use of antibacterial soaps and environmental sprays are, by and large, not necessary in the home.

Several therapies for influenza are available, including rimantidine (Flumantidine) and the neuraminidase inhibitors (Relenza, Tamiflu). When the winter influenza season is in progress, infections suspected of being influenza can be treated within 48 hours of the onset of symptoms to shorten the duration of infection by about one day. Vaccination has been shown to have a preventive benefit as well, although when influenza is defined only by clinical symptoms the benefit is slight [32]. The authors of the Cochrane database review concluded that while vaccination and treatment were beneficial, the most cost-effective approach to managing influenza in the healthy adult was to use supportive measures only [33]. Women with significant exposure risk such as health workers, immunocompromised patients, and older women may receive greater benefit from vaccination.

Sinusitis

Sinus infections are typically bacterial in nature and are frequently found as a superimposed infection when nasal swelling has blocked drainage from one or more sinus cavities. In addition to pain and pressure over the affected sinus, a change from the clear nasal drainage of rhinitis to a green or yellow discharge is commonly found. Toothache near the affected sinus is also predictive. Fever and a cough that worsens when lying down are also characteristic. Therapy includes supportive management with over-the-counter decongestants, increased humidity, and antibiotics. As with colds, antihistamines should not be used unless there is an allergic component to the congestion. Common pathogens in sinusitis include *Streptococcus* species, *Staphylococcus aureus*, and *Haemophilus influenzae*; these can generally be treated for ten days with any of a number of drugs, including mainstays such as ampicillin, trimethoprim/sulfamethoxazole, the cephalosporins, and the macrolides [34]. Table 7-10 summarizes specific therapies.

Because antibiotic resistance is rising, some experts are suggesting the use of symptomatic therapy

TABLE 7-10 Examples of Antibiotics Commonly Used in the Treatment of Respiratory Infections

Class	Dose Range/Duration	Pregnancy Category
Cephalosporins		
Cefaclor (Ceclor)	250 mg q8h × 10 days	B
Cefixime (Suprax)	400 mg po QD × 10 days	B
Cefuroxime Axetil (Ceftin)	250 mg po q12h × 10 days	B
Cephalexin (Keflex)	250 mg po q6h × 10 days	B
	500 mg po q12h × 10 days	B
Macrolides		
Azithromycin (Zithromax)	500 mg po × 1, then 250 mg po QD × 4 days	B
Clarithromycin (Biaxin)	250–500 mg po q12h × 10–14 days	C
Penicillins		
Amoxicillin (e.g., Amoxil)	500 mg po q8h × 10 days 500–875 mg q12h × 10 days	B
Amoxicillin/Clavulanate (Augmentin)	500–875 mg po q12h × 10 days (based on amoxicillin dose)	B
Quinolones		
Ciprofloxacin (Cipro)	500 mg po BID × 10 days	C
Levofloxacin (Levoquin)	500 mg po QD × 10 days	C
Trimethoprim/sulfamethoxazole (Bactrim)	160/800mg po BID × 10 days	C

only in newly presenting uncomplicated infections. Unresolved symptoms after therapy, frequent recurrences or infection, or a finding of periorbital edema require referral to a physician for further evaluation [35].

Bronchitis

Infections of the lower respiratory tract limited to the trachea and bronchi are termed bronchitis. It can appear as an inflammatory response to an otherwise uncomplicated URI. In healthy women of reproductive age, bronchitis is typically a viral syndrome of fever, malaise, fatigue, sore throat, chest pain, and cough. Worsening chest pain with shortness of breath or pain on inspiration suggests pneumonia. The cough may be productive or nonproductive. On auscultation, lung sounds other than over the bronchi should be clear; a chest x-ray, if performed, should not show infiltrates.

In most cases, the infection will clear and the cough resolves within one to two weeks with supportive therapy, which should include the usual regimen of rest, increased fluids, and over-the-counter decongestants or cough suppressants. If cough is the primary symptom, the use of an albuterol inhaler (Proventil, Ventolin) may provide relief [36]. If an inhaler is prescribed, the directions should be for two puffs every four to six hours as needed to relieve symptoms. Greater frequency of use, or prolonged use, suggests the need for referral to a physician.

Antibiotics are not useful in the case of viral bronchitis, but under certain circumstances suspected bacterial infections of the bronchi may require antibiotic therapy (see Table 7-10). Symptoms of such a condition include worsening cough with productive discolored sputum and chronic or recurrent bronchitis with underlying respiratory disease. If the diagnosis is unclear, pneumonia should be ruled out based on examination of the lungs and a chest x-ray. Consultation with the physician is warranted if the midwife is unable to exclude pneumonia.

Community-Acquired Pneumonias

Infections of the lungs are the leading infectious cause of death in the United States. Predisposing factors for pneumonia include damage to the cilia of the respiratory tract from chronic cough, viral infections, or smoking. The most common organisms found are *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Staphylococcus aureus*, with *S. pneumoniae* causing up to two-thirds of all community-acquired disease. Other bacteria and viruses can also produce pneumonia, as can chlamydia or mycoplasma. The onset of symptoms is usually abrupt, with fever, cough, chest pain, shortness of breath, sweats and chills, generalized aches, headache, and fatigue being common. When the cause is bacterial, high fever and a productive cough are more likely, whereas viral causes will produce a more generalized malaise. Unlike most upper respiratory infections, increases in respiratory rate and pulse are common. The lung fields will have rales and occasional wheezing, and areas of consolidation may produce diminished breath sounds on auscultation. Chest x-ray is indicated to confirm the diagnosis and to identify underlying complications. When feasible, a sputum sample should be obtained to identify the etiologic agent.

Whether patients with pneumonia are treated on an outpatient basis or are hospitalized is a decision with significant consequences in terms of treatment modalities, testing schemes, and costs. Fine and his colleagues reported on the development of a prediction rule that identified patients at low risk of dying or suffering major sequelae [37]. Adults under 50, without existing comorbidity such as liver, kidney, cardiac, cerebrovascular disease, or malignant disease are screened for physical abnormalities: altered mental status, pulse greater than 125 bpm, increased respiratory rate greater than 30, systolic pressure less than 90 mm Hg, or temperature less than 35° C or greater than 40° C. Patients who do not exhibit these signs of severe disease are at low risk of mortality. The authors went on to describe additional criteria for low-risk patients based on laboratory findings and other criteria. Using the findings described above produced a group of women who could be treated without further testing [37]. While uncomplicated pneumonia should be treated promptly with antibiotics and can safely be managed on an outpatient basis in healthy adults, the prudent midwife will consult with a physician if pneumonia is suspected. Common first-line antibiotics for community-acquired pneumonia include the macrolides, doxycycline, and quinolones [38].

Asthma

Asthma is the chronic inflammation of airways—associated with reversible obstruction from spasm, edema, and mucus production—and hyperresponsiveness to stimuli. It is classified into four steps based on severity and frequency of symptoms: (1)

mild intermittent asthma, (2) mild persistent, (3) moderate persistent, and (4) severe persistent (Table 7-11) [41]. Over time, changes in the walls of the airways can lead to irreversible constriction. While most cases of asthma have childhood onset, adults can also develop new disease. Current data suggest that about 14 million U.S. adults have recent asthma symptoms. Being female and African American and having lower family income are all associated with increased risk of developing asthma [39]. An adult presenting with symptoms of wheezing, chest tightness, and shortness of breath should be evaluated for asthma; occasionally a dry nocturnal cough will be the only presenting complaint. The differential diagnosis includes chronic obstructive disease (chronic bronchitis or emphysema), congestive heart failure, pulmonary embolism, drug-related cough, and other causes of airway obstruction. Common triggers for adult asthma attacks include exercise, rhinitis (infectious or allergic), bronchitis, gastroesophageal reflux, and allergies to NSAIDs (such as Motrin), sulfites, or beta-blockers (such as Inderal). Women with asthma should be counseled to avoid triggers, which may also include inhaled allergens such as perfumes and irritants such as environmental smoke or polluted air. Smoking cessation is key for decreasing the severity of the disease among women who smoke. The National Institutes of Health Expert Panel Report on asthma notes that underdiagnosis and undertreatment are the major contributors to morbidity and mortality from asthma [40].

In the office setting, a patient whose lung sounds and symptoms suggest asthma can be asked to use a peak flow meter that measures maximum expiratory breath force before and after the use of a short-acting bronchodilator to establish whether the respiratory difficulty responds to smooth muscle relaxation. Formal spirometry is necessary for an accurate diagnosis, but office evaluation can allow the immediate start of acute therapy. Midwives practicing in areas of high asthma frequency may keep flow meters in their offices either to assist in the presumptive diagnosis of asthma or to assess lung function when asthmatic women present and are symptomatic.

Anyone with persistent asthmatic symptoms needs to be on daily medication, rather than relying solely on a rescue inhaler such as $beta_2$-agonists like albuterol (Ventolin) or metaproterenol (Alupent). Undertreatment limits physical activity, decreases

TABLE 7-11 Classification of Asthma Severity: Clinical Features Before Treatment

	Days with Symptoms	Nights with Symptoms	PEF or FEV_1*	PEF Variability
Step 4 *Severe Persistent*	Continual	Frequent	″60%	>30%
Step 3 *Moderate Persistent*	Daily	≥5/month	>60%–<80%	>30%
Step 2 *Mild Persistent*	3–6/week	3–4/month	≥80%	20–30%
Step 1 *Mild Intermittent*	″2/week	″2/month	≥80%	<20%

* Percent predicted values for forced expiratory volume in 1 second (FEV_1) and percent of personal best for peak expiratory flow (PEF) (relevant for children 6 years old or older who can use these devices).

NOTES

- Patients should be assigned to the most severe step in which *any* feature occurs. Clinical features for individual patients may overlap across steps.
- An individual's classification may change over time.
- Patients at any level of severity of chronic asthma can have mild, moderate, or severe exacerbations of asthma. Some patients with intermittent asthma experience severe and life-threatening exacerbations separated by long periods of normal lung function and no symptoms.
- Patients with two or more asthma exacerbations per week (i.e., progressively worsening symptoms that may last hours or days) tend to have moderate-to-severe persistent asthma.

Source: Practical Guide for the Diagnosis and Management of Asthma. NIH Publication No. 97-4053. 10/97.

pulmonary function, and increases the risk of recurrent attacks. The choice of medications is based on both the severity and persistence of symptoms. The main categories of asthma drugs for long-term maintenance include (1) inhaled or systemic corticosteroids (e.g., Vanceril, Flovent, prednisone), (2) cromolyn sodium (Intal) and nedocromil (Tilade), (3) long-acting beta$_2$-agonists (e.g., Serevent), (4) methylxanthines such as theophylline, and leukotriene modifiers (e.g., Singulair). In addition to short-acting inhaled beta$_2$-agonists, anticholinergics such as ipratropium bromide, or short courses of oral corticosteroids may offer relief [40]. The National Heart, Lung, and Blood Institute Web site (www.nhlbi.nih.gov) provides access to the most current guidelines on asthma management. In general, newly diagnosed asthma should be evaluated in consultation with or by referral to a physician experienced in respiratory care.

During pregnancy, asthma symptoms may worsen as the lung space is compressed by the growing fetus. Women with moderate to severe asthma and recent exacerbations should be referred to a physician for evaluation. Liu and colleagues reported an increase in adverse pregnancy outcomes related to maternal asthma, including preterm labor and birth, preterm premature rupture of membranes (PPROM), and hypertensive disorders of pregnancy [42]. However, they could not identify severity of disease or level of asthma control in their retrospective cohort. Thus it is not clear that well-managed asthma with minimal exacerbations would have the same effect on pregnancy outcome. If a woman's condition is stable and she is not experiencing any limitations in physical activity, there is no reason why she should not receive prenatal care and give birth with a midwife.

Gastrointestinal Disorders and Abdominal Pain

Stomach aches and pains, diarrhea and constipation, and bloating are all common complaints presenting in primary care. As part of the history for any woman of childbearing age, last menstrual period and potential pregnancy risk are routinely assessed. Ensuring that women of childbearing age are not pregnant is essential in working up any abdominal complaints. This section will focus on general gastrointestinal health concerns common to all women, although obstetric concerns such as ectopic pregnancy or gynecologic complaints and gynecologic concerns such as ovarian cysts and endometritis will be addressed in other chapters.

Gastroenteritis and Acute Diarrhea

Some women may complain of diarrhea if they have any change in bowel habits that produces soft, frequent, or less formed stools. When assessing history, true diarrhea has increased water content and may have increased mucus content. Acute diarrhea is predominantly infectious; chronic diarrhea, lasting for more than two consecutive weeks, can result from diverse conditions, including infections, medication, chronic illness, malabsorption syndromes, stress, and irritable bowel syndrome. Most midwives will need to refer women with chronic watery diarrhea to a physician for further evaluation after completing a careful history and physical examination.

Viral gastroenteritis is a generally self-limiting disease, in which oral exposure to a pathogenic virus leads to explosive onset of nausea, vomiting, and/or diarrhea, fever, and malaise within two to three days of exposure. The abdomen is tender; no guarding is present. Bowel sounds are increased. Workup of acute diarrhea includes a stool sample to check for white blood cells or frank bleeding. Laboratory evaluation of electrolytes should be reserved for more severe or persistent cases when dehydration is suspected, as should stool for culture or ova and parasites.

Most viral cases in healthy adults will clear spontaneously within one to four days. Rest and oral fluids are the basic components of care. Intravenous rehydration with electrolytes can be used for severe dehydration and for individuals at increased risk, such as the elderly and the immunocompromised. Medications such as kaolin/pectin (Kaopectate), diphenoxylate (Lomotil), or loperamide (Imodium) can be offered to decrease the frequency of stools. If symptoms are not resolving or the patient is becoming dehydrated, closer evaluation is warranted. Stool samples for culture or for ova and parasites (depending on the suspected pathogen) as well as a toxin assay for *Clostridium difficile* (with recent antimicrobial use) would be indicated [43].

Other causes of diarrhea-linked infections include *E. coli* species, *Salmonella*, and a host of other bacteria, most of which are foodborne. The American Medical Association and the Centers for Disease Control and Prevention have published a reference for foodborne illnesses that identifies the

major contributing organisms, diagnostic criteria, and management [44]. *E. coli* is the most common cause of traveler's diarrhea. These bacteria may cause symptoms either as a result of toxin release or by directly attacking the bowel wall. With mild bacterial gastrointestinal infections, fever is less likely to be present than with viral diseases. As with the viral causes of diarrhea, symptomatic measures will usually suffice when the cause is bacterial. The use of antibiotics in the treatment of diarrhea should be reserved for culture-proven or severe disease that is clearly bacterial in nature.

Constipation

Straining to produce hard stools, infrequent bowel movements (fewer than once in three days), and painful defecation are characteristic of constipation. Initial questioning of women with these complaints should include an assessment of their "usual" bowel function. Among healthy women, inadequate dietary fiber, possibly decreased fluid intake, and iron therapy for anemia (whether real or simply suspected by the woman) are common causes. Other medications, such as tricyclic antidepressants (e.g., Elavil), anticholinergics (e.g., Atrovent), and calcium channel blockers (e.g., Cardizem and Verapamil), may slow peristalsis and increase stool transit time, leading to constipation. Misuse of laxatives, leading to decreased natural stimulation of the bowel, is also common, more so among the elderly. More serious causes range from neurological dysfunction to abuse of opiates. Stress, anxiety, and depression may lead to changes in bowel habits, as would abnormalities of the bowel and functional problems such as irritable bowel syndrome. A careful history and physical assessment of women with any chronic bowel changes is necessary to rule out serious underlying disease that would require a medical referral [45].

Management of chronic constipation in healthy women includes counseling about diet and exercise, and an increase in fluid intake. Avoidance of straining, and recognizing the physical cues that indicate the need to defecate, are included in teaching. Women should also be counseled to stop the overuse of laxatives, cathartics, and enemas. If any medication is necessary during early treatment, a bulk-forming over-the-counter drug such as Metamucil should be used; however, adding fiber to the diet is a better strategy since it promotes a pattern of healthy eating to maintain normal function. If symptom relief is not obtained with the above measures, a trial of laxatives such as docusate sodium (Colace) is in order before referring the woman to a physician.

Irritable Bowel Syndrome

Irritable bowel syndrome (IBS) consists of lower gastrointestinal tract complaints of increased bloating, diarrhea, and/or constipation in the absence of any structural or biochemical cause. It is chronic in nature, and one of the most common presenting complaints in primary care practice. The current definition (Rome II) includes onset associated with changes in the frequency or composition of the stool and pain relief with defecation, persisting over 12 weeks within the last year. To meet the diagnostic criteria, the symptoms need not be continuous. Intermittent symptoms totaling 12 weeks are considered significant. Increased or decreased stool frequency, abnormal stool formation (either hard or watery), bloating, difficulty in the passage of stool (straining, urgency, or failure to completely empty the bowel), and mucus in the stool are further confirmation of the diagnosis [46]. The onset of IBS usually occurs during the young adult years; because organic causes of bowel changes are more common with increasing age, a new diagnosis should be made with care in adults over 40. Assessment includes evaluation for bowel obstruction, including malignancies, and for gastrointestinal bleeding. Irritable bowel syndrome should not be confused with inflammatory bowel diseases such as Crohn's disease and ulcerative colitis, which are chronic, recurrent inflammations of the bowel. The relationship of symptom relief to having a bowel movement is strongly suggestive of IBS.

Care plans may include short-term use of therapy for diarrhea or constipation, but their chronic use should be avoided. Some women will complain of food allergies or conditions such as lactose intolerance. Most food allergies present as acute upset, not as chronic bowel changes. If a patient has severely restricted her dietary intake, adding foods back into the diet may improve general health and nutrition as well as symptoms.

There is a strong psychosocial component to seeking care for IBS, although the symptoms are common among adults who do not seek care. Thus, an important step in managing care for individuals with this complaint is building a trusting relationship. Education about IBS, reassurance about the course and management possibilities, and dietary modification are important in helping women man-

age their symptoms effectively [47]. Because of the strong likelihood of underlying psychological distress among patients with IBS, a careful assessment for anxiety disorders and depression is warranted. Considerations in managing this aspect of the disease include the use of antidepressants, particularly the selective serotonin reuptake inhibitors (SSRIs) such as Prozac or Zoloft, psychotherapy, and supportive behavioral therapy [48].

Gastroesophageal Reflux Disease

Gastroesophageal reflux disease (GERD), a condition affecting up to one in five adults, produces symptoms of heartburn that worsen with meals, bending over, and lying down. Other less easily recognizable symptoms include an asthmalike wheeze, cough, laryngitis, and chest pain. Persistent severe disease may produce complications such as injury to the epithelium of the esophagus (Barrett's esophagus) and stricture formation [49].

Therapy for GERD includes weight reduction, maintaining a diet high in protein and low in fat, and the avoidance of triggers such as caffeine, tobacco, and spicy or acidic foods. Remaining upright after meals will help prevent symptoms. If reflux is occurring primarily at night, elevating the head while in bed will also help avoid discomfort. If these measures do not relieve symptoms, the use of antacids will bring short-term relief, while H2 receptor antagonists such as cimetidine (Tagamet), famotidine (Pepcid), ranitidine (Zantac), and nizatidine (Axid) will relieve symptoms for longer periods. Proton pump inhibitors can be used for persistent problems. They include prescription drugs such as omeprazole (Prilosec), esomeprazole (Nexium), and lansoprazole (Prevacid). (See Table 7-12 for common regimens.)

Midwives whose patients fail a trial of H2 receptor antagonists should obtain consultation from a physician, to assess the need for endoscopy or possible fundoplication of the stomach [49]. Comparison of surgical outcomes with medical management has been shown to improve quality of life in severe cases, or when the patient is not satisfied with the results of medication therapy [50]. Treatment to eliminate *Helicobacter pylori* has also been demonstrated to have a beneficial effect on the course of GERD [51]. GERD is a common cause of chronic cough, due to reflux into the esophagus or larynx triggering a cough reflex, or to aspiration of refluxed stomach contents into the respiratory tract. Cough may be the only symptom of GERD, in which case treatment for GERD will relieve a cough not otherwise responsive to therapy [52].

Ulcers

Peptic ulcers are open lesions of the stomach or duodenum, penetrating through the mucosa into muscle. Common causes are excessive use of nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen or aspirin, and *H. pylori* infection, a condition responsible for 80 to 90 percent of all gastric and duodenal ulceration. It is more common among the elderly, persons of lower socioeconomic status, and Black and Hispanic ethnic groups; however, most persons who are colonized with *H. pylori* do not suffer from ulcers [53].

Endoscopy with collection of biopsy samples for histology is the most accurate technique for diagnosis as well as assessment of lesions for cancer risk. Culture for *H. pylori* is an additional useful tool in areas where antibiotic resistance is becoming a serious problem, in order to utilize the most ef-

TABLE 7-12 Medications for the Management of Gastroesophageal Reflux Disease (GERD)

Medication	Dose	Duration of Therapy	FDA Pregnancy Category
H2 Receptor Antagonists			
Cimetidine (Tagamet)	400 mg po QID or 800 mg po BID	12 weeks	B
Famotidine (Pepcid)	20 mg po BID	6 weeks	B
Nizatidine (Axid)	150 mg po BID	12 weeks	B
Ranitidine (Zantac)	150 mg po BID	12 weeks	B
Proton Pump Inhibitors			
Esomeprazole (Nexium)	20 mg po QD 20 mg po QD	4 weeks maintenance	B
Iansoprazole (Prevacid)	15 mg po QD	8 weeks	B
Omeprazole (Prilosec)	20 mg po QD	4-8 weeks	C

fective therapy first. Noninvasive testing methods such as serology and urea breath tests are most appropriate in symptomatic, healthy adults at low risk for stomach cancer. However, urea breath tests are more expensive and less widely available, and thus are more commonly used only to confirm the eradication of infection [54, 55].

Counseling about avoiding aspirin and NSAIDs, stress reduction, and smoking cessation are all useful interventions in conjunction with medication for the management of ulcers. Alone, they will not resolve the disease. Midwives should consult with or refer to a physician if considering the management of peptic ulcers. First-line drug therapy for peptic ulcer disease begins with removal of the *H. pylori* from the stomach and duodenum with aggressive antibiotic therapy, usually with more than one antibiotic, for two weeks. One example of this sort of therapy would be omeprazole (Prilosec) 20 mg po bid, plus clarithromycin (Biaxin) 500 mg po bid, plus metronidazole (Flagyl) 500 mg po bid for 14 days. Unless the ulceration has been caused solely by use of NSAIDs, no other therapy will provide lasting results. Drugs to reduce the acid content of the stomach—including antacids, H2 receptor antagonists, and proton pump inhibitors—are useful in promoting the healing of tissue [56]. Following the eradication of *H. pylori*, recurrence rates are low; maintenance doses of a proton pump inhibitor or sucralfate (Carafate) may be used when refractory or severe ulcers are resolved [57]. Gastric ulcers which remain unresolved need to be evaluated to exclude cancerous lesions of the stomach [58].

Assessing Abdominal Pain

This section limits itself to consideration of two common nonreproductive causes of acute abdominal pain: cholecystitis and appendicitis. Either of these may also present initially with more subtle symptoms. The differential diagnosis includes a host of other conditions, among them pyelonephritis, drug withdrawal, ulcers, pancreatitis, ectopic pregnancy, ovarian cysts, and heart attacks. The diversity of this list reinforces the idea that midwives confronted with acute abdominal pain should not hesitate to seek consultation when the diagnosis is unclear. Reproductive health issues related to abdominal pain are discussed in Chapter 14.

When a woman presents with acute abdominal pain, assessment begins with a comprehensive history. Onset of symptoms and their progress are determined, as well as identifying whether the pain is localized, and, if so, to which quadrant. Characteristics that distinguish the acute abdomen are abdominal rigidity or distention, guarding, rebound pain, tachycardia, and decreased or absent bowel sounds. Fever may be present but is not essential to the diagnosis. Vomiting as well as urinary, bowel, or vaginal symptoms may be present. An acute abdomen is often a surgical emergency, and immediate referral to a physician is an appropriate plan.

Cholecystitis

Cholecystitis is an inflammation of the gallbladder, an organ that collects, concentrates, and dispenses into the digestive tract the bile produced by the liver. Occasionally, the gallbladder will form gallstones, developing when excess cholesterol triggers a crystallization process. Cholecystitis is more common among women and the obese, and its incidence increases with age. When cholecystitis develops, symptoms range from diffuse discomfort to sharp epigastric pain following meals. The pain may last for several hours and is often associated with nausea and vomiting. Acute attacks present with severe, persistent right-upper quadrant pain, often radiating to the right shoulder blade or the central back opposite the epigastrium. Murphy's sign is positive if the woman has an inspiratory arrest with deep palpation of the right upper quadrant. Occasionally there is a palpable mass at the gallbladder. Leukocytosis, elevated liver function tests, and elevated bilirubin are common laboratory findings.

Once a diagnosis of cholecystitis is considered, the midwife should arrange for a medical referral. The usual treatment for symptomatic gallstones is surgical removal of the gallbladder. Laparoscopic techniques are commonly used. Nonsurgical treatments for small stones include medication therapy with bile acids, or dissolution by lithotripsy, or a combination. However, there is a substantial risk of recurrence following nonsurgical approaches.

A recent study looked at outcomes of cholecystectomy during pregnancy [58]. Preterm contractions, leading in one case to preterm delivery, were more common in the group that had laparotomy rather than a laparoscopic procedure performed. One maternal death occurred, in a woman who had experienced an ileus following her laparoscopic procedure, and then returned several days later with an intra-abdominal hemorrhage with no iden-

tifiable bleeding site. One fetus aborted spontaneously five weeks after an open procedure. In spite of these significant complications, the authors concluded that cholecystectomy was preferable to the risks of conservative management, which included pancreatitis and preterm labor.

Appendicitis

The classic descriptive symptoms for appendicitis are anorexia and generalized abdominal pain, resolving into acute right-lower quadrant abdominal pain, vomiting, fever, and the appearance of leukocytosis on complete blood count. Deep tenderness over McBurney's point in the lower right abdomen is an early sign of acute appendicitis. Rebound pain with release of pressure from the left lower abdomen is known as Rovsing's sign.

During pregnancy, appendicitis is the single most common abdominal emergency not directly related to the pregnancy itself. In addition, the common discomforts, such as round ligament pain, and physiologic and hematologic changes of pregnancy such as elevation in WBC, may mask symptoms of appendicitis. Pain commonly remains in the right-lower quadrant, although the original concept of appendicitis pain in pregnancy was that it would migrate into the right-upper quadrant as pregnancy advanced. False positive diagnoses in pregnancy are generally higher than in nonpregnant women, and false positive rates as high as 30 percent may be necessary to avoid missing this emergency diagnosis [59]. While maternal morbidity does not seem to be increased when appendicitis occurs during pregnancy, the risks of spontaneous abortion and preterm labor and/or preterm birth are increased [59, 60].

Genitourinary Problems

The close proximity of the urinary tract to the reproductive organs means that women frequently call their gynecologic provider for management of urinary tract symptoms. In pregnancy, lower urinary tract infections become more common, and asymptomatic bacteriuria is associated with an increased risk of preterm labor. Office evaluation and management of uncomplicated cystitis is an essential skill for midwives, as are prompt recognition and triage of the more serious pyelonephritis.

Acute Cystitis

Uncomplicated acute cystitis can be identified as the presence of as few as 100 colonies per milliliter of urine in symptomatic women, or more traditionally, as 100,000 colonies per milliliter whether or not symptoms of urinary tract infection (UTI) are present. The predominant organism is *E. coli*, with *S. saprophyticus*, *Enterobacter*, and *Enterococci* species making up most other pathogens. Symptoms include pain on urination and increased voiding frequency. In healthy young women, those who are sexually active will have a higher risk, primarily associated with delayed voiding after genital sex and the use of spermicides and diaphragms (which may promote the growth of bacteria in the periurethral area) [61]. In office practice, identification of positive leukocyte esterase on a urinalysis is adequately sensitive to initiate therapy. Most of the pathogens associated with UTIs remain sensitive to any of several standard drug regimens (see Table 7-13).

The Group Health Cooperative of Seattle developed clinical guidelines for triage of patients based on symptoms of UTI, which demonstrated decreased use of cultures, increased utilization of recommended drug regimens for treatment of cystitis, and no increase in adverse outcomes due to missed diagnoses or delayed treatment [62]. Their guidelines are shown in Figure 7-3.

Three-day antibiotic regimens are generally adequate for uncomplicated bladder infections. Single-day treatments are effective as a clinical cure, but they are associated with a higher rate of recurrent infection. The former "gold standard" of seven-day therapy is highly effective but not necessary in most women. Those who would benefit

TABLE 7-13 Anti-Infectives Commonly Used in the Treatment of Uncomplicated Urinary Tract Infections

Trimethoprim/sulfamethoxazole (Bactrim)	160 mg/800 mg po BID × 3 days*
Nitrofurantoin (Macrodantin)	100 mg po BID × 3 days*
Amoxicillin (Amoxil)	500 mg po TID × 3 days
Cephalexin (Keflex)	500 mg po QID × 3 days

During pregnancy, treat with 7-day therapy at the same dose.

* Avoid use in term pregnancy.

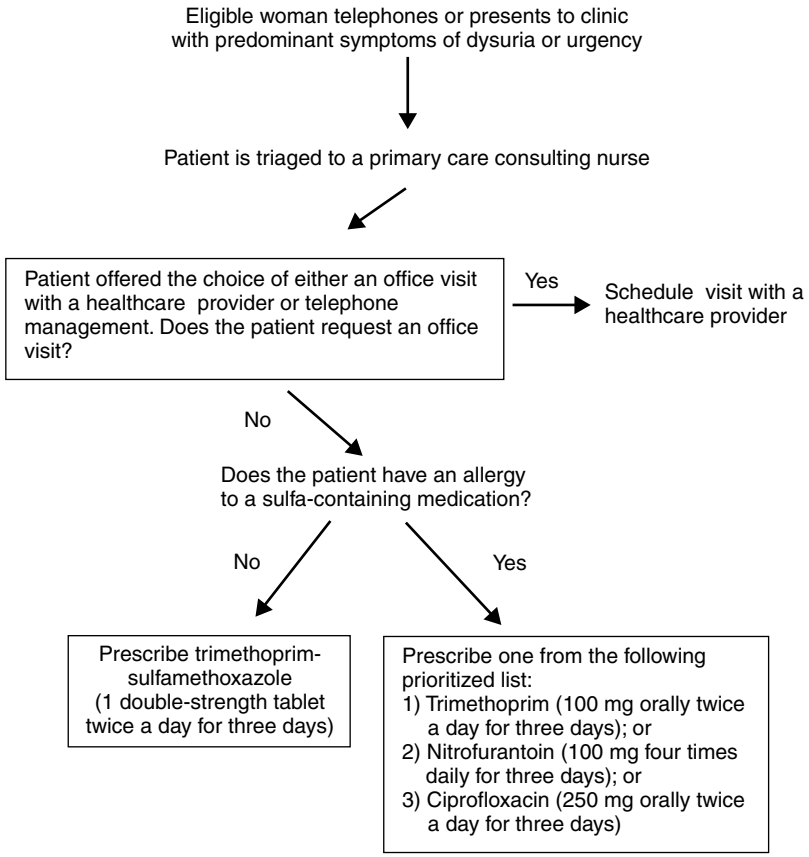


FIGURE 7-3 Guidelines for the treatment of urinary tract infections.

Source: Saint, S., Scholes, D., Fihn, S. D., Farrell, R. G., and Stamm, W. E. The Effectiveness of a Clinical Practice Guideline for the Management of Presumed Uncomplicated Urinary Tract Infection. *Am. J. Med.* 106:636–641 (June) 1999.

from longer regimens include pregnant women, immunosuppressed patients, diabetics, and patients whose symptoms had persisted for several days before beginning therapy.

Pyelonephritis

Acute pyelonephritis, an inflammation of the kidneys, might also have been included in the section on abdominal pain, as its characteristic presentation is severe flank pain and fever with associated nausea. The diagnosis should be confirmed by a urinalysis positive for white cells or pyuria and by culture. Physician consultation or referral is required when pyelonephritis is diagnosed. Outpatient treatment of healthy nonpregnant women can be appropriate if the infection is diagnosed early. However, many women will require hospitalization for intravenous antibiotics in the initial stage of treatment. A 10- to 14-day course of IV/oral therapy is required. Cephalosporins (e.g., Rocephin), quinolones (e.g., Cipro), and trimethoprim/sulfamethoxazole (Bactrim) are all effective [61]. During pregnancy, ampicillin plus gentamycin, cefazolin (Ancef), and ceftriaxone (Rocephin) have each been demonstrated to be effective. When pyelonephritis is treated effectively in pregnancy, it is not associated with an increase in adverse pregnancy outcomes [63].

Diabetes

Because of the increased rates of obesity in the United States, diabetes has become an increasingly common disease. Approximately ten times as many adults have Type II diabetes as Type I; 8 percent of American adults have Type II diabetes according to the most recent National Health and Nutrition Examination Survey (NHANES) data [64]. Diabetes is more common among the obese and women of color, and its prevalence increases with age. The disorder is associated with increased risks of hypertension, hyperlipidemia, and coronary heart disease, and it may also produce damage that will result directly in vascular disease, renal failure, and retinopathy.

The current classification strategy for diabetes focuses not on whether insulin is necessary, but on the cause of insulin deficiency. Type I diabetes is almost always mediated by the immune system causing pancreatic B cell destruction; Type II diabetes, which is far more common, is the result of resistance to insulin and the inability of the pancreas to increase insulin production to compensate. The term *impaired glucose tolerance* is used for adults with fasting glucose values that are elevated above normal but do not meet the criteria for overt diabetes. Other rare forms of diabetes have also been identified [65].

The diagnosis of diabetes is based on laboratory values. The presentation of women in clinical practice depends on both the type and severity of onset. Young women with Type I diabetes generally present with clear complaints of polyuria, including the need to urinate during the night, increased thirst, hunger with associated weight loss, and weakness or fatigue. Those with Type II diabetes may also complain of thirst, frequent voiding, and weakness, but they are more likely to present with recurrent vaginal yeast infections, itching, skin infections, blurred vision, or even peripheral neuropathy. In many cases, particularly with obese women, diagnosis will only occur with laboratory screening. Women with a history of large infants and unexplained fetal losses should be considered at risk. Table 7-14 presents the laboratory criteria for diagnosing diabetes. Two consecutive fasting values greater than 125 mg/dL can also be used as diagnostic.

Hemoglobin A_{1C} measurements can be used to assess both background level of blood sugar in newly diagnosed diabetics and maintenance of glycemic control. The test results are expressed as percentage of total hemoglobin. Normal, nondiabetic samples run 4.0 to 7.0 percent. Because red blood cells have a turnover period of 120 days, the A_{1C} levels will decline toward normal values as the patient develops better control.

When a woman is diagnosed with new onset diabetes, she needs a referral from the midwife to an endocrinologist and may also benefit from a nutrition referral. Based on the severity and duration of her disease prior to diagnosis, adult women with delayed recognition of Type II diabetes may already have hyperlipidemia, hypertension, and vascular damage. Smoking cessation, weight loss, and diet and exercise modification are essential components of maintaining health in diabetic women—as indeed they are for all women. It is in these areas that the midwife can play an important role. Women with diabetes continue to need regular gynecologic care and family planning, have an increased need for preconception counseling, and will remain prone to vaginal symptoms if glucose control is not optimal. Contraceptive methods can be chosen freely with regard to the woman's stated preferences as to method. However, when using hormonal contraceptives, attention to choosing a drug with minimal effect on the lipid profile is important. Because of the increased risk of vascular disease and hypertension experienced by diabetic women, the selection of a combined oral contraceptive with less than 35 μg of estrogen is recommended [66]. The risks of pregnancy versus those of the contraceptive method must be carefully weighed. Women choosing a barrier method should consider their individual risk for recurrent vaginal infections.

Medication for Type I diabetes is always insulin, which serves as a replacement for a nonfunctioning pancreas. Insulin is administered in split doses to maintain normal or near normal glucose levels throughout the day. Many adults with Type II diabetes are able to manage with diet,

TABLE 7-14 Criteria for the Diagnosis of Diabetes Mellitus

1. Symptoms of diabetes plus casual plasma glucose concentration ≥200 mg/dl (11.1 mmol/l). Casual is defined as any time of day without regard to time since last meal. The classic symptoms of diabetes include polyuria, polydipsia, and unexplained weight loss.

or

2. FPG ≥ 126 mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least 8 h.

or

3. 2-h PG ≥ 200 mg/dl (11.1 mmol/l) during an OGTT. The test should be performed as described by WHO, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.

In the absence of unequivocal hyperglycemia with acute metabolic decompensation, these criteria should be confirmed by repeat testing on a different day. The third measure (OGTT) is not recommended for routine clinical use.

Source: Copyright © 2003 American Diabetes Association. From *Diabetes Care*, Vol. 26, Supplement 1, 2003; S5-S20. Reprinted with permission from The American Diabetes Association.

exercise, and weight loss. Others move through a progression of diet and exercise, to single or multiple oral agents, to insulin. Common oral medications include the sulfonureas—for example, glyburide (Micronase) or glipizide (Glucotrol), repaglinide (Prandin), metformin (Glucophage), and rosiglitazone (Avandia).

Women with impaired glucose tolerance need consistent counseling regarding the importance of exercise, weight loss, and dietary changes. A recent comparison of metformin therapy versus lifestyle changes to reduce the onset of Type II diabetes among persons with impaired glucose tolerance found that an intervention to promote weight loss and exercise was more effective than medication in delaying the onset of diabetes [67].

Thyroid Disease

Diseases of the thyroid gland are more common among women than men; in addition, hormonal changes, including pregnancy, may require alterations in therapy. Thyroid-releasing hormone from the hypothalamus stimulates pituitary release of thyroid-stimulating hormone (TSH). In turn, TSH stimulates the production and release of triiodothyronine (T3) and thyroxine (T4) from the thyroid gland. Although T3 is the more active of the thyroid hormones, little is produced in the thyroid itself. Most T3 is produced from circulating T4 as it loses iodine.

In screening for or diagnosing thyroid diseases, the first tests performed are generally TSH and free T4. Because most circulating thyroid hormones are bound to thyroid binding globulins (TBG) and other serum proteins, a total T4 is not as useful. Other laboratory tests may be valuable in confirming a clinical diagnosis. Table 7-15 shows the changes in screening laboratory values associated with common thyroid disorders.

Hyperthyroidism

The single most common cause of hyperthyroid states (also referred to as thyrotoxicosis) is Graves' disease, an autoimmune disease. It is far more common among women than men and is the cause of greater than 90 percent of cases of thyrotoxicosis in young adults. The thyroid is typically enlarged and tender. Many women will complain of irritation of the conjunctiva, diplopia, or blurred vision, or present with proptosis (the projection of the eye forward in its orbit) and periorbital edema. (Table 7-16 lists the common signs and symptoms of thyroid disease.)

Other causes of hyperthyroidism include toxic multinodular goiter, toxic adenomas, early stages of Hashimoto's thyroiditis or postpartum thyroiditis. It has also been associated with very high levels of circulating hCG, such as those found in hydatidiform mole. Subclinical hyperthyroidism occurs when the TSH is low or undetectable and free T4 and T3 are normal. This is most commonly found with suppressive thyroid therapy, although mild Graves' disease is a possible cause. The midwife should refer for physician consultation any woman in whom hyperthyroidism is diagnosed or suspected.

Various therapies exist for treatment of hyperthyroid states. The thiourea drugs such as methimazole (Tapazole) and propylthiouracil, radioactive iodine, and surgical removal of the thyroid are all used successfully. Beta-blockers may be given for symptomatic relief. None of these treatments is without risks, including the subsequent development of hypothyroidism. Thus the midwife whose patient complains of symptoms of hypothyroidism after treatment for Graves' disease or other hyperthyroid states should screen for the presence of hypothyroidism.

During pregnancy, the dose of the thiourea drugs is limited to prevent fetal hypothyroidism and goiter, and propylthiouracil is considered safer; radioactive iodine is contraindicated during pregnancy. The goal is to maintain the free T4 in a high normal range, to minimize fetal risk.

TABLE 7-15 Thyroid Hormone Values

Condition	Thyroid-Stimulating Hormone (TSH)	Free T4	Serum T3
Graves' disease	Absent	Elevated	Elevated
Subclinical hyperthyroid	<0.1 mU/L	Normal	Normal
Hypothyroid	High with primary, low with secondary	Low	Low/normal
Subclinical hypothyroid	Mildly elevated (<10.0 mU/L)	Low/normal	

TABLE 7-16	Common Clinical Features of Thyroid Disease: Signs and Symptoms
Hyperthyroid	
Anxiety, nervousness	
Fatigue	
Weakness	
Increased sweating	
Heat intolerance	
Diarrhea	
Warm, moist skin	
Tremor	
Irregular menses	
Lid lag, stare	
Hyperreflexia	
Increased appetite with weight loss	
Palpitations with angina	
Goiter	
Ophthalmopathy	
Hypothyroid	
Fatigue, sleepiness	
Lethargy	
Muscle weakness	
Muscle cramping or pain	
Cold intolerance	
Constipation	
Dry skin, brittle nails, thinning hair	
Headaches	
Menorrhagia, amenorrhea (late)	
Delay in deep tendon reflex relaxation	
Depression	
Decreased sweating	
Edema (non-pitting)	
Hoarseness	
Pallor	
Loss of appetite	
Weight gain (occasionally weight loss)	
Slowed speech and body movements	
Bradycardia	
Goiter	

Hypothyroidism

By far the most common cause of hypothyroidism in the United States is the autoimmune disorder known as Hashimoto's thyroiditis. Common causes of hypothyroidism are listed in Table 7-17. Hypothyroidism is more common among women than men, and the incidence increases with age. A positive family history also increases one's risk. Testing women 50 or older and those with abnormal lipid profiles is a reasonable consideration, given that disease prevalence in older adults may reach 10 percent.

TABLE 7-17	Causes of Hypothyroidism
Primary	
Autoimmune thyroiditis (Hashimoto's thyroiditis)	
Radiation of head or neck	
Radioiodine therapy for Graves' disease	
Thyroidectomy	
Iodine deficiency	
Medications (e.g., lithium, amiodarone, thioureas, interferon-alpha, interleukin-2)	
Scleroderma	
Amyloidosis	
Enzyme defects	
Secondary	
Pituitary diseases	
Hypothalamic disease	

Hypothyroid conditions can result either primarily, from failure of the gland to produce adequate hormone, or secondarily, from pituitary or hypothalamic disease. In primary hypothyroid states, the TSH will be elevated. If the original problem is along the hypothalamic-pituitary axis, the TSH will be low. Additional laboratory testing when hypothyroidism is suspected includes antimicrosomal antibodies (to confirm Hashimoto's thyroiditis), CBC and B12, and a lipid profile (often abnormal in thyroid disease).

Fortunately, therapy for uncomplicated primary hypothyroidism is generally a straightforward matter of supplementing reduced gland function. In healthy young adults, a starting dose of 50 to 100 μg/day of L-thyroxine can be titrated upward every two to three weeks until symptoms resolve and laboratory values are normal. Among older women, the increase should be slower. Usual therapeutic doses are 100 to 150 μg.

During pregnancy, total T3 and T4 rise as a result of increased TBG secretion, but free T4 should change only minimally. Monitoring thyroid status will allow for any necessary increases in levothyroxine therapy [68].

Postpartum thyroiditis is a transient condition affecting up to 5 percent of women [69]. The presentation is initially that of hyperthyroidism, followed by a period of clinical hypothyroidism, usually three to six months following birth. Most women recover spontaneously. It can recur with subsequent pregnancies and suggests an increased future risk of thyroid disease. Women who present with symptoms suggestive of postpartum depres-

sion should also have this condition considered as part of their evaluation.

Gynecologically, women with menorrhagia who do not have an obvious cause for their bleeding, such as submucosal fibroids, should have a TSH and free T4 done as part of their workup. Even subclinical hypothyroidism, with TSH in the range of 5–10 mU/L, can produce excessive menstrual bleeding [70]. It has also been suggested that women using estrogen replacement therapy may need adjustments in their levothyroxine dose [71].

Carpal Tunnel Syndrome

The carpal tunnel carries the median nerve through the wrist, where compression from edema, inflammation of the tissue, or anatomical distortion can produce the classic symptoms of carpal tunnel syndrome (CTS)—tingling, numbness, or altered sensation across the palmar surface of part of the thumb, the first two fingers, and part of the ring finger in the affected hand. Figure 7-4 illustrates the area affected by CTS. Over time, CTS almost always becomes bilateral. Pain and numbness often worsen at night.

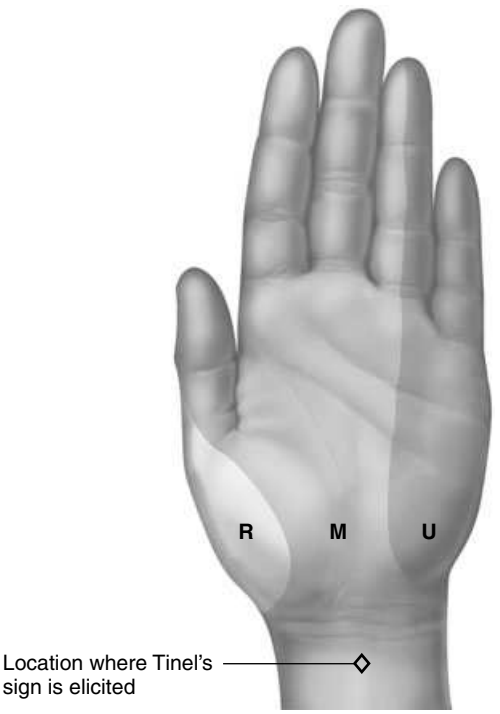


FIGURE 7-4 Distribution of sensation by the radial (R), median (M), and ulnar (U) nerves.

Two simple tests can help to confirm that the woman's complaint is consistent with carpal tunnel. First, tapping over the wrist crease in the midline should produce tingling in the affected area; this is referred to as Tinel's sign. Second, holding the wrist flexed for 30 to 45 seconds and releasing should produce symptoms; this is referred to as the Phalen test. When women engaged in a repetitive motion of the wrists at work or school complain of numbness or loss of sensation in this pattern, the risk is increasingly recognized, in part because of the increased insistence on ergonomics to reduce workplace injuries. However, pregnancy, contraceptive hormones, obesity, hypothyroid states, and diabetes, as well as arthritis and collagen vascular diseases can also produce the edema and constriction that underlies CTS [72, 73]. Other forms of nerve damage can also resemble these problems. If additional symptoms, not attributable to the median nerve, are present, prompt referral is warranted.

Initial treatment is conservative, and begins with splinting at night to place the wrist in a neutral position. For time-limited conditions like pregnancy, this may be all that is necessary. Aerobic exercise has been shown to improve the symptoms of CTS [74]. If symptoms worsen or persist, the woman should be referred to an orthopedic surgeon or neurologist for further evaluation. Treatment may then include surgical release of the nerve or injections of steroids. If left untreated, the condition will only worsen over time and eventually lead to permanent decrease in sensation.

Headache

The common categories of headache in women of reproductive age are migraines and tension-type headaches, with up to 90 percent of women reporting at least one headache per month. Other less common causes include infections, cluster headaches, arteriovenous malformations, cerebrovascular events, meningitis, tumors, glaucoma, sinusitis, medication overuse, and even dental problems. For this reason, atypical, unusually severe or unresponsive headaches should be promptly referred to a neurologist for evaluation. In addition, anyone who complains of "the worst imaginable headache" or "the worst headache I've ever had" should have an urgent evaluation by a physician to consider the possibility of hemorrhage into the brain. Finally, headaches which are of new onset

after the age of 40 carry an increased risk of being associated with a tumor and should be referred promptly. Midwives who choose to manage common headaches should have a readily available consulting physician who is knowledgeable about headache therapy. The increasing use of antidepressants in the treatment of headache may limit the ability of midwives to manage these conditions in states where the ability to prescribe psychoactive drugs is limited.

Taking a careful history as well as collecting a full description of headache symptoms, their frequency and onset, precipitating factors, menstrual history, family tendency, and secondary symptoms—for example, rash, fever, stiffness of the neck, visual changes, and head trauma—are essential to diagnosis. Physical examination assesses for neurological changes, pain from sinus or jaw problems, localization of current symptoms, and symptoms of headache secondary to other conditions. Characteristic features of the common headache types are shown in Table 7-18.

Migraine

Migraine headaches usually develop in late adolescence or early adulthood, and their frequency rises into middle age, after which they become less common. Classic descriptions include severe, unilateral, throbbing pain, often with associated nausea, vomiting, photophobia, or phonophobia. Migraineurs—people who have been diagnosed with migraine—are more common among women, with a population estimate of approximately 18 percent [75]. However, among those whose self-described symptoms meet the International Headache Society criteria for migraine, only half are diagnosed by their physicians [76]. Because of the severity of migraine, underdiagnosis and undertreatment lead to significant loss of productivity and decreased quality of life. It is important to recognize that the basic cause of migraine is an increased sensitivity to neurological stimuli, not the vascular changes that follow.

A prodrome of widely varying symptoms lasting for hours or several days before the onset of headache may be described by half or more of all

TABLE 7-18 Clinical Characteristics of the Primary Headache Syndromes

Feature	Migraine without Aura	Migraine with Aura	Tension-Type Headache (Episodic)	Cluster Headache (Episodic)
Prevalence	Common	Uncommon	Common	Rare
Gender	Females>males	Females>males	Females>males	Males>females
Family history	Frequent	Frequent	Frequent	Rare
Age at onset (yr)	10–30	10–30	20–40	20–40
Prodrome	Common	Common	None	None
Aura (visual)	None	Present	None	None
Site of pain	Hemicranial, bilateral	Hemicranial, bilateral	Bilateral, occipital, frontal	Unilateral, frontotemporal periorbital
Character of pain	Pulsatile	Pulsatile	Aching, tight, squeezing	Boring
Severity of pain	Moderate to severe	Moderate to severe	Mild to moderate	Severe
Onset to peak pain	Minutes to hours	Minutes to hours	Hours	Minutes (rapid)
Duration of pain	Usually 4–24 hrs	Usually 4-24 hrs	Hours to days	30–90 min
Frequency of attack	Variable, several per month	Variable, several per month	Variable, several per month	Daily during cluster period
Periodicity of attacks	No (exception, menstrual migraine)	No (exception, menstrual migraine)	No	Yes, "like clockwork"
Accompaniments	Nausea, vomiting, photophobia, phonophobia, osmophobia	Nausea, vomiting, photophobia, phonophobia, osmophobia	Nausea on occasion	Ipsilateral nasal congestion, rhinorrhea, conjunctival injection, ptosis, lacrimation
Behavior during headache	Still, quiet	Still, quiet	No change	Pace
Nocturnal attacks of pain	Can occur	Can occur	Very rare	Extremely frequent
Triggering factors	Multiple	Multiple	Stress, elevation	Alcohol, sleep, emotional upset

Source: From *Mayo Clin. Proc.* 71:1055–1066 (November) 1996. Found at www.ama-assn.org/spec/migraine/library/readroom/mayoful.htm.

migraineurs. Photophobia, phonophobia, mood changes, irritability, drowsiness, increased thirst, and hunger are the most commonly mentioned symptoms. Aura is experienced in the hour before headache onset by 10 to 20 percent of migraineurs. Visual changes such as scotomata, subjective visual images, and loss of visual field after appearance of bright, zigzag visual images are the most common aura. Paresthesias, disturbance of motor function, and disturbances of thought or speech are less common [77].

A number of lifestyle changes may improve the frequency of migraine. These include the avoidance of substances that the individual can identify as headache triggers (such as cheese, alcohol, or chocolate), stress reduction, and stable patterns of eating and rest.

Pharmacologic therapy depends on the severity and frequency of attacks. In mild cases of migraine, NSAIDs taken in maximal doses can be used as abortive therapy, especially if they can be taken during the warning prodrome. Acetaminophen 1000 mg can also be tried. There is evidence that the combination of aspirin, acetaminophen, and caffeine may have an increased benefit [78]. Among prescription drugs, ergotamine preparations such as Cafergot, the triptans—for example, sumatriptan (Imitrex) and naratriptan (Amerge)—and tricyclic antidepressants such as nortriptyline or amitriptyline are common first-line therapies. Women of childbearing age should be on an effective contraceptive method when using these medications, and those planning a pregnancy may require a change in therapeutic management.

During pregnancy, the incidence and severity of migraine are reported to decrease by as much as 70 percent, with rebound occurring during the postpartum period. Treatment is limited in most cases to acetaminophen and supportive measures. For obvious reasons, ergotamines should be avoided during pregnancy. The use of triptans is still controversial, although recent data do not indicate an increase in adverse pregnancy outcomes with sumatriptan [79, 80].

Menstrual migraine is the term used for headaches appearing only in association with menses and ovulation, which occurs in about 14 percent of women. Maintaining a stable estrogen environment can decrease the severity and frequency of these headaches [81]. One way to do this is with the use of monophasic combined oral contraceptives, particularly if they are prescribed to be taken in a long cycle, skipping the inert pills until three cycles are complete (i.e., the 21 hormonally active pills from each of three packages are taken sequentially before the pills are stopped for one week).

Tension Headache

Tension headaches are divided into two categories: chronic and episodic. Occurring in women more often than in men, the typical onset is in young adulthood. When tension headaches are episodic, women rarely present seeking treatment; chronic tension headaches that persist for hours and recur frequently are a more serious problem. Holroyd and colleagues reported that among persons with chronic tension headaches most were able to continue working and managing daily activities, but they had decreased ability to function, their sleep was disturbed, and emotional well-being was decreased [82]. Compared with matched controls, those with a diagnosis of chronic tension headache were significantly more likely to have anxiety or mood disorders.

Respect for the woman's complaints, assessment of the risk and need for treatment for anxiety or depression, and promotion of lifestyle changes that include relaxation and stress reduction are all part of providing care. Symptomatic therapy with NSAIDs or acetaminophen can be used, although the relief obtained may be greater with milder disease. One study recently compared the combination of ibuprofen 400 mg plus caffeine 200 mg with either drug separately and to placebo, and demonstrated a significantly increased benefit from the combination as reported by participants [83]. In another study, comparison of behavioral therapy for stress management with tricyclic antidepressant therapy showed a modest benefit for either intervention [84]. A combination of the two modalities reduced overall headache activity in about two-thirds of the participants by 50 percent [84].

Depression

Depressive disorders may affect more than 20 percent of women seen in primary care, depending on the definitions used. Approximately twice as many women as men suffer from depressive disorders, with an annual incidence of 13 percent, and a lifetime risk of one in five for major depression alone [85]. There is good evidence that depression is underdiagnosed in primary care, either because clini-

cians do not know how to identify it or because they choose not to recognize it when presented with symptoms. Major depression is a recurrent illness for half of the women who experience these symptoms.

The DSM-IV criteria for major depression include five or more of the following symptoms, present for a two-week period and representing a change from prior function. Either of the first two criteria must be present:

1. Depressed mood nearly every day for most of the day either by self-report or observation
2. Diminished or absent pleasure in all or most activities, most of the day, most days
3. Significant weight loss or gain (>5 percent), or decreased or increased appetite nearly every day
4. Insomnia or hypersomnia
5. Psychomotor agitation or retardation (must be observed by others)
6. Fatigue or loss of energy
7. Feelings of worthlessness, or inappropriate or excessive guilt, possibly delusional
8. Decreased ability to concentrate or think clearly, indecisiveness
9. Recurrent thoughts of death, suicidal ideation, or a suicide plan or attempt

The symptoms must cause significant impairment of life activities or distress, and cannot be accounted for by loss of a loved one or other major life loss [86].

Dysthymia is a more low-grade, chronically depressed state, in which mood is depressed most days, for most of the day, for two or more years. It is associated with at least two of the following characteristics:

1. Changes in appetite
2. Insomnia or hypersomnia
3. Fatigue, decreased energy
4. Low self-esteem
5. Poor concentration, difficulty with decision-making
6. Hopeless feelings [86]

Women who present with complaints that suggest depression should also be evaluated for medical conditions such as hypothyroidism or severe anemia that might produce similar symptoms. Pain or chronic disability from conditions such as arthritis, stroke, or heart disease may also produce depressive symptoms. It is important not to neglect either aspect of the woman's needs. Her depression is as real and as significant in her life as the physical conditions with which she is living.

Both psychotherapy and medications are important in the management of depression. Behavioral changes need to be incremental, as women with depression are already feeling overwhelmed. Goals need to be set in increments that allow for the positive reinforcement of visible achievements. Apart from crisis intervention, counseling is a long-term process, one for which few midwives are qualified or have the time to provide in the office setting. Maintaining a referral network that includes psychiatric services is essential.

Common medication classes for depression include the selective serotonin reuptake inhibitors (SSRIs), tricyclic compounds, and monoamine oxidase inhibitors (MAOIs), as shown in Table 7-19.

TABLE 7-19 Examples of Medications Used in the Treatment of Depression and Related Disorders

Class	Initial Dose	Maximum Dose	FDA Pregnancy Category
Selective Serotonin Reuptake Inhibitors (SSRIs)			
Citalopram (Celexa)	20 mg po QD	60 mg po QD	C
Fluoxetine (Prozac)	20 mg po QAM	90 mg po QAM	C
Paroxetine (Paxil)	20 mg po QD	50 mg po QD	C
Sertraline (Zoloft)	50 mg po QD	200 mg po QD	C
Antidepressants			
Venlafaxine (Effexor)	37.5–75 mg po bid	375 mg/day	C
Buproprion (Wellbutrin)	100 mg po bid	450 mg/day	B
Tricyclic Antidepressants			
Amitriptyline (Elavil)	50–100 mg po QHS	150 mg/day	C
Imipramine (Tofranil)	75 mg/day	200 mg/day	N

SSRIs are generally favored as first-line drugs because they have fewer anticholinergic effects as well as problems related to weight gain and the cardiovascular system. MAOI drugs are less commonly used because of the many food interactions that require dietary restriction. All of these classes of drugs do have negative side effects, and the midwife who considers prescribing any of these should be familiar with them.

Medication, while easy to prescribe for depression requires monitoring for titration to an effective dose and subsequent stability. Patients newly started on an antidepressant need information about interactions and side effects. They then need to be seen on a one- to two-week basis for six weeks, and reevaluated at 12 weeks. If the first choice of medication is partially effective, a dose change is advised. If the first choice is ineffective, a change in therapy, after a washout period to clear one drug from the body if another class is prescribed, is recommended. Those not in complete remission by 12 weeks need referral to a mental health specialist.

Because the antidepressant medications, particularly SSRIs and the atypical antidepressants, are being used for management of other problems, including premenstrual syndrome and menopausal symptoms, the midwife may find herself using these medications more frequently.

Conclusion

Deciding the scope of midwifery practice issues used to be a simple matter: Midwives took care of healthy pregnant women and helped them give birth. The recognition then came that women's family planning needs could be well served by midwives. Managing office-based gynecologic problems like infections, answering the questions that came with life changes, and addressing menopause all began to be recognized as part of the core of midwifery practice.

Of course, midwives never did care only for healthy women, if for no other reason than that many of the women we have traditionally served were at risk by age, socioeconomic status, and lack of access to other health care resources. Today midwifery is practiced in a health care system in which the only provider many women see is their "women's health" provider. And midwives still care for pregnant women.

What does this mean for the student of midwifery? First, it means an obligation to correctly identify common complaints—minor and major. This includes the obligation to describe accurately those symptoms or signs for which you cannot make a diagnosis. Second, it requires an ability to assess and triage these complaints. Which can you personally manage? Which require referral? Which will you care for, or direct the care of, because the woman is pregnant and her other sources of care are not familiar with the interactions of mother and fetus? These are matters for individual decision-making, with the stipulation that as a midwife you must have a resource for consultation and referral that is accessible. Midwives who practice primary care need to be sure that consultants include resources who are knowledgeable about primary health care concerns. In fact, all midwives need to know to whom they will refer cases beyond their scope of practice. This can include nurse-practitioners or physician assistants as well as physicians. Not all obstetrician-gynecologists are comfortable in the primary care role; not all women have an identified primary care provider.

The astute reader may have noticed the frequency with which reference has been made in this chapter to counseling about lifestyle changes in order to prevent or treat diseases. One of the assets midwives bring to primary care for women is our understanding of the importance of health maintenance and disease prevention. This is the same strength we bring to pregnancy care and birth, the understanding that in order to maintain normalcy attention must be paid to the everyday aspects of health: from nutrition and exercise to substance use or abuse. Furthermore, to maintain normalcy, the midwife must be able to recognize when it is not present. Every midwife has an obligation to provide this aspect of primary care with all women.

References

1. American College of Nurse-Midwives. *Certified Nurse-Midwives and Certified-Midwives as Primary Care Providers/Case Managers*. Washington, DC: ACNM, 1992, rev. 1997.
2. Donaldson, M. S., Yordy, K. D., Lohr, K. N., and Vanselow, N. A. (Eds.) *Primary Care: America's Health in a New Era*. Washington DC: National Academy Press, 1996.
3. Cherry, D. K., and Woodwell, D. A. National ambulatory medical care survey: 2000 summary. *Advance Data from Vital and Health*

Statistics, No. 328. Hyattsville, MD: National Center for Health Statistics, June 5, 2002.

4. Horton, J. A., Cruess, D. F., and Pearse, W. H. Primary and preventive care services provided by obstetrician-gynecologists. *Obstet. Gynecol.* 82:723–726, 1993.
5. Hendrix, S. L., Piereson, S. D., and McNeeley, S. G. Primary and preventive care in a university obstetrics and gynecology group practice. *Am. J. Obstet.Gynecol.* 172:1719–1725, 1995.
6. Scupholme, A., and Carr, K. C. CNMs and primary care: Practice models and types of services. *Quickening* 24(6):14, 1993.
7. Scroggs, J. A., Griffin, L. P., Bayerl, M., and Schulkin, J. Obstetrician-gynecologists as primary care physicians: the perspectives of health maintenance organization medical directors and obstetrician-gynecologists. *Obstet. Gynecol.* 90(2):291–295 (August) 1997.
8. Slusarcick, A. L., and McCaig, L. F. *National Ambulatory Medical Care Survey: 1998. Outpatient Department Summary*, No. 317. Hyattsville, MD: National Center for Health Statistics, July 27, 2000.
9. Paine, L. L., Lang, J. M., Strobino, D. M., et al. Characteristics of nurse-midwife patients and visits, 1991. *Am. J. Public Health* 89(6):906–909 (June) 1999.
10. Scupholme, A., Paine, L. L., Lang, J. M., Kumar, S., and DeJoseph, J. F. Time associated with components of clinical services rendered by nurse-midwives. *J. Nurse-Midwifery* 39(1):5–12 (January/February) 1994.
11. *Clinical Preventive Services for Normal-Risk Adults Recommended by the U.S. Preventive Services Task Force. Put Prevention into Practice*. Rockville, MD: Agency for Health Care Quality and Research, June 2002.
12. Fraser, I. S. A preliminary study of factors influencing perception of menstrual blood loss volume. *Am. J. Obstet. Gynecol.* 149(7):788–793, 1984.
13. Frewin, R., Henson, A., and Provan, D. ABC of clinical haematology. Iron deficiency anaemia. *Br. Med. J.* 314:360–363 (February) 1997.
14. U.S. Department of Health and Human Services, Public Health Service. *The Clinician's Handbook of Preventive Services*. Alexandria, VA: International Medical Publishing, 1994.
15. Elwood, P. C. Evaluation of the clinical importance of anemia. *Am. J. Clin. Nutr.* 26(9):958–964 (September) 1973.
16. U.S. Preventive Services Task Force. *Guide to Clinical Preventive Services*. Baltimore, MD: Williams and Wilkins, 1996.
17. Centers for Disease Control. Reference criteria for anemia screening. *MMWR Morb. Mort. Wkly. Rep.* 38:400–404, 1989.
18. Linker, C. A. Blood. In Tierney, L. M., McPhee, S. J., Papadakis, M. A. (Eds.) *Current Medical Diagnosis and Treatment 2001,* 40th Ed. New York: Lange Medical Books/McGraw-Hill, 2001.
19. Claessens, E. A., and Cowell, C. A. Acute adolescent menorrhagia. *Am. J. Obstet. Gynecol.* 139:277–280, 1981.
20. Kadir, R. A., Economides, D. L., Sabin, C. A., Owens, D., and Lee, C. A. Frequency of inherited bleeding disorders in women with menorrhagia. *Lancet* 351:485–489, 1998.
21. Dilley, A., Drews, C., Miller, C., et al. Von Willebrand disease and other inherited bleeding disorders in women with diagnosed menorrhagia. *Obstet. Gynecol.* 97:630–636, 2001.
22. Dajani, A. S., Taubert, K. A., Wilson, W., et al. Prevention of bacterial endocarditis. Recommendations of the American Heart Association. *JAMA* 277(22):1794–1801 (June 11) 1997.
23. National Institutes of Health, National High Blood Pressure Education Program. *The Sixth Report of the Joint National Committee on Prevention, Detection, and Treatment of High Blood Pressure*. NIH, November 1997.
24. Trials of Hypertension Prevention Collaborative Research Group. Effects of weight loss and sodium reduction intervention on blood pressure and hypertension incidence in overweight people with high normal blood pressure. The Trials of Hypertension Prevention Phase II. *Arch. Intern. Med.* 157:657–667, 1997.
25. Appel, L. J., Moore, T. J., Obazanek, E., et al., for the DASH Collaborative Group. A clinical trial of the effects of dietary patterns on blood pressure. *N. Eng. J. Med.* 336:1117–1124, 1997.
26. Kramerow, E., Lentzer, H., Rooks, R., Weeks, J., and Saydh, S. *Health, United States, 1999. With Health and Aging Chartbook*, (PHS) 99-1232. Hyattsville, MD: National Center for Health Statistics, 1999.
27. National Cholesterol Education Program. *Third Report of the National Cholesterol Education Program (NCEP) on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III)*. National Institutes of Health/National Heart, Lung, and Blood Institute, May 2001. Accessed at www.nhlbi.nih.gov/guidelines/index on 8/2/02.
28. McCaig, L. F., and Hughes, J. M. Trends in antimicrobial drug prescribing among office-

based physicians in the United States. *JAMA* 273:214–219 (January 18) 1995.

29. Gonzales, R., Bartlett, J. G., Besser, R.E., et al. Principles of appropriate antibiotic use for treatment of acute upper respiratory tract infections in adults: Background, specific aims, and methods. *Ann. Intern. Med.* 134(6):479–486 (March 20) 2001.

30. Hayden, F. G., Diamond, L., Wood, P. B., Korts, D. C., and Wecker, M. T. Effectiveness and safety of intranasal ipratropium bromide in common colds: A randomized, double-blind, placebo-controlled trial. *Ann. Intern. Med.* 125(2):89–97, 1996.

31. Luks, D., and Anderson, M. R. Antihistamines and the common cold. A review and critique of the literature. *J. Gen. Intern. Med.* 11:240–244 (April) 1996.

32. Jefferson, T. Advances in the diagnosis and management of influenza. *Curr. Infect. Dis. Rep.* 4(3):206–210 (June) 2002.

33. Demicheli, V., Jefferson, T., Rivetti, D., and Deeks, J. Prevention and early treatment of influenza in healthy adults. *Vaccine* 18(11-12): 957–1030 (January 6) 2000.

34. Low, D. E., Derosiers, M., McSherry, J., et al. A practical guide for the diagnosis and treatment of acute sinusitis. *Can. Med. Assoc. J.* 156(suppl. 6):S1–14 (March 15) 1997.

35. Poole, M. D. A focus on acute sinusitis in adults: Changes in disease management. *Am. J. Med.* 106(5A):38S–47S (May 3) 1999.

36. Gonzales, R., Bartlett, J. G., Besser, R. E., et al. Principles of appropriate antibiotic use for treatment of uncomplicated acute bronchitis: Background. *Ann. Intern. Med.* 134(6):521–529 (March 20) 2001.

37. Fine, M. J., Auble, T. E., Yealy, D. M., et al. A prediction rule to identify low-risk patients with community-acquired pneumonia. *N. Eng. J. Med.* 336(4):243–250 (January 23) 1997.

38. Bartlett, J. G., Dowell, S. F., Mendel, L. A., et al. Practice guidelines for the management of community-acquired pneumonia. *Clin. Infect. Dis.* 3:347–382 (August) 2000.

39. Centers for Disease Control and Prevention. Self-reported asthma prevalence among adults—United States, 2000. *MMWR Morb. Mort. Wkly. Rep.* 50(32):682–686 (August 17) 2001.

40. National Institutes of Health. *Guidelines for the Diagnosis and Management of Asthma.* Expert Panel Report 2. NIH Publication No. 97-4051, July 1997.

41. National Institutes of Health. *Practical Guide to the Diagnosis and Management of Asthma.* NIH Publication No. 97-4053, October 1997.

42. Liu, S., Wen, S. W., Demissie, K., et al. Maternal asthma and pregnancy outcomes: A retrospective cohort study. *Am. J. Obstet. Gynecol.* 184(2):90–96 (January) 2001.

43. DuPont, H. L., and the Practice Parameters Committee of the American College of Gastroenterology. Guidelines on acute infectious diarrhea in adults. *Am. J. Gastroenterol.* 92(11):1962–1975 (November) 1997.

44. Centers for Disease Control and Prevention. Diagnosis and Management of Foodborne Illnesses. *MMWR Morb. Mort. Wkly. Rep.* 50(No. RR-2):1–69, 2001.

45. Browning, S. M. Constipation, diarrhea, and irritable bowel syndrome. *Primary Care* 26(1):113–139 (March) 1999.

46. Ringel, Y., Sperber, A. D., Drossman, D. A. Irritable bowel syndrome. *Ann. Rev. Med.* 52:319–338, 2001.

47. Drossman, D. R., and Thompson, W. G. The irritable bowel syndrome: Review and a graduated multicomponent treatment approach. *Ann. Intern. Med.* 116(12 pt 1):1009–1016 (June 15) 1992.

48. Goroll, A. H., and Mulley, A. G., Jr. Approach to the patient with functional gastrointestinal disease. In *Primary Care Medicine*, 4th ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2000, ch. 74, pp. 484–493.

49. McQuaid, K. R. Alimentary tract. In Tierney, L. M., McPhee, S. J., and Papadakis, M. A. (Eds.) *Current Medical Diagnosis and Treatment 2001.* New York: Lange Medical Books/McGraw-Hill, 2001.

50. Fernando, H. C., Schauer, P. R., Rosenblatt, M., et al. Quality of life after antireflux surgery compared with nonoperative management for severe gastroesophageal reflux disease. *J. Am. Coll. Surg.* 194(1):23–27 (January) 2002.

51. Schwitzer, W., Thurmshirn, M., Dent, J., et al. *Helicobacter pylori* and symptomatic relapse of gastroesophageal reflux disease: a randomized controlled trial. *Lancet* 357:1738–1742 (June 2) 2001.

52. Irwin, R. S., and Richter, J. E. Gastroesophageal reflux and chronic cough. *Am. J. Gastroenterol.* 95(8)suppl:S9–14, 2000.

53. Centers for Disease Control and Prevention. *Helicobacter pylori* and peptic ulcer disease—fact sheet for health care providers. www.cdc.gov/ulcer/md.htm. Accessed 8/6/02.

54. Braden, B., and Caspary, W. F. Detection of *Helicobacter pylori* infection: When to perform which test? *Ann. Med* 33:91–97, 2001.

55. Stone, M. A. Non-invasive testing for *Helicobacter pylori*. *Postgrad. Med. J.* 75:74–77, 1999.

56. Soll, A. H., for the Practice Parameters Committee of the American College of Gastroenterology. Medical treatment of peptic ulcer disease: practice guidelines. *JAMA* 275(8):622–629 (February 28) 1996.

57. Graham, D. Y., and Malaty, H. M. Alendronate and naproxen are synergistic for development of gastric ulcers. *Arch. Int. Med.* 161:107–111 (January 8) 2001.

58. Barone, J. E., Bears, S., Chen, S., and Tsai, J. Outcome study of cholecystectomy during pregnancy. *Am. J. Surg.* 177:232–236 (March) 1999.

59. Mourad, J., Elliot, J. P., Erickson, L., and Lisboa, L. Appendicitis in pregnancy: New information that contradicts long-held clinical beliefs. *Am. J. Obstet. Gynecol.* 182(5):1027–1029 (May) 2000.

60. Anderson, B., and Nielsen, T. F. Appendicitis in pregnancy: Diagnosis, management, and complications. *Acta Obstetricia et Gynecologica Scandinavica* 78:758–762, 1999.

61. Orenstein, R., and Wong, H. S. Urinary tract infections in adults. *Am. Fam. Physician* 59(5):1225–1234 (March 1) 1999.

62. Saint, S., Scholes, D., Fihn, S. D., et al. The effectiveness of a clinical practice guideline for the management of presumed uncomplicated urinary tract infection in women. *Am. J. Med.* 106:636–641 (June) 1999.

63. Wing, D. A., Hendershott, C. M., Debuque, L., and Millar, L. K. A randomized trial of three antibiotic regimens for the treatment of pyelonephritis in pregnancy. *Obstet. Gynecol.* 92(2):249–253 (August) 1998.

64. Harris, M. I., Flegal, K. M., Cowie, C. C., et al. Prevalence of diabetes, impaired fasting glucose, and impaired glucose tolerance in U.S. adults: The Third National Health and Nutrition Examination Survey, 1988–1994. *Diabetes Care* 21:518–524, 1998.

65. Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Report of the expert committee on the diagnosis and classification of diabetes mellitus. *Diabetes Care* 26(suppl. 1)S5–20 (January) 2003.

66. American Diabetes Association. *Medical Management of Pregnancy Complicated by Diabetes*, 3rd ed. Alexandria, VA: American Diabetes Association, 2000.

67. Diabetes Prevention Program Research Group. Reduction in the incidence of Type II diabetes with lifestyle intervention or metformin. *N. Eng. J. Med.* 346(6):393–403 (February 7) 2002.

68. Mandel, S. J., Larsen, P. R., Seeley, E. W., and Brent, G. A. Increased need for thyroxine during pregnancy in women with primary hypothyroidism. *N. Eng. J. Med.* 323:91–96, 1990.

69. Gerstein, H. C. How common is postpartum thyroiditis? A methodologic overview of the literature. *Arch. Int. Med.* 150:1397–1400, 1990.

70. Wilansky, D. L., and Greisman, B. Early hypothyroidism in patients with menorrhagia. *Am. J. Obstet. Gynecol.* 160(3):673–677 (March) 1989.

71. Arafah, B. M. Increased need for thyroxine in women with hypothyroidism during estrogen therapy. *N. Eng. J. Med.* 344(23):1743–1749 (June 7) 2001.

72. Karpitskaya, Y., Novak, C. B., and MacKinnon, S. E. Prevalence of smoking, obesity, diabetes mellitus, and thyroid disease in patients with carpal tunnel syndrome. *Ann. Plast. Surg.* 48(3):269–273 (March) 2002.

73. Lewis, R. A. Carpal Tunnel Syndrome. In Leppert, P. C., and Howard, F. M. (Eds.) *Primary Care for Women*. Philadelphia, PA: Lippincott-Raven Publishers, 1997.

74. Nathan, P. A., Wilcox, A., Emerick, P. S., et al. Effects of an aerobic exercise program on median nerve conduction and symptoms associated with carpal tunnel syndrome. *J. Occup. Environ. Med.* 43(10):840–843 (October) 2001.

75. Lipton, R. B., Stewart, W. F., Diamond, S., et al. Prevalence and burden of migraine in the United States: data from the American Migraine Study II. *Headache* 41(7)646–657 (July/August) 2001.

76. Lipton, R. B., Diamond, S., Reed, M., et al. Migraine diagnosis and treatment: results for the American Migraine Study II. *Headache* 41:638–645 (July/August) 2001.

77. Capobianco, D. J., Cheshire, W. P., and Campbell, J. K. An overview of the diagnosis and pharmacologic treatment of migraine. *Mayo Clin. Proc.* 71:1055–1066 (November) 1996.

78. Lipton, R., Stewart, W., and Ryan, R. Efficacy and safety of the nonprescription combination of acetaminophen, aspirin, and caffeine in alleviating headache pain of an acute migraine attack: Three double-blind randomized placebo trials. *Arch. Neurol.* 55:210–217, 1998.

79. Kallen, B., and Lygner, P. E. Delivery outcome in women who used drugs for migraine during

pregnancy with special reference to sumatriptan. *Headache* 41:351–356, 2001.

80. O'Quinn, S., Ephross, S. A., Williams, V., et al. Pregnancy and perinatal outcomes in migraineurs using sumatriptan: a prospective study. *Arch. Gynecol. Obstet*. 263:7–12, 1999.

81. Cady, R. K. Female population with migraine. *Obstet. Gynecol. Survey* 54(12):S7–13, 1999.

82. Holroyd, K. A., Stensland, M., Lipchik, G. L., et al. Psychosocial correlates and impact of chronic tension-type headaches. *Headache* 40:3–16 (January) 2000.

83. Diamond, S., Balm, T. K., and Freitag, F. G. Ibuprofen plus caffeine in the treatment of tension-type headache. *Clin. Pharmacol. Ther.* 68(3):312–319 (September) 2000.

84. Holroyd, K. A., O'Donnell, F. J., Stensland, M., et al. Management of chronic tension-type headache with tricyclic antidepressant medication, stress management therapy, and their combination. *JAMA* 285(17):2208–2215 (May 2) 2001.

85. Kessler, R. C. Sex differences in DSM-III-R psychiatric disorders in the United States: Results from the National Comorbidity Survey. *J. Am. Med. Womens Assoc.* 53:148–157, 1998.

86. *Diagnostic and Statistical Manual of Mental Disorders (DSM—IV)—TR*. American Psychiatric Publishing, Inc. Arlington, VA: June 2000.

• • • Additional References

Braunwald, E., Fauci, A. S., Kasper, D. L., et al. *Harrison's Principles of Internal Medicine*. New York: McGraw Hill Professional Publishing, 2001.

Brinkley, L. S., and Szaligyi, P. G. *Bates Guide to Physical Examination and History Taking*. Philadelphia, PA: Lippincott Williams and Wilkins, 2002.

Centers for Disease Control and Prevention *Summary of Adolescent/Adult Immunization Recommendations*. www.cdc.gov/nip/recs/adult-schedule.pdf. Accessed 9/24/2002.

Goroll, A. H., and Mulley, A. G., Jr. *Primary Care Medicine*, 4th ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2000.

Leppert, P. C., and Howard, F. *Primary Care of Women*. Philadelphia, PA: Lippincott-Raven Publishers, 1997.

Report of the U.S. Preventive Services Task Force. *Guide to Clinical Preventive Services*, 2nd ed. Baltimore, MD: Williams and Wilkins, 1996.

Tierney, L. M., McPhee, S. J., and Papadakis, M. A. (Eds.) *Current Medical Diagnosis and Treatment 2001*, 40th ed. New York: Lange Medical Books/McGraw-Hill, 2001. (Updated yearly, and with relevant Web sites.)

Useful Web Sites

The National Heart, Lung, and Blood Institute
www.nhlbi.nih.gov

Centers for Disease Control and Prevention
www.cdc.gov

American Medical Association
www.ama-assn.org

Agency for Health Care Research and Quality
www.ahrq.hhs.gov

American Diabetes Association
www.diabetes.org

CHAPTER

8

Chronic Infectious Diseases

Infectious diseases, ranging from the common cold to mastitis, are discussed in this book in several chapters. This chapter provides an overview of three separate issues, each of which is a chronic disease that carries its own risks to women and their families: (1) human immunodeficiency virus and acquired immune deficiency syndrome (HIV/AIDS), (2) the family of hepatitis infections, and (3) tuberculosis. Most midwives will not be the primary clinicians for women with any of these chronic diseases but will provide women's health care in consultation with a physician or other clinician.

HIV/AIDS

In the United States, HIV is a disease that has disproportionately attacked women who are poor, urban, and of color. These are all markers for social conditions that leave individuals at greater risk within our society. But those infected with the virus have been further stigmatized by the early perception that HIV was a disease of homosexual men and drug abusers. As the heterosexual transmission of HIV increases the proportion of those infected who are women, the U.S. data have begun to resemble more closely the statistics from the rest of the world. In considering counseling, screening, and treatment programs for women, the devastation that unchecked heterosexual and perinatal transmission bring to countries and cultures always needs to be considered. This is not a disease that can be ignored because "it can't happen here." It can.

Natural History

The human immunodeficiency virus is an RNA retrovirus that preferentially attacks T-helper lymphocytes (CD4 cells) as well as other cell types. The natural history of HIV begins as an initial viral syndrome within the first month after exposure, including fever, muscle aches, sore throat, lymphadenopathy, and other nonspecific symptoms. During this time, the virus is rapidly reproducing, causing a drop in the CD4 count and a high viral load [1, 2]. Except in cases where the risk of transmission is appreciated, these early symptoms are generally interpreted as a simple viral infection and treated symptomatically. As the body mounts an immune response, the viral load subsides and the CD4 cell number increases. In uninfected adults, a normal CD4 count ranges from 500 to 1500.

For a period of time that may exceed ten years, the disease remains hidden. Although the virus continues to replicate and destroy CD4 cells, these are rapidly replaced until the immune system is too worn down to maintain its protective effect. In the later stages of the disease, falling CD4 levels reach a point at which the body can no longer defend itself from common ailments or from diseases that do not commonly attack humans (opportunistic infections). Figure 8-1 depicts the natural history of HIV infection in the human body.

Median time from infection to an AIDS defining condition is between eight and ten years. Among the factors that can affect the rate of disease progression are age, race, gender, IV drug abuse, and both genetic and viral characteristics. Women appear to have levels of virus in the bloodstream that are relatively lower than those in men at all stages of disease progression [3]. The diagnosis of

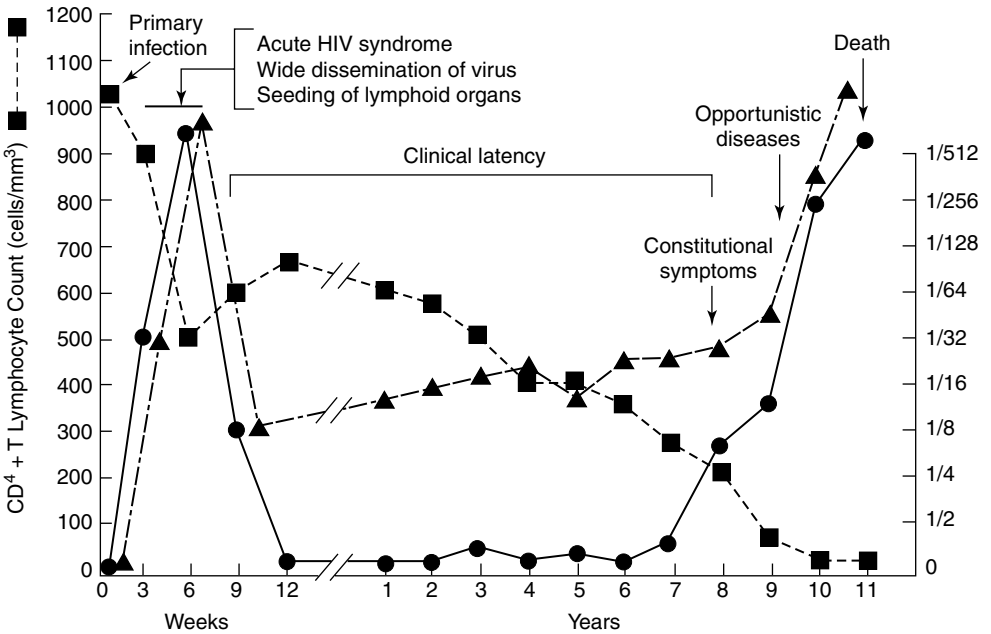


FIGURE 8-1 Natural history of HIV disease.

Source: From Fauci, et al. Immunopathogenic Mechanisms of HIV Infection. *Ann Intern Med*. 1996;124:654–663.

AIDS is based on specific clinical findings, as shown in Table 8-1.

Transmission

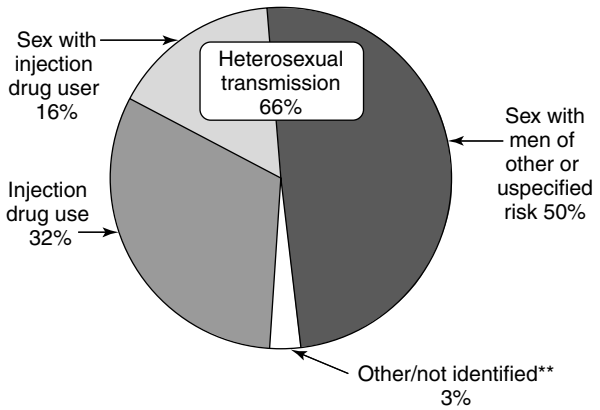
Transmission of HIV occurs sexually, through exposure to blood or other body fluids, and perinatally. For women, sexual transmission has become the prevalent mode, even in the United States, where intravenous substance abuse with sharing of needles was once believed to be the primary route. Data from the Centers for Disease Control and Prevention (Figure 8-2) illustrate the relative risks of exposure types for women. On diagnosis, many women report no known risk, which is to say that they are not involved in drug use, nor are they involved in sex work, nor do they recall any cutaneous exposure. When the final determination of risk is made, about two-thirds of all women in the United States with HIV/AIDS have been exposed sexually [4]. Younger age is associated with increased sexual risk, as are multiple partners, partners with known risk factors, history of sexually transmitted diseases, and failure to use a protective barrier during intercourse.

Rates of transmission between heterosexual partners are affected by level of infectivity in the affected partner, use of a protective latex barrier such as a condom, and concurrent infections with other sexually transmitted diseases.

TABLE 8-1 Criteria for AIDS Diagnosis

CD4 Count <200 cells/mm^3
Invasive cervical cancer
Candidiasis of bronchi, trachea, lungs, esophagus
Extrapulmonary cryptococcosis
Disseminated or extrapulmonary coccidiomycosis
Cryptosporidiosis >1 month
Cytomegalovirus other than liver, spleen, or lymphatic
HIV encephalopathy
HSV lesion persisting >1 month, or bronchitis, pneumonitis, esophagitis
Disseminated or extrapulmonary histoplasmosis
Isosporiasis >1 month
Kaposi's sarcoma
Burkitt's lymphoma
Immunoblastic lymphoma
Primary lymphoma of the brain
M. avium complex
M. tuberculosis
Other mycobacterial infections outside the lungs
Pneumocystis carinii pneumonia
Recurrent pneumonia, any cause
Multifocal leukoencephalopathy
Recurrent salmonella septicemia
Toxoplasmosis of the brain
Wasting syndrome

Source: Centers for Disease Control and Prevention. 1993 Revised Classification System for HIV Infection and Expanded Surveillance Case Definition for AIDS Among Adolescents and Adults. MMWR 41(no RR-17). December 18, 1992. Accessed online at cdc.gov/mmwr/preview/mmwrhtml/00018871.htm.



*Data adjusted for reporting delays and estimated proportion and distribution of cases initially reported without risk.
Data reported through June 2002.
** Includes patients whose medical record review is pending, who died, were lost to followup, or declined interview; and patients with other or undetermined modes of exposure. Includes sex with a bisexual male, a person with hemophilia, transfusion recipient with HIV infection, or an HIV infected person with an unspecified risk.

FIGURE 8-2 Risk factors for transmission of HIV in women.

Source: From Centers for Disease Control and Prevention. Accessed online on February 14, 2003, at www.cdc.gov.

Transmission from the male to female partner is significantly more common than the reverse. Estimates of transmission with a single act of unprotected intercourse have ranged from 9/10,000 to as high as 5/1000 [5, 6]. Some factors that affect viral shedding at the cervix, and thus increase the risk of an HIV positive woman infecting her partner, include pregnancy, cervical ectopy, hormonal contraceptives, vaginal infections, STDs, and disease progression as shown by high viral load or decreased CD4 count.

There are a number of counseling issues that arise when infected women or men are sexually active and ask about heterosexual transmission, including counseling about the use of contraception plus an effective barrier, the possible desire of a couple for a child, whether the uninfected partner is aware of their partner's status, and the affected person's level of infectivity. Midwives have an obligation to provide unbiased information to all our patients, and need to seek out community or other resources as needed to meet the woman's information and care needs. Part of that responsibility is to educate and support women in disclosing their disease status to partners, or to provide her with other resources for doing so.

Transmission through exposure to blood and body fluids (exclusive of sexual transmission) is strongly associated with intravenous substance abuse. However, it is essential to realize that any open skin lesion is a portal for this type of transmission. Health care workers, including midwives, are at risk of exposure whenever universal precautions are not followed (see Chapter 45). Most clinicians do not take chances with the person they know to be infected with HIV. But many women with HIV are unaware that they are at risk, much less infected. Universal precautions means not taking chances based on a mistaken belief that one can "tell" who is at risk.

The CDC maintains guidelines for post-exposure prophylaxis [7] that are regularly updated. These can be found at www.cdc.gov/hiv/pubs/guidelines.htm. Anyone who experiences a needlestick or splash injury should check with their employee health unit or personal physician regarding management. Not all exposures carry the same degree of risk, and the best time to deal with an exposure is immediately.

Perinatal transmission is discussed in the section on pregnancy and HIV.

Counseling and Testing for HIV

The CDC recommends testing for HIV in a number of specific circumstances. Currently described populations at increased risk include women attending STD clinics and any adolescent program with a high rate of STDs, substance abuse programs, homeless shelters, outreach/needle exchange programs, and tuberculosis clinics. Testing is also recommended in other instances regardless of identified risk [8]. Table 8-2 lists those for whom HIV testing is currently recommended. Stigma associated with HIV diagnosis, and the implication of risky behavior in asking for the test long delayed acceptance of HIV screening as an important component of preventive health care. Whether the woman is requesting HIV testing, for example, after an unplanned, unprotected sexual encounter, or whether you are recommending testing, as with pregnancy, counseling and informed consent are essential components of care.

Counseling prior to the performance of HIV testing includes a focused discussion of risk reduction for the individual including collecting the data for a risk assessment (see Table 8-3), acknowledging current attempts the woman is making to reduce her risk, and being specific in discussing her current risks and understanding of HIV. This session is also a time when further risk reduction plans can be made and skills reinforced—for example, negotiating condom use. Counseling prior to HIV testing, like all other health care counseling, should be individualized [8].

TABLE 8-2 Recommendations for When to Test for HIV

1. All clients in settings where the population is at increased behavioral or clinical risk of HIV
   a. adolescent and school-based clinics with high STD rates
   b. clinics serving men who have sex with men
   c. correctional facilities including juvenile detention
   d. drug and alcohol programs
   e. freestanding HIV testing sites
   f. homeless shelters
   g. outreach (e.g., needle exchange) programs
   h. STD clinics
   i. TB clinics
2. Individual in settings with <1% HIV prevalence
   a. clinical signs or symptoms of HIV infection
   b. have diagnoses suggesting increased HIV risk
   c. self-report HIV risks
   d. specifically request the test
3. All clients in settings where the prevalence of HIV is >1%
4. Regardless of any of the above
   a. all pregnant women
   b. all persons with possible occupational exposure
   c. all clients known to be exposed to an HIV positive person sexually or through needle sharing

Source: From Revised guidelines for HIV counseling, testing, and referral *MMWR* 50:(No. RR-19), 2001. Accessed online at cdc.gov/mmwr/pdf/rr/rr5019.

TABLE 8-3 Risk Assessment Questions for HIV in Women

How many sexual partners have you had in your lifetime? This year?
How old were you the first time you were sexually active?
Are your partners men, or women, or both?
What have you used to protect yourself from pregnancy? From sexually transmitted infections?
Have you ever had an abnormal Pap smear or an STD or hepatitis?
Have you ever used an IV drug, or used other drugs like crack?
Have you abused alcohol?
Have you ever shared a needle?
Have any of your partners ever used drugs, shared needles, been in jail, had an STD, had hepatitis, worked as a prostitute, or traded sex for drugs/money?
Are you concerned that you have been put at risk for catching HIV?

Sources: From Anderson, J. R. *A Guide to the Clinical Care of Women with HIV* 2001. Centers for Disease Control and Prevention *Sexually Transmitted Diseases Treatment Guidelines* 2002. May 10; 51(RR-6):1–80. Accessed at www.cdc.gov/hiv/pubs/mmwr/mmwr2002.htm.

Posttest counseling for women whose results are negative offers a chance to reinforce positive messages about prevention of infection and makes sure that she understands the limitations of the test. For women whose results are positive, hearing the test results may block all further effective communication for a time. Empathic listening and emotional support are an important part of this visit. In this case, the next contact needs to be set before she leaves the site, for ongoing support, education, and clinical care.

Pregnancy raises some specific concerns. The Institute of Medicine report *Reducing the Odds*, which was released in 1999, emphasized the need for routinizing HIV testing during pregnancy. Most evidence suggests that 6000 to 7000 HIV seropositive women give birth every year in the United States. The concerns expressed by many of the participants and the expert panel illustrated the tension between public health and risk reduction on the one hand, and the individual's right to privacy and informed consent on the other [9]. An increasingly common approach is to offer HIV testing as a part of routine prenatal care and have women who wish not to be tested refuse consent. The CDC recommendation regarding HIV testing during pregnancy is universal counseling and voluntary testing. All pregnant women should ideally be tested for HIV as early in pregnancy as possible. However, no woman should be required to be tested or have the test done without her consent. Women with identified risk factors (e.g., STD exposure, IV drug use, multiple sexual partners) or who initially declined testing should be offered repeat testing during the third trimester, after an open discussion of any concerns.

When a woman has not been tested during pregnancy, offering her a rapid HIV test during her labor may present another opportunity for intervening to prevent perinatal transmission of HIV. At least two currently marketed tests are available that can provide results within 1 to 2 hours. The same standards apply to counseling and informed consent during labor as at any other time.

The current standard for HIV testing is to run an enzyme-linked immunosorbent assay (ELISA) and repeat it if positive, before performing the Western blot to confirm HIV-positive status. The initial ELISA can cross-react to give a false-positive result if it is used without the confirmatory test. For the Western blot to be read as positive, antibodies to two or more protein "bands" found in HIV must be present. The presence of a single band is inconclusive and may be the result of recent HIV expo-

sure or a chronic finding. Among the causes of these persistent inconclusive results are autoimmune or collagen vascular diseases, alloantibodies from pregnancy or transfusion, and infection with rare HIV subtypes or HIV-2. True false positives, to both ELISA and Western blot, are less than 0.001 percent in low prevalence areas [10].

The use of rapid tests in settings where quick results are essential or women may not return for results can expedite initial care. However, it should always be kept in mind that these tests are not conclusive until the confirmatory Western blot has been run. Since the interim results are immediately available, unlike standard tests in which results are rarely reported until both tests have been completed, the midwife has a responsibility to advise the woman tested during her labor that she is at high risk for HIV, but NOT that she has a confirmed diagnosis. Prophylaxis for the prevention of perinatal transmission of HIV can then be offered for the period of time required to obtain results of the confirmatory test. Usually this will include both intrapartum therapy for the mother and a few days of zidovudine syrup given to the newborn.

One final aspect of HIV counseling has to do with reproductive counseling for the woman known to be HIV positive, or to have an HIV-positive partner. Preconceptional counseling for these women includes the risk of transmission with sexual intercourse, the factors such as viral load that affect that risk, risks of mother to child transmission and how to decrease that risk, the risks and benefits of antiretroviral medication, and the issue of having children while living with a chronic and life-threatening disease. Family planning should also be raised as part of this discussion.

Monitoring HIV Progression

Other than the tests mentioned previously for use in diagnosis of HIV, there are many others used to evaluate health and disease progression. Several of these are particularly important for the midwife to be familiar with, in order to interpret the woman's health status. These include measurement of the CD4 subset of lymphocytes, plasma viral load, changes in the CBC and chemistry panels, and tests of disease resistance. Measuring CD4 counts is one way to measure disease progression, since over time the constant turnover of these cells depletes the body's ability to regenerate new ones. The amount of virus present in the blood is another way in which disease progress is evaluated, since higher viral loads indicate more strain placed on the immune system and therefore higher likelihood of disease progression.

CD4 Lymphocyte Count The CD4 cells are one group of the T-lymphocytes. Over the course of HIV disease, CD4 counts are used to measure the degree of immune suppression, or how effectively the body is protecting itself from the virus. Values in healthy nonpregnant adults are generally above 500 cells/mm^3. The results of this test are usually reported both as an absolute value and as a percentage of lymphocytes. The lower level of normal is about 32 percent. Factors other than HIV infection can cause drops in this value, including pregnancy, drug abuse, steroid use, and other illnesses; diurnal variation is also a factor. For this reason, the CD4 count is not a test used in diagnosing HIV. When the CD4 count falls below an absolute level of 200 cells/mm^3, a diagnosis of AIDS is made, based on decreased immune competence. As with all the tests discussed in this section, remember that each laboratory may report their own set of normal values; the midwife needs to be aware of the standard values used in the laboratory, as well as of the possibility of variation between labs.

Viral Load Testing Several genetically based tests to measure the amount of virus present in the blood are available. All of them have a lower limit, below which virus is present but not in measurable amounts, and an upper limit, although greater quantities of virus may well be present. The one most frequently reported is the HIV PCR-RNA. Initially, a standard test, which measures RNA between 400 and 750,000 viral particles per milliliter, should be used to assess the level of infectivity. Once a woman is on HIV therapy, an ultrasensitive test, which measures as low as 20 copies/milliliter, can be used to monitor the effectiveness of therapy. The same version of the test should be used consistently, since each reports slightly different values. From the standpoint of clinical care, it is essential to understand that these tests measure the level of virus only in the bloodstream. Other tissue reservoirs may persistently maintain a latent source of virus. In addition, the amount of virus in cervical secretions may vary from that in the blood [11].

Tests of Viral Resistance Over time, the HIV virus mutates in the body and can become resistant to various medications, or even classes of medication. Both phenotype and genotype assays can be performed to determine whether a rising viral load is

due to resistance or to some other factor, such as not taking medication that has been prescribed. These tests should only be ordered by the person who is responsible for the long-term management of the woman's care, since the effectiveness of future medication regimens depends on careful selection among available choices. If the midwife is participating in the care of HIV-positive women, whether during pregnancy or for family planning and well-woman care, it is essential that the woman also have access to a primary care provider experienced in HIV management on whom the midwife can call for therapeutic concerns.

Changes in General Laboratory Values Women with HIV may also experience changes in standard laboratory values. The CBC may show a macrocytic anemia in women using zidovudine during pregnancy, or with any regimen in which zidovudine included. A decrease in WBCs or thrombocytopenia may also be seen with HIV. The protease inhibitors can produce hyperglycemia. Many of the antiretrovirals cause changes in liver and kidney function as may other health issues such as alcohol use or hepatitis. Adverse reactions to some medications may produce severe lactic acidosis. Abnormalities found on blood tests should be reported to the woman's primary provider.

Medication Therapy for HIV

There are currently four classes of medication available commercially in the United States for treatment of HIV: (1) nucleoside and nucleotide reverse transcriptase inhibitors, (2) nonnucleoside reverse transcriptase inhibitors, (3) protease inhibitors, and (4) fusion inhibitors. Each is named for the timing of its intervention in viral replication. By combining medications from one or more of these classes, viral replication can be suppressed almost completely. Table 8-4 gives examples of the medications found in the major classes.

CDC Guidelines

The Centers for Disease Control and Prevention publishes and regularly updates guidelines for the management of HIV disease. These guidelines discuss such issues as when to begin therapy, appropriate drug combinations for initial and continuing therapy, adherence to therapy, and evaluation of drug resistance. Midwives involved in the care of women living with HIV should familiarize themselves with this material, which is regularly updated at the CDC Web site (www.cdc.gov) [12].

HIV in Pregnancy

During pregnancy, many of the "rules" for treating HIV disease change. In untreated populations the standard absolute risk of mother-to-child transmission (MTCT) without breastfeeding is given as 25 percent. About 5 to 10 percent is antepartum, and up to 20 percent intrapartum. Breastfeeding adds an additional 5 to 15 percent absolute risk of transmission [13].

Where the usual management as of this writing is to delay the onset of antiretroviral therapy in adults until the CD4 count has declined to 350 cells/mm^3 or less, therapy for the prevention of MTCT is aimed at maintaining a nondetectable viral load regardless of the CD4 count. The rationale is that viral levels are directly associated with infectivity. Although most perinatal infection (66 to 75 percent) occurs around the time of birth, the remaining portion has already occurred antenatally [14]. Many factors affect the risk of transmission during pregnancy and birth. An elevated viral load, clinical disease progression, coinfection with STDs, hepatitis C and other diseases, substance abuse, smoking, multiple sexual partners and unprotected intercourse, preterm birth, chorioamnionitis, and invasive fetal monitoring or testing, are among the factors that increase risk of MTCT [15–19].Viral load also varies among body compartments, so that blood levels of HIV may not directly correlate with cervical secretions, although they appear to behave similarly [11].

Medications for HIV During Pregnancy The original treatment for prevention of HIV transmission during pregnancy, zidovudine monotherapy, was initiated as the Pediatric AIDS Clinical Trial Group (ACTG) 076 Trial in the early 1990s. The clinical effect of this three-part (antepartum, intrapartum, and neonatal) treatment was to reduce MTCT by two-thirds, from 25.6 to 8.3 percent [20, 21]. This remains the minimum standard of care for pregnant women with HIV, regardless of viral load. More effective regimens, called highly active antiretroviral therapy (HAART) regimens, have further reduced the risk to 1 to 2 percent [22, 23]. The midwife providing care for HIV-positive women during pregnancy coordinates medication therapy with an infectious disease specialist or primary care physician experienced in HIV management in order to maintain the most effective long-term options for treatment. Women already taking HAART should continue without stopping medication in the first trimester; newly diagnosed women, and those not

TABLE 8-4 Classes of HIV Medication

Generic Drug Name, Abbreviation (Brand)	*FDA Category*	*Dose*
Nucleoside/Nucleotide Reverse Transcriptase Inhibitors (NRTIs)		
Zidovudine, AZT (Retrovir)	C	300 mg po bid
Lamivudine, 3TC (Epivir)	C	150 mg po bid
Didanosine, ddI (Videx)	B	<60 kg 250 mg po qd or 125 mg po bid (tabs) OR 250 mg po qd or 167 mg po bid (powder) >60 kg 400 mg po qd or 200 mg po bid (tabs) OR 500 mg po qd or 250 mg po bid (powder) OR Videx EC 400 mg po qd
Zalcitabine, ddC (Hivid)	C	0.75 mg po tid
Stavudine, d4T (Zerit)	C	<60 kg 30 mg po bid >60 kg 40 mg po bid
Abacavir, APV (Ziagen)	C	300 mg po bid
AZT + 3TC (Combivir)	C	300 mg AZT + 150 mg 3TC po bid
AZT + 3TC + ABC (Trizivir)	C	300 mg AZT + 150 mg 3TC + 300 mg ABC po bid
Tenofovir DF (Viread)	B	300 mg po qd
Non-nucleoside Reverse Transcriptase Inhibitors (NNRTIs)		
Generic Drug Name, Abbreviation (Brand)	*FDA Category*	*Dose*
Nevirapine, NVP (Viramune)	C	200 mg po bid
Delavirdine, DLV (Rescriptor)	C	400 mg po tid
Efavirenz, EFV (Sustiva)	C*	600 mg po qhs
Protease Inhibitors (PIs)		
Generic Drug Name, Abbreviation (Brand)	*FDA Category*	*Dose*
Saquinavir, SQV,hgc (Invirase)	B	400 mg po bid with RTV
Saquinavir, SQV,sgc (Fortovase)	B	1200 mg po tid
Ritonavir, RTV (Norvir)	B	600 mg po bid
Indinavir, IDV (Crixivan)	C	800 mg po q 8 hours
Nelfinavir, NFV (Viracept)	B	750 mg po tid OR 1250 mg po bid
Amprenavir, APV (Agenerase)	C	1200 mg po bid (caps) OR 1400 mg po (oral solution)
Lopinavir/Ritonavir, LPV/RTV (Kaletra)	C	400 mg LPV + 100 mg RTV po bid

* Not used in pregnancy due to primate studies showing teratogenicity.

Note: Many of these drugs have specific dosing requirements, medication interactions, and/or significant side effects beyond the scope of this reference. Interested readers are referred to www.hivatis.org for current antiretroviral information.

Sources: www.hivatis.org; Bartlett, J. G., and Gallant, J. *Medical Management of HIV Infection*, 2001–2002 Edition.

currently on medication, should wait until organogenesis is complete before beginning therapy. Considerations in prescribing medications during pregnancy include the woman's own medication needs and ability to adhere to complex regimens, prior therapy, and potential for the development of resistance. Balancing short-term prevention of MTCT with the lifetime therapy of the mother is beyond the scope of basic midwifery practice.

Although all HIV medications currently marketed are classified as either FDA Class B or C (see Table 10-6), the data on fetal and neonatal effects largely come from pragmatic prescription of medication for the mother's own need and reduction of viral load. Zidovudine remains the only medication used for a long enough period to state that outcomes for uninfected children indicate no long-term problems [24].

Studies of women taking antiretrovirals during pregnancy, compared with HIV-positive women not on medication, have shown no increase in fetal loss, preterm birth, or low birth weight [25]. However, significant adverse events have occurred that can affect the outcome of individual pregnancies, such as mitochondrial insufficiency and lactic acidosis. Simply knowing the FDA category is not enough to ensure safe use. Efavirenz (Sustiva) is known to produce teratogenic effects in primates and is therefore not used during pregnancy despite its category C rating. The antiretroviral pregnancy registry maintains an ongoing database of infant outcomes.

During labor, women who have received antiretroviral therapy during pregnancy should receive intravenous zidovudine. Depending on the specific circumstances they may also be given a single oral dose of nevirapine. Women who have not received any antiretrovirals during pregnancy, whether because they have not obtained prenatal care or because they are newly diagnosed at the time of labor, should receive both zidovudine and nevirapine [26].

Route of Birth and Risk of Transmission Several studies have now demonstrated a reduction in risk of transmission when birth occurs by cesarean section, at term, prior to the onset of labor, and with intact amniotic membranes. This reduction can exceed 50 percent, and is independent of other factors such as viral load or antiretroviral therapy. When women were on the original zidovudine-only regimen and had prophylactic cesarean delivery, the rates of transmission were found to be as low as 2 percent, comparable to the rates achieved with HAART, nondetectable viral load, and vaginal birth [27–29]. It is unclear how much additional reduction can be achieved with cesarean birth in women who do have undetectable viral loads on HAART, given that some cases of antepartum transmission may occur as early as the first trimester. Thus, vaginal birth is a reasonable choice for these women. It is also known that the longer membranes are ruptured, the greater the risk of transmission at the time of birth [30]. For these reasons, women with viral loads greater than 1000 should always be offered cesarean birth, and any woman who, following counseling regarding risks and benefits of vaginal versus cesarean birth for both mother and infant, requests cesarean delivery, should be accommodated.

Support Systems for Infected Women

Women living with HIV are frequently isolated from their natural support systems during pregnancy by their unwillingness to discuss their HIV diagnosis and fear of community response. Coupled with the social and economic disruption often present in the lives of these women, this isolation can lead to depression, lack of self-care, and other nonmedical problems. Substance abuse may also play a role. For all these reasons, the midwife who cares for HIV-positive pregnant women needs to maintain a network of resources including treatment programs, housing assistance, counseling, social work, nutrition, and even possible doula services. Among the barriers to care perceived by women, themes that are commonly mentioned include the lack of adequate health insurance, physical inaccessibility of clinical sites, lack of child care, inefficient scheduling that produces long waits, and provider behaviors that discourage women from seeking care. Women see both gender and race as factors in their treatment.

A study by Meredith in 1997 asked HIV-positive women what they wanted from their care [31]. Their answers included the following:

Personalized care and respect
Having someone to talk to about problems
Honest answers
Medical follow-up
Reduced barriers to care
Education about their condition

Physical and emotional abuse are also factors in the lives of women living with HIV. Recent studies have noted that disclosure can be associated with abandonment by family or friends, verbal abuse, or physical assault. Women with prior histories of abuse or substance use, who were homeless, or who lived with their male partners were most at risk [32–34].

Gynecologic Care of Women with HIV

Women with HIV need regular gynecologic care and active management of any abnormalities found during care. On diagnosis, all women should have 6 month interval visits for one year. While women remain immune competent, with CD4 counts greater than 500, annual visits will then suffice, as long as the Pap smear remains normal. Counseling for STD prevention and family planning at this time is similar to that provided any other patient. Emphasis does need to be placed on condom use for prevention of heterosexual transmission, disclosure of the HIV diagnosis to sexual partners, and the importance of correct use of contraceptive measures.

Contraceptive Choice Counseling about contraception becomes increasingly important in HIV infected women, as an explanation of the need to include barrier protection against infecting a partner, reinfection with another HIV strain, and coinfection with STDs, must be included. However, the barriers are the least effective standard contraceptive measures and are often omitted when couples become comfortable with one another. Reinforcing the importance of condom use is essential to effective counseling in the younger population, who may feel that safer sex is no longer an issue. Condom use has been demonstrated to be the single most effective measure against transmission between sexual partners, and over time, HIV discordant heterosexual couples have been shown to increase their use of condoms [5, 6, 35].

Most methods of contraception can be safely used, but the use of IUDs is generally restricted. The increased severity of genital diseases in association with HIV and the increased inflammatory reaction within the uterus are specific concerns. Combined hormonal contraceptives utilize the same hepatic pathway for metabolism as some of the antiretroviral drugs; their effectiveness may be decreased by drug interactions. The woman's infectious disease provider should be kept advised as to any changes in contraception.

Pap Smears, the Human Papillomavirus, and HIV Annual Pap smear testing in women with no known cervical abnormalities is adequate unless she has developed symptomatic disease or has a CD4 count of less than 200. After that time, Pap smears should be performed every 6 months. Women living with HIV should consider having HPV testing done with Pap smears as long as they have never had a prior HPV diagnosis.

There is increasing evidence that HIV increases the risk of persistent HPV infection at the cervix, including rapidly progressive Pap smear abnormalities, increased recurrence rates for treated lesions, and increased rates of cervical neoplasia [36, 37]. The rates of complication increase with progression of HIV disease [38]. Duerr [39] found rates of HPV infection and of squamos intraepithelial lesions (SIL) Pap results three times higher among HIV-infected women. Beginning in 1993, the CDC identified invasive cervical cancer as an AIDS-defining illness.

Aggressive management of atypical squamos cells of undetermined significance (ASCUS) and SIL results on Pap smears including colposcopy and biopsy at the first abnormal finding is appropriate. During this procedure, the colposcopist should take care to examine the entire lower genital area and anus for possible lesions, since an elevated risk of anal cancer among HIV-positive persons engaging in anal intercourse has been identified [40]. Proven cervical abnormality warrants Pap testing every 3 to 4 months for one year, followed by exams every 6 months.

STDs in HIV-Positive Women All STDs can be cofactors for HIV transmission, particularly those that produce vaginal or cervical lesions. Sexually transmitted diseases all share a common risk—exposure to more than one sexual partner, either individually or through one's own partner. Thus STD counseling and screening should include a discussion of the risk of HIV and an offer of HIV testing. For women who are HIV infected, treating STDs decreases their risk of transmitting HIV by reducing associated inflammation and viral shedding.

The treatment of any sexually transmitted disease and pelvic inflammatory disease requires attention to duration of therapy and the possibility of inadequate treatment effect. Test of cure or follow-up visits should not be omitted in this population.

A Guide to the Clinical Care of Women with HIV, a reference published by the Health Resources and Services Administration, can be obtained online at www.hab.hrsa.gov/. This publication is an excellent source for more detailed information regarding all aspects of management of HIV in women.

HIV and Older Women

About 10 percent of AIDS cases are found in adults over 50, many of whom know little about HIV risks and transmission. In addition, this is not a population group that regularly considers condom use for prevention of infection, nor do women in this age group need protection against unplanned pregnancy. One study found that older women are only half as likely as men to be tested for HIV [41]. However, the physiologic thinning of vaginal mucosa and decreased lubrication following menopause actually increase risk of HIV transmission. Another study of older adults found that active sexual lives and multiple partners were not uncommon; less than 40 percent of those sexually active were using condoms. A majority of men, and 80 percent of women, did not see themselves at risk in this study [42]. Counseling messages about safer sex cannot be limited to the young.

Global Aspects of HIV in Women

Writing about the HIV pandemic from within the perspective of the resource-rich industrialized world provides a view that does not reflect the experience of the vast majority of women infected with HIV [43]. In Africa, the Middle East, and the Caribbean, half or more of all infected individuals are women [44]. Table 8-5 illustrates the relative burden of HIV in the developing world, which lacks both financial and infrastructure resources required to convert HIV from a death sentence to a serious but chronic disease. Although attempts are being made to obtain medications at reduced costs and distribute them equitably, this is far from a completed plan. Specific concerns include sexual transmission when women do not have the ability to protect themselves sexually, high rates of mother-to-child transmission (MTCT), and newly increasing concern about transmission to health care providers during birth when protective resources are not available.

Several trials of shorter courses of medication during pregnancy to prevent MTCT have been conducted. As can be seen in Table 8-6, even limited therapy can produce effective decreases in HIV transmission. These studies, performed in Africa and Thailand, were primarily intended to determine whether short courses or different drug regimens could be of use in settings where resources are limited or health care is provided over widespread areas [45–50]. Among the many complications of implementing HIV reduction programs are the inability to monitor and manage drug reactions, the need of mothers to breastfeed in order to prevent infant death from malnutrition or diarrhea, and in some communities, the need to breastfeed in order to disguise the mother's infected status.

TABLE 8-5 Global HIV/AIDS Statistics through 2002, Ranked by Percentage of HIV-Positive Women

	Adult Prevalence	Adults and Children with HIV/AIDS	Percentage of Adults Who Are Women
Sub-Saharan Africa	8.8%	29,400,000	58
North Africa and Middle East	0.3%	550,000	55
Caribbean	2.4%	440,000	50
South and Southeast Asia	0.6%	6,000,000	36
Latin America	0.6%	1,500,000	30
Eastern Europe and Central Asia	0.6%	1,200,000	27
Western Europe	0.3%	570,000	25
East Asia and Pacific	0.1%	1,200,000	24
North America	0.6%	980,000	20
Australia and New Zealand	0.1%	15,000	7
TOTAL	1.2%	50,000,000	50

Source: UNAIDS data, 12/31/2002. UNAIDS (Joint United Nations Programme on HIV/AIDS). Accessed online at www.unaids.org

TABLE 8-6 Trials of Short Antiretroviral Therapy Courses

Trial Name	Site	Medication	Duration	Breastfeeding	Percentage of Reduction in MTCT
CDC	Thailand	Zidovudine (Retrovir)	36 weeks Labor	No	50
Petra	Uganda, Tanzania, South Africa	Zidovudine/Lamivudine (Combivir)	36 weeks Labor Postpartum Newborn	Yes	52 at 6 weeks
		Zidovudine/Lamivudine (Combivir)	Labor Postpartum Newborn	Yes	38 at 6 weeks
HIVNET 12	Uganda	Nevirapine (Virammune)	Labor Newborn	Yes	47 at 4 months

Source: Kriebs, J. The global reach of HIV, *J. Perinatol. Neonatal Nurs.* 16(3):1–10, 2002. Reprinted by permission.

Tuberculosis

Exposure to the *Mycobacterium tuberculosis* bacillus produces a latent tuberculosis infection in about 21 to 23 percent of those exposed. The CDC estimates that 10 to 15 million people in the United States have been exposed and have latent TB infection. The only evidence of infection in this group will be a positive tuberculin test. About 10 percent of otherwise healthy women with latent infection will progress to active disease at some point. For people with a damaged immune system—for example, persons with diabetes—the risk is as much as three times higher. For HIV positive women, the risk of active TB may be as much as 100 times higher than the overall rate [51]. Other factors also influence the risk of progressive disease. Table 8-7 lists the major risk factors for TB infection.

Because the bacterium is spread by droplet formation or aerosolization, casual contacts are at little to no risk. Close family members and those in close daily contact with the infected individual are most likely to have been exposed. The droplets spread through the respiratory system before being neutralized by macrophage response. In some cases, the bacterium will also reach the lymph glands and spread through the body to other susceptible tissues.

Most people who are exposed to tuberculosis and develop a reaction to the tuberculin test have no symptoms and do not offer any risk of infection to others; the term used for this condition is latent tuberculosis [52].

Even when an initial lesion in the lung develops, most immune competent people will mount an adequate response and their bodies will encapsulate and calcify the inflammatory lesion, preventing further symptoms. On x-ray, the lesion will be visible. Initial active clinical disease and reactivations of previously undiagnosed or inadequately treated disease may present with atypical pneumonia and patchy lung infiltrates, a generalized malaise and fatigue, night sweats, weight loss, fever, and/or a productive cough with or without hemoptysis. Pleuritic pain may develop. On examination, crepitus and rales may be heard [53].

TABLE 8-7 Risk Factors for Tuberculosis Infection and Progression

Overcrowded environment
Immigration from areas where TB is endemic
Nosocomial exposure (e.g., nursing homes)
Evidence of prior TB infection
HIV
Diabetes
Steroid therapy
Immunosuppressive therapy
Head and neck cancers
Renal disease
Malabsorption syndromes
Gastrectomy, intestinal bypass
Malnutrition, low body weight
Alcoholism
Substance abuse

Testing for Tuberculosis Infection

Screening tests will detect hypersensitivity to the tuberculin protein. The screening test most commonly used is the Mantoux test, commonly known as a PPD (purified protein derivative) test. The purpose of screening for tuberculosis is to detect those individuals who have inactive disease, and those who have recently been exposed and converted. If a woman was screened previously and had a negative screening test, administer the PPD. If this PPD is positive, the woman is a converter representing new disease that may or may not be currently active. The tuberculin test does not need to be repeated in anyone with a documented prior positive result.

Many individuals from countries outside the United States (e.g., England, Carribean Islands) receive Bacillus Calmette-Guerin (BCG) vaccine in childhood to prevent tuberculosis infection. These individuals should still be screened with PPD; they will have a positive PPD for up to two years secondary to the BCG vaccine. After that, one should not assume that positive PPD is secondary to vaccination [54, 55]. Since many people who received BCG vaccine as children may not know this is what they were given, look for the scar caused by the vaccine before giving PPD.

The midwife should take a history prior to administration of PPD to determine the presence of conditions that might alter the reaction to the tuberculin (i.e., give a false positive or a false negative) and what classification of tuberculin reaction to use in reading the test. This history should include the following:

1. Previous history of tuberculosis
2. Previous screening test and results
3. Vaccination with BCG
4. Close contact with a person with infectious tuberculosis
5. Chest x-ray suggestive of previous tuberculosis with inadequate or no treatment

6. Current signs and symptoms of tuberculosis (see Table 8-8)
7. Whether the woman is HIV positive
8. Whether the woman is an intravenous drug abuser
9. Whether the woman is foreign-born, from an area of the world where tuberculosis is common (e.g., Latin America, Africa, Asia)
10. Whether the woman is in a high-risk racial or ethnic group (e.g., Native American, African American, Hispanic, Asian, or Pacific Islander)
11. Whether the woman is a member of a medically underserved, low-income population
12. Severe or febrile illness, measles, or other viral infections
13. Live-virus vaccination
14. Hodgkin's disease
15. Sarcoidosis
16. Whether the woman is currently on corticosteroids or immunosuppressive drugs
17. Whether the woman is a member of a locally identified high-prevalence group (e.g., homeless person, migrant worker)
18. Whether the woman is a resident of a shelter or long-term facility (e.g., nursing home, correctional facility)
19. Occupational exposure to tuberculosis (e.g., health care worker, on staff of long-term care facility, on staff of homeless shelter or drug treatment center)

TABLE 8-8 Signs and Symptoms of Active Tuberculosis

Fever: Initially minimal to moderate temperature elevation occurs daily in the late afternoon or evening, usually accompanied by a feeling of euphoria and well-being; as disease progresses, temperature elevations reach 103°F (39.5°C) or higher.

Night sweats: The daily rise in body temperature reverses at night with accompanying diaphoresis.

Weight loss: Minor weight loss with anorexia occurs early in the disease; increased weight loss, fatigue, and irritability occurs as the disease progresses.

Chronic cough: A cough that is worse in the morning.

Chronic, productive cough: A cough that produces large amounts of purulent, greenish-yellow sputum sometimes accompanied by hemoptysis.

Pleurisy with effusion: This is particularly significant in young childbearing women, as pleurisy in this age group is uncommon.

Spontaneous atelectasis: Especially in a young person, this may be a sign of active tuberculosis.

Crepitant rales: This is heard best on auscultation after the woman coughs.

The Mantoux test consists of 0.1 mL of purified protein derivative (PPD) tuberculin containing 5 tuberculin units, administered intradermally in the forearm. The reaction to the PPD should be read 48 to 72 hours after injection. If a patient's reaction is not read until after 72 hours and it is negative, the test should be repeated. A positive reaction may be measurable up to 1 week after testing. Reaction is the diameter of a palpable swelling (induration), measured in millimeters. Erythema is not included in the measurement. Tuberculin reactions are classified as positive according to risk factors, as follows [52] :

1. Induration ≥5 mm:
   a. persons known to have HIV infection
   b. persons in close contact with a person who has infectious tuberculosis
   c. persons whose chest x-ray is suggestive of previous tuberculosis with inadequate or no treatment
   d. patients who are immune suppressed
2. Induration ≥10 mm:
   a. recent immigrants from an area of the world where tuberculosis is common (e.g., Latin America, Africa, Asia)
   b. persons who have high-risk health conditions
   c. children exposed to high-risk persons
   d. residents and employees of a homeless shelter, jail, long-term care facility, or any congregate living setting
   e. intravenous drug abusers
   f. mycobacteriology laboratory employees
3. Induration ≥15 mm:
   a. persons with no known risk factors for tuberculosis

Both false-positive and false-negative readings may occur, as shown in Table 8-9.

TABLE 8-9 Factors That May Cause False-Positive and False-Negative Responses to the Tuberculin Skin Test

False Positive	Nontuberculous mycobacteria BCG vaccination
False Negative	Anergy Recent TB infection Very young age (<6 months old) Live-virus vaccination Overwhelming TB disease

Source: Centers for Disease Control and Prevention. *Core Curriculum on Tuberculosis: What the clinician should know*, 4th ed. 2000. Accessed online at www.cdc.gov/nchstp/tb/pubs/corecurr/default.htm

Anergy is the condition in which the tuberculin reaction decreases or disappears, even when exposure to tuberculosis has occurred. Causes include HIV/AIDS, overwhelming TB disease, viral or febrile illnesses, sarcoidosis, live-virus vaccinations and immune suppression [52, 56, 57]. Although anergy panel testing is no longer recommended, awareness of this possibility should lead the clinician to follow patients at risk of TB disease and possible anergy with chest x-ray or sputum culture, and referral to a provider experienced with tuberculosis.

Chest X-Ray The appearance of active pulmonary TB is seen on radiography most often in the upper lobes or the superior aspect of the lower lobes, while old healed TB scars appear as nodules or fibrotic changes. Although chest films will show abnormalities suggestive of TB, they are not by themselves diagnostic.

Sputum Culture Sputum cultures should be performed when there is clinical suspicion of active tuberculosis. The long delay in obtaining results (as much as 2 weeks) should not be a reason to delay assessment, even though diagnosis is not final without the confirmation of cultures. A smear from the sample can be evaluated for the presence of mycobacteria by acid-fast or fluorescent stain. Even when the stain is negative, the sputum sample should be sent for culture [52].

Treatment of Latent Tuberculosis

Those who have positive skin testing and in whom active tuberculosis has been ruled out by chest x-ray should be offered Isoniazid (INH) prophylaxis. The standard adult regimen is 300 mg per day in a single dose. Directly observed therapy regimens with twice a week dosing have been used for persons who had difficulty in complying with several months of daily therapy [52, 58]. Nine months is considered the optimum length of therapy. Pregnant and breastfeeding women may safely take this regimen, with the addition of a pyridoxine (vitamin B_6) supplement [59]. Prior to beginning INH therapy, women should be screened for historic risk factors for HIV or hepatitis, contraindications to the medication, and current medications. Teaching includes the benefits and risks of long-term therapy, the importance of adherence, and side effects. Baseline liver function studies should be obtained in persons with hepatic disease, HIV, and women who are pregnant or postpartum. At least monthly, the patient should be assessed for adherence to medication regimen, signs and symptoms of active disease, and for symptoms of hepatitis [52].

Other regimens for prophylaxis of latent TB include rifampin and pyrazinamide for those resistant to INH, and those with multidrug resistant TB exposure should receive ethambutol plus either pyrazinamide or a fluoroquinolone. Any of these regimens should be managed by the patient's primary care provider or an infectious disease specialist, not by the midwife.

Management

Both latent and active tuberculosis are managed by providers other than the midwife, and any patient suspected of TB infection on screening should be promptly referred. In some settings, it may be appropriate for the midwife to order the chest x-ray as the woman is being referred, to expedite therapy.

Hepatitis*

Viral hepatitis is actually a group of pathogenic viruses, identified by the letters A through G. While hepatitis A is usually spread by the fecal-oral route, others are spread by contact with blood and body fluids and can be contracted sexually. Both acute and chronic viral hepatitis often affects women and, if pregnant, their infants. Among the issues to be considered by midwives are when to test for hepatitis, what the risk factors and symptoms are, and management strategies. Hepatitis is a condition for which referral to and collaboration with medical consultants is essential.

Hepatitis A and B are the most common forms of hepatitis in the United States. There are fewer new cases per year of hepatitis C, but it becomes chronic about 75 to 85 percent of the time, in contrast to hepatitis B, which develops as a chronic state in 2 to 6 percent of adult cases [60]. These three common types of viral hepatitis will be discussed in more depth in this section.

Hepatitis D occurs as a coinfection with hepatitis B or as a secondary infection, and is most common in Mediterranean countries. It is uncommon in the general population of North America although it may occur in intravenous drug users and persons with frequent exposure to blood products (e.g., hemophiliacs) as well as their sexual contacts.

* Revised with Mary Curran, CNM, MPH

Perinatal transmission is unlikely, because neonatal prophylaxis for hepatitis B is effective against hepatitis D as well [61].

Hepatitis E is common in Asia, South America, and Latin America and has been diagnosed in the United States only in individuals traveling from developing countries. Like hepatitis A, it is transmitted by fecal-oral contamination. It is significant in women for causing a fatality rate in pregnancy as high as 21 percent in the third trimester. There are no long-term effects of hepatitis E, nor does it have a carrier state [62, 63]. Hepatitis F is a "novel" agent that is associated with liver disease in hepatitis A, B, and C negative patients. There are no diagnostic tests or therapies other than support and symptomatic treatment [63]. Hepatitis G has both acute and chronic states, but appears to have a mild presentation with little or no lasting damage. There is no therapeutic agent available for its treatment. It can be transmitted perinatally [64].

Hepatitis can also result from generalized infection by other viruses, including cytomegalovirus, Epstein-Barr virus, herpes simplex virus, and measles virus. Nonviral causes of liver infection include bacterial sepsis and syphilis. Hepatitis can also be chemically induced by chronic alcohol ingestion or by medications such as aspirin (acetylsalicylic acid), Tylenol (acetaminophen), Dilantin (phenytoin), INH (isoniazid), and rifampin [65].

Hepatitis A

Hepatitis A (formerly called infectious hepatitis) is the most common form of hepatitis worldwide and generally occurs more frequently in impoverished populations, where good hygienic practices are difficult to maintain. Fecal-oral contamination is the usual route of transmission. Contaminated water and food (especially shellfish) are common sources of hepatitis A (HAV) viral infection. The burden of the infection includes a case rate of about 4.9 per 100,000 people in the United States, or 10,600 infections in 2001 [66]. An estimated 15 to 30 percent of reported cases of HAV are attributed to household or sexual contact with an infected person, and an additional 10 to 15 percent of reported cases are among children and employees of child care centers and members of their households [67]. Rare transmission of HAV in blood products has been documented during the viremic or prodromal phase of the infection [68]. The incubation period is short, with an average of 28 days (range of 15 to 50 days) [69] with virus shed through the feces approximately 2 weeks prior to clinical symptoms, and it is the period of time when the risk of transmission is greatest.

Clinical Illness Signs and symptoms of hepatitis A resemble those of the "flu" and include abrupt onset of anorexia, malaise, fatigue, weakness, nausea, and low-grade fever. Uncommonly, urticaria, arthritis, arthralgia, and myalgia may occur. Jaundice may be present, along with upper right quadrant or epigastric pain, an enlarged and tender liver, pruritus, splenomegaly, muscle pain, and weight loss. Hepatitis A has a short acute phase of 10 to 15 days, with symptoms resolving within 2 months, although 10 to 15 percent of symptomatic persons have prolonged or relapsing disease lasting up to 6 months [70]. The disease does not result in the chronic or carrier state. If contracted during pregnancy, there is no known risk to the newborn.

Diagnosis In order to diagnose acute hepatitis A virus, serologic testing with the findings of immunoglobulin M (IgM) antibody is required to confirm infection. IgM anti-HAV usually becomes detectable 5 to 10 days before the onset of symptoms and can persist for up to 6 months after infection [71]. Immunoglobulin G (IgG) anti-HAV appears early in the course of the disease and will indicate lifelong protection against the disease [72].

Treatment Ninety-nine percent of those individuals infected with hepatitis A will recover without treatment. Each year in the United States there are about 100 cases of fulminant hepatitis A that lead to death from acute liver failure [73]. Between 11 and 22 percent of persons with hepatitis A are hospitalized and those adults who become ill lose an average of 27 days of work [74, 75].

Pregnancy and Lactation Hepatitis A infection is no more severe in pregnant women than in nonpregnant individuals [76]. Maternal HAV infection during pregnancy is not associated with fetal loss or developmental abnormalities [62]. Vertical transmission from mother to infant has not been shown [77]. Maternal hepatitis A virus infection in the last trimester or during breastfeeding is not a contraindication to breastfeeding [78]. Breastfeeding is not a contraindication for vaccination; inactivated virus will not affect the safety of breast milk.

Prevention Since 1995, two licensed inactivated HAV vaccines have been available in the United States. In 1996 the CDC Advisory Committee on

Immunization Practices (ACIP) recommended HAV vaccination for specific groups at high risk for exposure such as international travelers and individuals working in countries where HAV is endemic [78]. The ACIP now recommends that in addition to those at high risk for exposure, there should be a routine vaccination of children in states, counties, and communities in the United States with rates that are twice the 1987–1997 national average or greater (i.e., greater than or equal to 20 cases per 100,000 population) and consideration of routine vaccination for children in states, counties, and communities with infection rates that are greater than or equal to the national average for 1987–1997 of 10 cases per 100,000 [79]. HAV vaccine is an inactivated virus that is safe for use in pregnant women.

People at risk for hepatitis A include the following:

- Household/sexual contacts of infected persons
- International travelers
- Persons living in American Indian reservations, Alaska Native villages, and other regions with endemic hepatitis A
- During outbreaks: day care center employees or attendees, homosexually active men, injecting drug users

Close family and household members, personal contacts, and contacts who meet the criteria of individuals at high risk for hepatitis A should receive immune serum globulin (ISG) for prophylaxis after a potential or known exposure. Hepatitis screening is not necessary prior to receiving ISG.

Hepatitis B

Hepatitis B (formerly called serum hepatitis) is transmitted through blood, blood by-products, contaminated needles, saliva, vaginal secretions, and semen. Infection with hepatitis B (HBV) may result in a chronic or carrier state, with an increased risk for chronic active hepatitis, chronic liver disease, cirrhosis of the liver, and hepatocellular carcinoma. The CDC reports that in 1999 about 80,000 new infections of hepatitis B occurred, which was a decrease from 450,000/year in the 1980s. Chronic hepatitis B presently affects 1 to 1.25 million persons in the United States [80]. Recent studies of posttransfusion hepatitis show that less than 5 percent of cases are caused by hepatitis B [81].

Clinical Illness Hepatitis B has an incubation period of 1 to 4 months. Nonhepatic symptoms (rash, fever, arthralgia, myalgia, arthritis) generally precede jaundice in hepatitis B. Signs and symptoms of hepatitis B infection may include nausea, vomiting, right upper quadrant abdominal pain, enlarged and tender liver, fever, chills, general weakness and exhaustion, and headache. Approximately 70 percent of patients with acute hepatitis B will have a subclinical infection, whereas 30 percent will develop icteric disease [82]. The clinical symptoms and jaundice generally disappear in 1 to 3 months. Approximately 90 percent of those acutely infected perinatally will progress to chronic infection [62].

Diagnosis Hepatitis B surface antigen (HbsAG) and hepatitis Be antigen (HbeAG) usually appear in the infected person's blood from 1 to 10 weeks after an acute exposure to HBV, before the onset of clinical symptoms or elevation of the liver enzyme serum alanine aminotransferase (ALT). Persistence of HbsAg for more than 6 months implies progression to chronic HBV infection. HbeAG is a marker for viral replication and infectivity. During pregnancy, it is associated with higher rates of vertical transmission. Hepatitis B core antibody (IgM class) appears during the midphase of the clinical course, with hepatitis B core antibody (IgG class) becoming predominant late in normal recovery. IgM core antibody may remain detectable for 2 years following acute infection; IgG will persist, and will also be present in chronic infection. Reports of seroconversion from acute to chronic hepatitis B vary from 5 to 10 percent. Hepatitis B surface antigen will usually disappear by 4 to 6 months and be followed by the presence of hepatitis B surface antibody (anti-HBs), which will confer lifelong immunity. Hepatitis B core antibody and hepatitis B surface antibody may persist in noncarriers for many years. Figures 8-3 and 8-4 illustrate the relationship over time among these values [82].

Treatment Acute hepatitis B is not responsive to any treatment and must run its natural course. A person with acute or chronic hepatitis B should be evaluated for liver disease.

Pregnancy and Lactation In the United States, 15,000 pregnant women who are hepatitis B surface antigen (HbsAg)-positive deliver annually [83]. HBV infection is no more severe in pregnant women than in nonpregnant individuals [84]. Chronic HBV carriers usually have normal pregnancies, unless there is also severe chronic hepatitis or secondary cirrhosis and associated complications

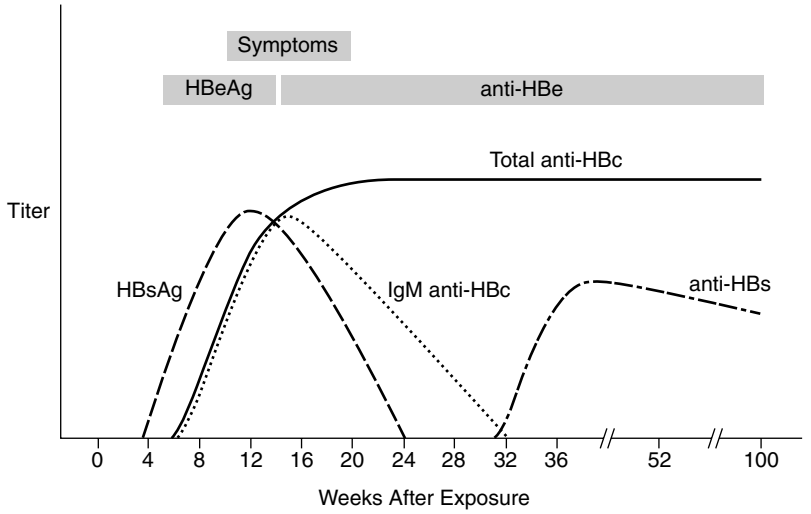


FIGURE 8-3 Progressive serology changes with acute hepatitis B infections.

Source: From Centers for Disease Control and Prevention. Accessed online on February 14, 2003 at www.cdc.gov.

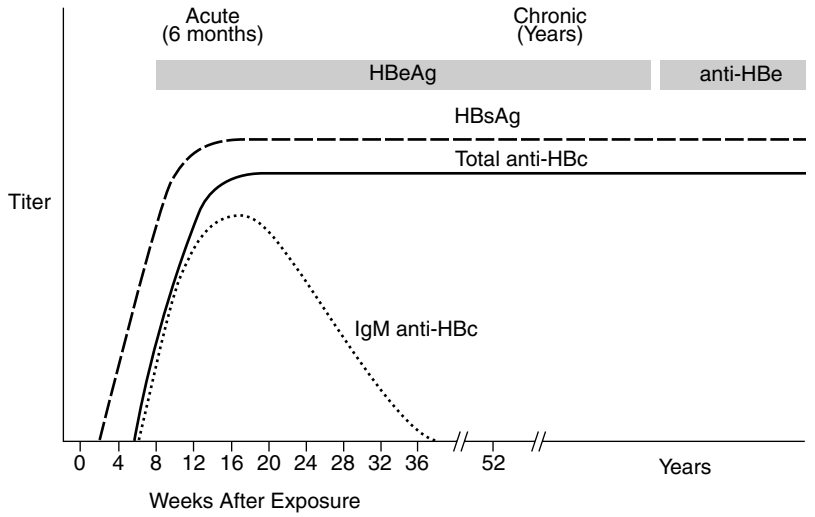


FIGURE 8-4 Progressive serology changes with progression to chronic hepatitis B infection.

Source: From Centers for Disease Control and Prevention. Accessed online on February 14, 2003, at www.cdc.gov.

[85]. Maternal-newborn transfer of hepatitis B can occur at the time of delivery through contact with the infected maternal blood, or during close maternal-infant contact in the postpartum period. The transfer can occur regardless of route of delivery. Women who are HBsAg-positive and hepatitis Be antigen-positive have a 90 percent chance of transmitting their disease to their infants. Of the infected infants, 90 percent will become carriers; 25 percent will eventually die of liver failure from cirrhosis or primary hepatocellular carcinoma. The infants of potentially infectious mothers are treated with HBV human hyperimmune globulin (HBIG) within 12 hours of birth and are also inoculated with the first of three injections of HBV vaccine prior to discharge from the hospital [86]. Immunoprophylaxis at birth followed by a hepatitis B vaccine series reduces vertical transmission of hepatitis B to less than 3 percent [82].

Breastfeeding is not contraindicated. With the treatment regimen of HBIG and the first inoculation with HBV vaccine there is no increased incidence of HBV infections in infants of breastfeeding mothers who are chronically infected [78]. Vaccination of the mother is not contraindicated during pregnancy or when breastfeeding.

Prevention The American College of Obstetricians and Gynecologists and the Centers for Disease Control and Prevention recommend routine hepatitis B virus screening for HbsAg for all pregnant women in order to identify those women who are chronic carriers of hepatitis B. Those women who test negative for HBsAb should be considered for vaccination if they have not been previously vaccinated [87]. Pregnancy is not a contraindication for either hepatitis B vaccine or HBIG. If a susceptible woman has never been vaccinated for either hepatitis A or hepatitis B, there is now available a combination vaccine (TWINRIX), which is administered in a 3-dose schedule that will provide immunity to both viruses [88].

The Advisory Committee on Immunization Practices (ACIP) and the American Academy of Family Physicians (AAFP) presently recommend the following 3-dose schedule of vaccinations for hepatitis B in childhood:

Hepatitis B initial dose: at birth prior to discharge from hospital w/minimum interval to next dose 4 weeks

Hepatitis B second dose: 1 to 4 months; minimum interval to next dose 8 weeks

Hepatitis B third dose: 6 to 18 months; should not be administered before age 6 months [89]

Those at risk for hepatitis B include the following:

1. Individuals with multiple sex partners or diagnosis of a sexually transmitted disease
2. Intravenous drug users
3. Infants/children of immigrants from areas where hepatitis B is endemic, such as Asia, Africa, Pacific Islands, Haiti
4. Sex partner(s) and household contacts of hepatitis B carriers
5. Homosexual males
6. Women who have intimate contact with bisexual males
7. Public safety personnel and health care personnel in obstetrics, surgery, emergency room, laboratory, and housekeeping
8. Infants born to mothers with hepatitis B (active, chronic, or carrier)
9. Hemodialysis patients

Health care providers who work with populations at high risk for hepatitis B have the option of obtaining hepatitis B vaccine. Hepatitis B vaccine is an inactivated vaccine and the only true contraindication to receiving this vaccine is a prior anaphylactic reaction to it. Their options are to obtain hepatitis B vaccine or to do nothing; each has its own set of risks that should be carefully weighed.

Hepatitis C

Hepatitis C (HCV), formerly known as non-A non-B hepatitis, is the major cause of posttransfusion hepatitis and was identified as the hepatitis C virus in 1989 [90]. Hepatitis C is found in highest concentrations in the blood and is primarily transmitted through the bloodborne route; however, for many individuals the method of acquisition of the virus is unknown [91]. Sexual transmission is not unknown but is rare at approximately 5 percent [92]. Hepatitis C is the leading cause of chronic liver disease in the United States, with an estimated 40,000 new cases per year in 1998, but with an estimated 2.7 million persons chronically infected. Eighty-five percent of those infected with hepatitis C become chronic carriers, which accounts for the high number of infected individuals who may have serious and often asymptomatic chronic liver disease [93].

Clinical Illness The average incubation period for hepatitis is generally 6 to 7 weeks, with a range of 2 weeks to 26 weeks. Hepatitis C is different from hepatitis A and B in that the acute phase of the infection is often asymptomatic and without jaundice: Only 30 to 40 percent of patients will present with the typical clinical signs of hepatitis and only 20 to 30 percent will appear with jaundice [94]. Reports of progression to chronic infection range from 70 to 85 percent, with long-term sequelae including cirrhosis and hepatocellular carcinoma [95]. Liver failure from chronic hepatitis is presently the leading indication for liver transplantation in the United States.

Diagnosis Diagnosis of HCV infection is made by serum enzyme immunoassay (EIA) detection of antibody to the hepatitis C virus. Targeted screening for the hepatitis C virus is based on risk factors as recommended by the CDC:

1. Injecting drug users
2. Recipients of clotting factors made before 1987
3. Hemodialysis patients
4. Recipients of blood and/or organ transplants prior to June 1992
5. People with undiagnosed liver problems

6. Infants born to infected mothers (testing after 12 to 18 months old)
7. Healthcare/public safety workers (only after known exposure)

If antibody to HCV is positive, recombinant immunoblot assay (also known as "Western blot," or RIBA) is used to confirm the result. If this confirms the antibody to HCV, then because of the high (70 to 85 percent) incidence of chronic disease, serum alanine aminotransferase (ALT) and quantification of HCV-RNA (viral load) should be performed. The midwife would then refer this patient to her primary care physician, hepatologist, or gastroenterologist. The midwife would counsel the patient to expect an evaluation of her liver function with serum testing and possibly biopsy.

Treatment Treatment for clinical hepatitis C is the same palliative care as for hepatitis A and B. Treatment for chronic hepatitis includes combination therapy with injections of alpha interferon and the oral antiviral drug ribavirin. This treatment is not appropriate for pregnancy and it should be noted that ribavirin is a teratogenic drug (category X) and is contraindicated during pregnancy [96]. It should also be avoided in a patient's partner when trying to conceive a pregnancy. Patients can be counseled to expect a 24- to 48-week course of therapy, with this medication regimen.

Pregnancy and Lactation The U.S. Public Health Service has estimated that the likelihood of perinatal transmission of the hepatitis C virus, in the absence of coinfection with HIV, is on the order of 5 to 6 percent. The incidence of transmission does increase when associated with a maternal viral load of 10,000,000 copies/ml^3 of circulating virus [92]. Data collected to date show no increase in HCV infection among breastfed babies; therefore, breastfeeding is not contraindicated in a mother with chronic hepatitis C infection [97].

Prevention There is no vaccine to prevent hepatitis C. Prevention centers around education and avoidance of lifestyle choices that would put one at risk for exposure to hepatitis C.

Diagnosis of Hepatitis

Hepatitis may be detected through history, physical examination, and laboratory data, as follows:

1. History
   a. blood transfusion or blood products/organs prior to June 1992
   b. previous hepatitis or jaundice
   c. exposure to someone who has hepatitis or is jaundiced
   d. multiple sex partners
   e. male homosexuals
   f. sex with a bisexual male
   g. intravenous drug use, even one episode, even in the remote past
   h. immigration or travel from a country with endemic hepatitis
   i. occupation—health care worker or public safety worker, day care worker
   j. clinical signs of hepatitis
      (1) anorexia
      (2) nausea
      (3) vomiting
      (4) upper right quadrant abdominal pain
      (5) epigastric pain
      (6) malaise
      (7) weakness
      (8) fatigue
      (9) arthralgia
      (10) arthritis
      (11) urticaria
      (12) myalgia
   k. hemophilia
   l. history of dialysis
2. Physical examination
   a. tender, enlarged liver
   b. enlarged spleen
   c. jaundice (of sclera or entire body)
3. Laboratory tests
   a. positive hepatitis screening test or identification of specific hepatitis antigens and antibodies
   b. elevated liver function tests AST (SGOT), ALT (SGPT), LDH, and bilirubin

Evidence or suspicion of hepatitis should be reported to the woman's primary care provider, or to the midwife's consulting physician if there is not an established primary care relationship. Any hepatitis is significant in a pregnant woman if it leads to anorexia, nausea, and vomiting, as these may interfere with her nutritional status. Women with debilitating acute disease and chronic or carrier status should be collaboratively managed with a physician. Hepatitis is a reportable disease. Midwives need to know their state reporting regulations and be in compliance with them.

References

1. Shacker, T. W., Hughes, J. P., Shea, T., Coombs, R. W., and Corey, L. Biologic and virologic characteristics of primary HIV infection. *Ann. Intern. Med.* 128(8):313–320, 1998.
2. Cao, Y., Krogstad, P., Korber, B. T., et al. Maternal HIV-1 viral load and vertical transmission of infection: the Ariel Project for the prevention of HIV transmission from mother to infant. *Nat. Med.* 3(5):549–552, 1997.
3. Farzadegan, H., Hoover, D. R., Astemborski, J., et al. Sex differences in HIV-1 viral load and progression to AIDS. *Lancet* 352:1510–1514, 1998.
4. Centers for Disease Control and Prevention. Accessed online on February 14, 2003, at www.cdc.gov/HIV/graphics/women/htm.
5. Padian, N. S., Shiboski, S. C., Glass, S. O., and Vittinghoff, E. Heterosexual transmission of human immunodeficiency virus (HIV) in northern California: results from a ten-year study. *Am. J. Epidemiol.* 146(4):350–357, 1997.
6. de Vincenzi, I., for the European Study Group on Heterosexual Transmission of HIV. A longitudinal study of human immunodeficiency virus transmission by heterosexual partners. *N. Eng. J. Med.* 331(6):341–346 (August 11) 1994.
7. Centers for Disease Control and Prevention. Public Health Service guidelines for the management of health care worker exposures to HIV and recommendations for postexposure prophylaxis. *MMWR* 47(RR-7), 1998.
8. Centers for Disease Control and Prevention. Revised U.S. Public Health Service recommendations for HIV screening of pregnant women. *MMWR* 50(RR19):59–86, 2001.
9. Institute of Medicine. *Reducing the Odds: Preventing Perinatal Transmission of HIV in the United States*. Washington, DC: National Academy Press, 1999.
10. Anderson, J. R. HIV and reproduction. In Anderson, J. R. (Ed.) *A Guide to the Clinical Care of Women with HIV*. Rockville, MD: Health Resources and Services Administration, 2001.
11. Uvin, S. C., and Caliendo, A. M. Cervicovaginal human immunodeficiency virus secretion and plasma viral load in human immunodeficiency virus-seropositive women. *Obstet. Gynecol.* 90(5):739–743 (November) 1997.
12. Panel on Clinical Practices for Treatment of HIV Infection. Guidelines for the use of antiretroviral agents in HIV-infected adults and adolescents. Department of Health and Human Services. Accessed online at www.aidsinfo_nih.gov/guidelines/adult/html_adult_02-04-02.html.
13. De Cock, K. M., Fowler, M. G., Mercier, E., et al. Prevention of mother-to-child HIV transmission in resource-poor countries: translating research into policy and practice. *JAMA* 283(9):1175–1182 (March 1) 2000.
14. Mofenson, L. M. Interaction between timing of perinatal human immunodeficiency virus infection and the design of preventive and therapeutic interventions. *Acta Paediatr. Suppl.* 421:1–9, 1997.
15. Garcia, P. M., Kalish, L. A., Pitt, J., et al. Maternal levels of plasma human immunodeficiency virus type 1 RNA and the risk of perinatal transmission. *N. Eng. J. Med.* 341:394–402, 1999.
16. European Collaborative Study. Risk factors for mother-to-child transmission of HIV 1. *Lancet* 339:1007–1012, 1992.
17. Landesman, S. H., Kalish, L. A., Burns, D. N., et al. Obstetrical factors and the transmission of human immunodeficiency virus type 1 from mother to child. *N. Eng. J. Med.* 334:1617–1623, 1996.
18. Wabire-Mangen, F., Gray, R. H., Mmiro, F. A., et al. Placental membrane infection and risks of mother-to-child transmission of HIV-1 in Uganda. *JAIDS* 22:373–385, 1999.
19. John, G. C., Nduati, R. W., Mbori-Ngacha, D. A., et al. Correlates of mother-to-child human immunodeficiency virus type 1(HIV-1) transmission: association with maternal plasma HIV-1 RNA load, genital HIV-1 shedding, and breast infections. *J. Infect. Dis.* 183:206–212, 2001.
20. Connor, E. M., Sperling, R. S., Gelber, R., et al. Reduction of maternal-infant transmission of human immunodeficiency virus type 1 with zidovudine treatment. *N. Eng. J. Med.* 331(18):1173–1180, 1994.
21. Sperling, R. S., Shapiro, D. E., Coombs, R. W., et al. Maternal viral load, zidovudine treatment, and the risk of transmission of human immunodeficiency virus type 1 from mother to infant. Pediatric AIDS Clinical Trial Group 076 Study Group. *N. Eng. J. Med.* 335(22):1678–1680 (November 28) 1996.
22. Cooper, E., Charurat, M., Thompson, B., et al. Effectiveness of potent anti-retroviral therapies on reducing perinatal transmission of HIV-1. Presented at the XIII International AIDS Conference, Duikan, South Africa, July 9–14, 2000. Abstract LbOr4.

23. Cooper, E. R., Charurat, M., Mofenson, L., et al. Combination antiretroviral strategies for the treatment of pregnant HIV-1-infected women and prevention of perinatal HIV-1 transmission. *J. Acquired Immune Defic. Syndromes* 29:484–494, 2002.

24. Culnane, M., Fowler, M. G., Lee, S. S., et al. Lack of long-term effects of in utero exposure to zidovudine among uninfected children born to HIV-infected women. *JAMA* 281(2):151–157, 1999.

25. Tuomala, R. E., Shapiro, D., Mofenson, L. M., et al. Antiretroviral therapy during pregnancy and the risk of adverse outcome. *N. Eng. J. Med*. 346:1863–1870, 2002.

26. Public Health Service Task Force Recommendations for the Use of Antiretroviral Drugs in Pregnant HIV-1 Infected Women for Maternal Health and Interventions to Reduce Perinatal HIV-1 Transmission in the United States—August 30, 2002. Accessed on line at http://aidsinfo.nih.gov/guidelines/perinatal/perinatal_083002.html.

27. European Mode of Delivery Collaboration. Elective cesarean-section versus vaginal delivery in prevention of vertical HIV-1 transmission: a randomised clinical trial. *Lancet* 353(9158):1035–1039, 1999.

28. International Perinatal HIV Group. The mode of delivery and the risk of vertical transmission of human immunodeficiency virus Type 1—a meta-analysis of 15 prospective cohort studies. *N. Eng. J. Med*. 340(13):977–987, 1999.

29. Mandelbrot, L., Le Chenadec, J., Berrebi, A., et al. Perinatal HIV-1 transmission: interaction between zidovudine prophylaxis and mode of delivery in the French Perinatal Cohort. *JAMA* 280(1):55–60 (July 1) 1998.

30. Read, J. Duration of Ruptured Membranes and Vertical Transmission of HIV-1: A Meta-Analysis from Fifteen Prospective Cohort Studies. Paper presented at the Seventh Annual Conference on Retroviruses and Opportunistic Infections, San Francisco, CA: January 30–February 2, 2000.

31. Meredith, K., Delaney, J., Horgan, M., Fisher, E., Jr., and Fraser, V. A survey of women with HIV about their expectations for care. *AIDS Care* 9(5):513–522, 1997.

32. Gielen, A. C., O'Campo, P., Faden, R. R., and Eke, A. Women's disclosure of HIV status: experiences of mistreatment and violence in an urban setting. *Womens Health* 25(3):19–31, 1997.

33. Gielen, A. C., Fogerty, L., O'Campo, P., Anderson, J., Keller, J., and Faden, R. Women living with HIV: disclosure, violence and social support. *J. Urban Health* 77(3):480–491 (September) 2000.

34. Zierler, L., Gange, S. J., Celentano, D., et al. Incidence of violence against HIV-infected and uninfected women: findings from the HIV Epidemiology Research (HER) Study. *J. Urban Health* 79(4):5122–5124 (December) 2002.

35. Weller, S., and Davis, K. Condom effectiveness in reducing heterosexual HIV transmission. Cochrane Database Syst. Rev. (1):CD003255, 2002.

36. Cu-Uvin, S., Hogan, J. W., Warren, D., et al. Prevalence of lower genital tract infections among human immunodeficiency virus (HIV)-seropositive and high risk HIV-seronegative women. HIV Epidemiology Research Study Group. *Clin. Infect. Dis*. 29:1145–1150, 1999.

37. Ellerbrock, T. V., Chiasson, M. A., Bush, T. J., et al. Incidence of cervical squamous intraepithelial lesions in HIV-infected women. *JAMA* 282:1030–1037, 2000.

38. Delmas, M. C., Larsen, C., van Bentham, B., et al. Cervical squamous intraepithelial lesions in HIV-infected women: prevalence, incidence, and regression. *AIDS* 14:1775–1784, 2000.

39. Duerr, A., Kierke, B., Warren, D., et al. Human papillomavirus-associated cervical cytologic abnormalities among women with or at risk of infection with human immunodeficiency virus. *Am. J. Obstet. Gynecol*. 184(4):584–590 (March), 2001.

40. Abulurach, S., and Anderson, J. R. Gynecologic problems. In Anderson, J. R. (Ed.) *A Guide to the Clinical Care of Women with HIV*. Rockville, MD: Health Resources and Services Administration, 2001.

41. Mack, K. A., and Bland, S. D. HIV testing behaviors and attitudes regarding HIV/AIDS of adults aged 50–64. *Gerontologist* 39(6):687–694 (December), 1999.

42. Allison-Ottley, S., Weston, C., Hennawi, G., Nichols, M., Eldred, L., and Ferguson, R. P. Sexual practices of older adults in a high HIV prevalence environment. *Md. Med. J*. 48(6):287–291 (November–December), 1999.

43. Kriebs, J. The global reach of AIDS. *J. Perinat. Neonatal Nurs*. 16(3):1–10, 2002.

44. UNAIDS (Joint United Nations Programme on HIV/AIDS). Accessed online on February 10, 2002, at www.unaids.org.

45. Guay, L. A., Musoke, P., Fleming, T., et al. Intrapartum and neonatal single-dose nevirapine compared with zidovudine for prevention of mother-to-child transmission of HIV-1 in Kampala, Uganda: HIVNET 012 randomised trial. *Lancet* 354:795–802, 1999.

46. Shaffer, N., Chuachoowong, R., Mock, P. A., et al. Short-course zidovudine for perinatal HIV-1 transmission in Bangkok, Thailand: a randomised controlled trial. *Lancet* 353:773–780, 1999.

47. Lallemant, M., Jourdain, G., Le Coeur, S., et al. A trial of shortened zidovudine regimens to prevent mother-to-child transmission of human immunodeficiency virus type 1. Perinatal HIV Prevention Trial (Thailand) Investigators. *N. Eng. J. Med.* 343:982–991, 2000.

48. Wiktor, S. Z., Ekpini, E., Karon, J. M., et al. Short-course zidovudine for prevention of mother-to-child transmission of HIV-1 in Abidjan, Cote d'Ivoire: a randomised trial. *Lancet* 353:781–785, 1999.

49. Dabis, F., Msellati, P., Meda, N., et al. six-month efficacy, tolerance, and acceptability of a short regimen of oral zidovudine to reduce vertical transmission of HIV in breastfed children in Cote d'Ivoire and Burkina Faso: a double-blind placebo-controlled multicentre trial. *Lancet* 353:786–792, 1999.

50. The PETRA Study Team. Efficacy of three short-course regimens of zidovudine and lamivudine in preventing early and late transmission of HIV-1 from mother to child in Tanzania, South Africa, and Uganda (Petra study): a randomised, double-blind, placebo-controlled trial. *Lancet* 359(9313):1168–1169, 2002.

51. Rieder, H. L., Cauthen, G. M., Comstock, G. W., and Snider, D. E. Epidemiology of tuberculosis in the United States. *Epidemiol. Rev.* 11:79–98, 1989.

52. Centers for Disease Control and Prevention. Core Curriculum on Tuberculosis: what the clinician should know. 4th ed. Atlanta, GA: CDC, 2000.

53. Davis, B., Simon, H. B. Management of tuberculosis, In Goroll, A. H., Mulley, A. G. Jr. (Eds.) *Primary Care Medicine*, 4th ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2000.

54. Davis, B., Simon, H. B. Tuberculosis screening and prophylaxis, In Goroll, A. H., Mulley, A. G. Jr. (Eds.) *Primary Care Medicine*, 4th ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2000.

55. U.S. Preventive Services Task Force. *Guide to Clinical Preventive Services*, 2nd ed. Baltimore, MD: Williams and Wilkins, 1996.

56. Nash, D. R., Douglas, J. Anergy in active pulmonary tuberculosis. *Chest* 77:32–37, 1980.

57. Holden, D. M., Dubin, M. R., and Diamond, P. H. Frequency of negative intermediate strength tuberculin sensitivity in patients with active tuberculosis. *N. Eng. J. Med.* 285:1506–1509, 1971.

58. International Union Against Tuberculosis Committee on Prophylaxis. Efficacy of various durations of isoniazid preventive therapy for tuberculosis: five years of followup in the IUAT trial. *Bull. WHO* 60:555–564, 1982.

59. Hale, T. W. *Medications and Mothers' Milk*, 10th ed. Amarillo, TX: Pharmasoft Publishing, 2002.

60. Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines 2002. *MMWR* 51(No. RR-6), 2002.

61. American College of Obstetricians and Gynecologists. Viral hepatitis in pregnancy. *ACOG Educational Bulletin* No. 248, July 1998.

62. Reinus, J. F., and Leikin, E. L. Pregnancy and liver disease: viral hepatitis in pregnancy. *Clin. Liver Dis.* 3:1 (February) 1999.

63. Pastorek, J. G., and Yordan-Jovet, R. Hepatitis A to E. In Faro, S., and Soper, D. E. (Eds.) *Infectious Diseases in Women*. Philadelphia, PA: W. B. Saunders, 2001.

64. Alter, J. M., Gallagher, M., Morris, T. T. et al. Acute non A-E hepatitis in the United States and the role of hepatitis G virus infection. *N. Eng. J. Med.* 336:741, 1997.

65. Dienstag, J. R. Management of hepatitis. In Goroll, A. H., and Mulley, A. G. (Eds.) *Primary Care Medicine*, 4th ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2000.

66. Centers for Disease Control and Prevention National Center for Infectious Diseases. Viral hepatitis surveillance. Accessed online at www.cdc.gov/ncidod/diseases/hepatitis/resource/dz_burden02.htm.

67. Alter, M. J. Acute viral hepatitis in the United States. American Association for the Study of Liver Diseases. Postgraduate Course 2000. Update on Viral Hepatitis, Dallas, TX, October 27–28, 2000. Accessed on line at www.hepnet.com/hepc/aasl200/alter.html.

68. Lemon, S. M. The natural history of hepatitis A: the potential for transmission by transfusion of blood or blood products. *Vox Sang* 67(suppl. 4): 19–23, 1994.

69. Krugman, S., Giles, J. P.,. Viral hepatitis: new light on an old disease. *JAMA* 212:1019–1029, 1970.

70. Glikson, M., Galun, E., Oren, R., Tur-Kaspa, R., Shouval, D. Relapsing hepatitis A. review of 14 cases and literature survey. *Medicine* 71:14–23, 1992.

71. Liaw, Y. F., Yang, C. Y., Chu, C. M., Huang, M. J. Appearance and persistence of hepatitis A IgM antibody in acute clinical hepatitis A observed in an outbreak. *Infection* 14:156–158, 1986.

72. Stapleton, J. T. Host immune response to hepatitis A virus. *J. Infect. Dis.* 171(Suppl. 1):S9–14, 1995.

73. Williams, I., Bell, B., Kaluba, J., and Shapiro, C. Association between chronic liver disease and death from hepatitis A, United States 1989–1992 (Abstract A39). Paper presented at Ninth Triennial International Symposium on Viral Hepatitis and Liver Disease. Rome, Italy, April 1996.

74. CDC. *Hepatitis Surveillance Report* No. 56. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, CDC, 1996.

75. Centers for Disease Control and Prevention: Prevention of hepatitis A through active or passive immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 45(RR-15):1, 1996.

76. Zhang, R. L., Zeng, Z. S., Shang, H. Z: Survey of 34 pregnant women with hepatitis A and their neonates. *Chin. Med. J.* 103:522, 1990.

77. Koff, R. S. Seroepidemiology of hepatitis A in the United States. *J. Infect. Dis.* 171(Suppl. 1), S19–S23, 1995.

78. Lawrence, M. L., Lawrence, R. A. The evidence for breastfeeding: given the benefits of breastfeeding, what contraindications exist? *Pediatr. Clin. North Am.* 48:1 (February) 2001.

79. Centers for Disease Control and Prevention. Prevention of hepatitis A through active or passive immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 48(RR-12):1–37, 1999.

80. Centers for Disease Control and Prevention National Center for Infectious Diseases. Viral Hepatitis B—Fact sheet, accessed online February 28, 2002, at www.cdc.gov/ncidod/disease/hepatitis/b/fact.htm.

81. Mandell, G. L., Bennett, J. E., and Dolin, R. (Eds.) *Principles and Practice of Infectious Diseases*, 5th ed. Philadelphia, PA: Churchill Livingstone, Inc., 2000, pp. 1666–1669.

82. Chan, H. L. Y., Lok, A. S. F. Hepatitis B in adults: a clinical perspective. *Clin. Liver Dis.* 3(2):291–307 (May) 1999.

83. Hunt, C. M., Sharara, A. I. Liver disease in pregnancy. *Am. Fam. Physician* 59:4 (February 15) 1999.

84. Hiber, J. P. Hepatitis and pregnancy. *J. Pediatr.* 91:545, 1977.

85. Schweitzer, I. L., and Peters, R. L. Pregnancy in hepatitis B antigen positive cirrhosis. *Obstet. Gynecol.* 48:435, 1976.

86. General Recommendations on Immunization: Recommendations of the Advisory Committee on Immunization Practice (ACIP) and the American Academy of Family Physicians (AAFP); *MMWR* 51(LRR-2) (February 8) 2002.

87. American College of Obstetricians and Gynecologists. Immunization during pregnancy. *ACOG Technical Bulletin* No. 160 (October) 1991.

88. Twinrix product information, Glaxo SmithKline. Accessed on February 15, 2003, online at www.gsk.com/products/vaccines/htm.

89. Centers for Disease Control and Prevention. Recommendations of the Advisory Committee on Immunization Practices (ACIP) and the American Academy of Family Physicians (AAFP); *MMWR* 51(RR-2) (February 8) 2002.

90. Choo, Q. L., Kuo, G., Weiner, A. J., et al. Isolation of a cDNA clone derived from a blood-borne non-A, non-B viral hepatitis genome. *Science* 244:359–362, 1989.

91. Alter, M. J. Transmission of hepatitis C virus: route, dose, and titer. *N. Eng. J. Med.* 330:784–786, 1994.

92. Dienstag, J. L. Sexual and perinatal transmission of hepatitis C. *Hepatology* 26:3 (suppl. 1) 1997.

93. Center for Disease Control and Prevention. National Center for Infectious Diseases. Viral Hepatitis C—Fact Sheet, accessed online February 28, 2003, at www.cdc.gov/ncidocl/diseases/hepatitis/c/fact.htm.

94. Williams, I. Epidemiology of hepatitis in the United States. *Am. J. Med.* 107(6B):2S–9S, 1999.

95. Centers for Disease Control and Prevention. Recommendations for Prevention and Control of Hepatitis C virus (HCV) and HSV-related chronic disease. *MMWR* 44(RR19):1–39 (October 16) 1998.

96. Virazole, product information, ICN Pharmaceuticals, 1993.

97. Zanetti, A. R., Tanzi, E., Paccagnini, S., et al. Mother-to-infant transmission of hepatitis C virus. *Lancet* 345:289–291, 1995.

CHAPTER

9

Women and Exercise

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The focus here will be on supporting and monitoring women's participation in physical activity as a method of promoting their health and well-being. The chapter begins with a brief discussion of the value of exercise to women's health, which provides the rationale for the midwife's acquiring competency in this area. The impact of exercise on women at various life stages is discussed throughout, as are other key topics: management procedures for determining needs and motivations, screening for risks, assessing fitness levels, recommending exercise regimens, making referrals to appropriate fitness professionals, and evaluating outcomes.

The Value of Exercise to Women's Health

Exercise can be defined in a general way as the recreational physical activities and activities of daily living that enhance physical fitness, which has been identified as an effective strategy for the reduction of disease and death [1]. Public health experts recognize that adequate and appropriate physical activity is a factor in the prevention of premature death, heart disease, non–insulin-dependent (Type II) diabetes, obesity, some cancers, osteoporosis, osteoarthritis, falls, anxiety, and depression for both women and men [2]. However, as the Surgeon General has reported, women are less likely than men to participate in exercise [2]. Issues of safety, time pressures in women's lives, and the inability of measurement techniques to account for the effect of activities of daily living on women's overall activity level have been identified as factors contributing to this situation [3].

As more is learned about a female-centered approach, it is becoming apparent that recreational physical activity can be a gateway to health promotion for women. One study involving rural midlife women identified participation in physical activity as the predictor of other health-inducing behaviors, such as a nutritious diet or not smoking [4]. Adequate appropriate activity is also associated with reduced health risks, such as fractures or deformities due to low bone mineral density (BMD). High levels of current physical activity are predictive of high levels of BMD in midlife and older women, while low levels of childhood physical activity are associated with low levels of BMD in these women [5]. Physical fitness has a positive influence on well-being. Vigorous activity commenced prior to six weeks postpartum appears to have a favorable impact on a woman's physical and psychological adaptations to motherhood [6]. Because a high level of support from a woman's health care provider is a significant factor in successful lifestyle change [7], the midwife has an important influence on increasing participation by women in health-enhancing physical activities at critical stages in their lives.

Five key times provide opportunities for girls and women to develop effective exercise strategies: (1) adolescence, (2) pregnancy, (3) the postpartum period, (4) menopause, and (5) senescence. These are the key phases during which women undergo dramatic physical and psychological changes—transition points at which a woman can redefine herself. Meaningful activities that enhance prowess and self-image at each critical stage profoundly affect a woman's physical and mental health.

By understanding the impact of exercise on health during these life stages, as well as devising strategies for guiding women toward satisfying activities, the midwife gains important tools for facilitating a woman's progress along a path of healthful living. Participation in physical activity drives other

behaviors that support an active life, such as the desire for nutrient-dense calories or improvements in sleep and mood, as well as reducing the risk of disorders such as Type II diabetes. The health care provider with a formidable grasp of appropriate activity for a patient, the means to support that activity, and the ability to prompt a woman to uncover an internal impetus for activity exerts a powerful positive influence on the women she serves.

Any background knowledge needed for understanding exercise begins with a basic fact of modern life: the postindustrial world has become increasingly sedentary. Despite gains in sanitation and technologies that improve health, processed food and labor-saving devices have contributed to lowered levels of physical activity and an increased incidence of poor nutrition, stress, obesity, heart disease, and cancer. As mechanization and technology have increased productivity, the human body's physiologic adaptations to exertion and restoration—i.e., strength, endurance, range of motion, motor control, and a sense of well-being—became separated from daily living.

Kenneth Cooper's 1968 monograph, Aerobics [8], and Herbert Benson's 1974 article in the journal *Psychiatry* [9] marked a major shift in understanding the discipline of pursuing exercise and relaxation in order to gain beneficial adaptations as separate measurable entities rather than as inherent aspects of living. These two researchers recognized the physical adjustments that occur in work and reflection, studied them, and created descriptive vocabulary comprehensible to Western minds. Since the early 1970s, research in physical fitness and stress reduction has yielded a growing list of health benefits, including benefits for women. While one of the first aspects of women's health to receive major attention was prenatal exercise, interactions of exercise and women's health from the onset of menses through senescence have been documented [10–13].

Understanding the benefits of woman-centered physical fitness and having methods of translating that information into something desirable and accessible to one's clients are reasonable objectives in the midwife's pursuit of knowledge and practice in this area. The remainder of this chapter discusses the information that will help the midwife reach these objectives.

A New Exercise Model for Adolescent Girls

Adolescent girls need information and reassurance about their changing bodies, sexuality, identity, and health status. Midwives are in a unique position to be helpful in this regard. During adolescence, significant nonparent adults play an important role in the process of transforming the emotional attachment to parents into a sense of self with feelings for significant others [14–19]. One study found adults other than parents comprised 22.3 percent of all persons adolescents listed as significant [20], and another study found nonparent adults comprised 27.2 percent of adolescent girls' social networks [21]. While allowing a degree of autonomy from parents, these relationships provide emotional support and advice from an adult [16]. Girls, more often than boys, participate in intergenerational relationships, where alternative female models other than the mother are available for identification or attachment [22]. These types of relationships also cross racial and ethnic lines [23–27]. It is important to note that such relationships are most effective when they occur naturally, as might happen in the case of the midwife, rather than as arranged mentoring [28].

The Impact and Benefits of Exercise

Identity issues, stress management, reproductive issues, eating disorders and obesity, and disease prevention form the major areas in which physical activity can have profound effects upon adolescent females' healthy development. With highly athletic girls, midwives must be alert for signs of female athlete triad, which involves disordered eating, amenorrhea, and bone loss [29, 30], as well as injuries. For girls less inclined to the competitive environment so often associated with sports, helping them increase their level of physical activity or remain adequately active to prevent loss of self-efficacy and the disorders of a sedentary lifestyle may require keeping track of local teen aerobics classes, dance studios, community service programs, or other creative physical activity outlets.

Identity Issues Girls come into sexual maturity in a milieu in which the dominant modern world view is that traits of independence and self-assertion have the greatest value [31]. But girls often value the self more in relation to others. Just at the time when independence and belief in self are most valued, girls look to others for meaning. It appears that the self-esteem of white girls plummets drastically after about age 9 [32]. Participating in vigorous physical activity in adolesence has a positive effect on their self-esteem [33–35]. African-American girls appear less susceptible to falling self-esteem, but they and girls of many ethnic backgrounds benefit psychologically from developing self-efficacy, in part through physical activities [36–39].

How does this transfer to the playing field? Many girls place higher values on the cooperation aspects of games than boys do. Examining play-time activities of fifth graders in the 1970s one researcher found that aggressive legal debates over the rules appeared to be enjoyed by the boys as much as the game itself [40]. Girls, on the other hand, viewed the rules as open to innovation and less significant than keeping harmony among the smaller group. Curiously little has changed in girls' social values when it comes to athletic games since this study. Despite more serious athletics for girls and an easing of access to higher levels of sport for physically gifted, aggressive girls, many female players continue to place value in social support, to stretch the rules to keep the peace, and to be rewarded for nurturing behaviors. For these girls, who often stop exercising during adolescence, the aim is to help them develop an activity model in which fitness is a by-product and dominance is not the goal. A new focus of physical activities can be established: having fun, being with others, helping others, learning new skills, and facilitating aesthetic inclinations [41]. For example, some girls will benefit from volunteering at a veterinary clinic or a nursing home, where physical tasks involve activities that help others, while other girls might enjoy teaching younger children the latest dance steps. Increasingly, fitness professionals are developing programs for adolescent girls that address these matters. The midwife can keep abreast of such community programs and encourage participation by girls at risk of inactivity.

Stress Management Both vigorous physical activity and stress management exercises can provide outlets for the daily hassles and major life changes that adolescents experience. Stress generates tension in the body, which is alleviated during vigorous activity [42–47]. Stress-management exercises can be tailored to this population. Relaxation techniques can be undertaken while sitting in chairs, which is often more socially comfortable for adolescents than lying on the floor. Creative exercises such as theatrical role-playing also allow opportunities to discharge difficult feelings. Girls can be encouraged to participate in expressive or fun tasks, like contributing their own rules to a traditional game, or making a funny version of a favorite workout video. Offering simple choices such as playing basketball or jump rope provides a sense that they have some control of their lives.

Eating Disorders and Obesity A key factor in the relationship between nutrient intake and energy expenditure is balance. In a healthy situation these two things are in balance. Eating disorders combined with high levels of exercise or inactivity can lead to disease. In the current culture, balance is hard to maintain; it is an environment that combines abundant "toxic" food with ideal, unrealistic body images [48, 49]. Data on eating disorders are constantly being reported: 2 percent of the female population is affected by eating disorders; a third of the population is obese [50]; virtually all girls are affected to some degree by disordered eating as part of their maturation process [51].

The connection between chronic, high-volume exercise in girls and women, unhealthy eating behaviors, and suppression of reproductive functions has been noted for some time [52–63]. The incidence of anorexia nervosa in dancers is considered to be between 3.5 and 7.6 percent [64]. Other athletes who may be at risk are runners, swimmers, gymnasts, ice skaters, and cyclists. Athletes whose sport or art requires a lean aesthetic or high doses of endurance activity are at greater risk than those in other activities. While hypoestrogenic states are usually associated with menstrual irregularities in competitive athletes, swimmers are more likely to experience mild hyperandrogenism [65].

Because body fat is positively associated with both insulin and cardiovascular reactivity to exercise, prevention of childhood obesity may be important as a preventive measure for both Type II diabetes and cardiovascular disease [66]. Fasting insulin concentration has been shown to be associated with cardiovascular reactivity to exercise in young children, supporting the hypothesis that the relationship between hyperinsulinemia and hypertension is mediated by sympathetic nervous tone and that the process begins in childhood [66]. Although aerobic exercise favorably affects risk factors in adults, evidence is less clear with children and adolescents. One study demonstrated no significant relationship between cardiovascular fitness and lipid profiles in these age populations [67]. Others did find high levels of body fat related to unfavorable risk factors [68, 69].

Exercise and Disease Prevention Bone health is an area where we have a fairly clear understanding of the connections between physical activity in puberty and adolescence, good nutrition, and strong bones. Peak bone mass probably occurs in the early twenties, with the teen years critical for the attainment of high peak bone mass [70–73]. Athletic amenorrhea [74–76] and nutritional deficits [77, 78] can lead to detrimental bone changes. It appears that weight-bearing exercise and the maintenance of a normal weight in the teen years are the key factors for development of peak bone mass [79].

Premature puberty may signal reproductive endocrine disturbances over time [80]. The resulting exposure to increased estrogen production may be associated with a high degree of breast epithelial proliferation and possible hyperplasia [81]. Intense physical activity in girls has been associated with a lowered risk of reaching menarche at an early age [82]. Women with an ongoing exercise history may have a lowered risk of breast cancer [83], and exercise history often begins in youth. The role of physical activity as a possible primary prevention lies partly in its ability to reduce the risk of early menarche and reduce exposure to ovarian hormones through reduction of the number of ovulatory cycles [84]. Results from large studies that include exercise in adolescence and breast cancer are mixed. Two major studies demonstrate conflicting outcomes. One study looked at 6888 women with breast cancer between the ages of 17 and 74 and 9539 controls ages 18 to 74. Women reporting any strenuous physical activity between the ages of 14 and 22 showed a modest reduction in breast cancer, while those who exercised vigorously at least once a day had a 50 percent reduction in breast cancer [85]. Another study examined the correlation between physical activity and risk of breast cancer in middle-aged women and found only a weak correlation, including no association between any duration or intensity of exercise between the ages of 12 and 21 and risk of breast cancer [86].

Evidence strongly supports the theory that sedentary lifestyles are a major factor in the development of Type II diabetes [87]. Obesity in girls is linked to overweight in women [88] and is, by this association, suspect as a possible marker for Type II diabetes in girls whose parents demonstrate a central adiposity or weight-gain pattern. While information is still forthcoming on the relationship of physical activity in girls in puberty and its effect on Type II diabetes, it has been reported that women 34 to 59 years old who performed vigorous exercise at least once a week had a 16 percent lower risk [89].

Researchers have shown that the mechanism by which obese children receive cardiovascular benefits through regular physical training over a four-month period may be the favorable reduction of the ratio of sympathetic to parasympathetic activity in cardiac autonomic function [90]. It seems clear that exercise will improve fitness in obese adolescent girls [91–93] as well as reduce obesity [94, 95].

Adolescent girls with Type I diabetes represent a special risk, particularly if they show signs of disordered eating. Research has indicated that these girls often skip or underdose themselves with insulin [96]. It is important to help young women with Type I diabetes remain on their insulin regimen and follow the dietary and activity guidelines prescribed to them.

Management of Exercise

Supporting and monitoring physical activity in young women under a midwife's care involves gathering background information, screening for injuries and risks, making referrals to appropriate activity programs, and ongoing assessment of the activity regimen. These steps are easily integrated into the care-giving process:

1. Establish a database
   a. interest and motivation
   b. exercise history and classification
   c. nutritional status
2. Screen
   a. injuries
   b. risk factors
3. Refer to appropriate exercise or activity programs
4. Periodically assess and evaluate the exercise program

Establishing a Database

Interest and Motivation. Initially, it is useful to have knowledge about a girl's interests and background in sports or exercise, in addition to her health and nutritional status. Although her interests may be evolving, understanding her talent and skills helps to tap her existing beliefs about what she can do [97, 98]. Asking about motivations—finding out whether a girl is interested in skill acquisition, helping others, aesthetic or expressive concerns—gives the midwife clues about providing support and enthusiasm if a girl joins a particular program.

In some cases, demographic information may also be helpful [99–103]. Demographics and motivations can often intersect: for example, in Hawaiian culture girls learn values that include many subtle types of helping and community building, which are important motivators for this population [104]. Being effective with this group means respecting these subtleties and proposing projects that fulfill specific aspects of helping others.

Exercise History and Classification. Determining the type and amount of physical activity in which a given patient is currently involved will provide information about half of the equation on balancing energy output and intake. Direct questions can be used. For example, the midwife might ask which sports or activities a girl participates in and how often. She can also use established physical activity questionnaires to quantify the amount of activity [105–113]. Or more indirect methods can be used, such as following through on more general questions about interests. On the basis of the information obtained, the activity levels of girls might be categorized as one of the following:

1. *Inactive or sedentary:* no exercise and little or no physical activity such as walking or low-intensity activities of daily living.
2. *Low activity level:* low-intensity activities such as painting or drawing, singing, working at a service or retail store; low-intensity daily activities such as making the bed, loading the dishwasher; one or two 30-minute low-intensity exercise sessions per week, such as yoga or stretching; walking to and from school—five minutes each way.
3. *Moderate activity level:* moderate-intensity sports such as cheerleading or drill team; moderate-intensity activities of daily living such as vacuuming or yardwork; three or more 30-minute moderate activities per week, such as vigorous play with young siblings, step aerobics, jogging, or cheerleading; brisk walking to and from school—ten minutes each way.
4. *Athlete or dancer:* regular, near daily moderate- to high-intensity physical activity; playing on a school or community sports team, dancing with a dance company, or participating in four or more hours of aerobics per week.

Nutritional Status. Asking a girl to keep a food diary for several days provides information about the second half of the equation for balancing energy intake and output. The situation is in hand if there is an energy balance: the girl falls into the second, third, or fourth exercise classification; she is in a normal weight range and not unhappy about her size; and no problems arise in her primary health care history. If she is under- or overweight, or if she is unhappy (realistically or otherwise) with her size, or the primary care exam determines a problem like insulin resistance or amenorrhea, intervention is indicated. If there are signs of an eating disorder, referral to an appropriate professional specializing in these matters is appropriate. If a girl needs to increase or reduce her activity level, referral to a special teen program or a fitness professional may be helpful. In the case of a low activity level or inactivity and high food intake, increasing energy output by increasing the intensity, duration, and/or frequency of activity is recommended, whether or not food intake needs to be reduced.

Screening

Injuries. When an active girl presents with injury or chronic discomfort, and the health history rules out an underlying cause, she needs to be seen by a pediatric orthopedist. To play varsity sports, most schools require students be screened by a primary care provider for injury and health risks. In this case, it is helpful to be aware of the types of injuries that prevail in girls' sports. There are forms that are used for injury screening and inventory [114–117]. Major injuries and upper–body injuries are most likely in football and baseball—sports girls rarely play—with the greatest number of injuries occurring in football [118, 119]. While absolute numbers of sports-related injuries in high school students are higher in males, research suggests that basketball and soccer may have the greatest injury rates for adolescent girls, and higher rates for girls than for boys [118–121]. Knee injuries and anterior cruciate ligament (ACL) surgeries appear to be higher for girls than for boys in these sports or for girls in other sports [118, 122]. Other lower-limb and spinal injuries are distributed among both boys' and girls' sports at much lower rates.

Risk Factors. The health history will help in determining if a girl is at risk for various diseases and disorders. In addition, her energy equation should be evaluated. Girls at risk of obesity may also be at risk for the associated cascade of metabolic disorders, including diabetes, heart disease, and some cancers. Underweight girls are at risk for infertility and bone loss.

Referral to Appropriate Exercise or Activity Programs

The transformation of information about physical activity in a given population into practical, effective, real-world programs is the province of exercise professionals. There are also personal trainers qualified to work one-on-one with adolescent girls. Once a girl's database has been established, if she is not readily able to participate in school or community-based programs, such a specialist may be useful in developing a physical activity strategy. If this step is beyond her emotional or financial capacity, it may fall to the midwife to assist a girl in developing an effective plan.

A productive strategy might start with a simple homework assignment to help educate a girl about what it means to live a healthy life, including participation in physical activity. When females learn how to generate health, they pass this information on to their families and communities. In the United States, it is clear that commercial enterprises are aware of this phenomenon, because they point health-related advertising toward women. When developing nations spend more money educating girls than boys, this produces a higher rate of return in the following ways: Birthrates drop, infant mortality drops, maternal mortality drops, overall health increases, the incidence of AIDS drops, more women enter the workforce, wages increase 10 to 20 percent for each additional year of school, educated mothers are more likely to have educated children, and all of these factors contribute to a stronger economy [123]. Using an educational tool such as the Health Activity Survey in Figure 9-1 allows a girl to see

Healthy Activity Survey

Name: Date:

Ask your classmates, friends, and family about their health behavior. Get someone's signature for each item below.

Someone who . . .

1. Drinks 8 glasses or more of water, juice, and/or milk each day:

2. Walks at least 20 to 30 minutes almost every day:

3. Brushes her/his teeth at least twice a day:

4. Eats 5 fruits and vegetables a day:

5. Has never smoked cigarettes or quit smoking more than 2 years ago:

6. Gets 8 hours of sleep almost every night:

7. Exercises vigorously at least 3 days per week:

8. Practices relaxation, meditation, or stress management:

9. Does not do drugs or alcohol, and does not practice unsafe sex:

10. Has regular health checkups:

FIGURE 9-1 Healthy activity survey.

what constitutes healthy behaviors and who among her acquaintances is making healthy choices.

Some girls have greatly benefited from the cultural and political context that has allowed them to run the marathon and pole-vault in the Olympics, or become professional basketball and soccer players. However, for most girls the focus of physical activity needs to shift from developmental tasks primarily associated with adolescent males—learning dominance—to the developmental tasks of adolescent females—emphasizing expression, functional acts, and biomechanics based on balance rather than overcoming resistance. With the assistance of a midwife, a girl can create her own fitness program, chart her own progress, and determine her own standard of success.

Periodically Assessing and Evaluating the Exercise Program As a regular part of the physical examination and health history updating, the midwife can talk with her young clients about their exercise levels and satisfaction with the activities in which they are engaged. If interest wanes, it may be helpful to start again by asking about evolving interests and motivations. Getting back to the original regimen may not be the answer. Going in a new direction may be in order. It cannot be assumed that a woman will want or need to do the same activities as she passes from one phase to another—although she may come back to the activities of her youth later in her life.

Appropriate Exercise during Pregnancy

It has been estimated that at least 1.5 million pregnant women participate in physical activity each year [124, 125], with a fair number of these involved in moderate- to high-intensity sustained cardiovascular exercise [126, 127]. A range of activities are reported—from walking and yoga to swimming, running, and aerobic dancing [124]. During a well-designed moderate- to high-intensity exercise program, the ability of the body to deliver and use oxygen and to move with endurance, strength, elasticity, balance, coordination, and efficiency improves. As a result of these training effects, the body is not stressed as much when working at a lower intensity. This is a considerable benefit in sustaining low- to moderate-intensity long-distance endurance activities such as pregnancy, labor, birth, and nursing, and in delivering oxygen and nutrients to the fetus.

The Impact and Benefits of Exercise in Pregnancy

The countless dramatic physiological adaptations that occur during pregnancy are perceived by the body as work. In response to the demands of the developing fetus, the body increases blood volume, raises the maternal heart rate, increases stroke volume, strengthens the heart muscle, and increases vasculature. These adaptations—protective mechanisms to ensure that the fetus is supplied with necessary nutrients—are also observed over time in the body's response to sustained exercise, athletics, and dance, which are also perceived by the body as work.

Research supports the view that maternal adaptations of pregnancy—including adjustments in cardiovasculature and hemodynamics, fetal responses, metabolism, acid-base balance, thermoregulation, respiration, and biomechanics—can be enhanced by regular moderate exercise without fetal detriment, providing there is no uteroplacental insufficiency or life-threatening disorder [128–131]. Physically active women also have significantly greater blood volumes and vasculature than sedentary women, as well as improved heart function, cardiac output, and aerobic training effects. These factors, along with favorable changes in blood pressure, hemoglobin concentration, and placental function, augment oxygen and nutrient delivery in a healthy pregnant woman who continues exercising throughout her pregnancy. It appears that initiation of a moderate exercise regimen in early pregnancy also produces favorable adjustments.

Cardiovasculature and Hemodynamics Studies have demonstrated that aerobic exercise during the first and second trimesters enhances placental volume and function in women who continue vigorous exercise into and through pregnancy [132, 133], and that those who commence moderate-intensity exercise three to five times a week at eight weeks' gestation benefit from enhanced feto-placental volume and function [134]. Previously sedentary women benefit from aerobic conditioning, showing increases in maximal aerobic power and submaximal duration, and preservation of anaerobic working capacity in late gestation [135], all of which are valuable assets during the prolonged, low-intensity endurance test of the first stage of labor followed by the strength test of the second stage.

Strength training, while not extensively studied, also appears to be well-tolerated by pregnant women and their fetuses, providing they avoid the Valsalva maneuver, extreme muscle fatigue, or long stretches

of time in positions that may lead to orthostatic hypotensive syndromes, such as the supine position after the fourth month, and standing for long periods or doing leg presses in the inclined (semirecumbent) position in the last trimester [128, 136].

Hypotensive Syndromes. Detrimental hypotensive syndromes can result from the relaxation of vasculature with pregnancy. Placement of the uterus in relationship to the vena cava, the size and weight of the uterus, and the proportions of the woman are factors in this condition. In the third trimester, cardiac output while standing is reduced by approximately 18 percent from a side-lying position; thus standing without moving for long periods of time is particularly dangerous. Similarly but less dramatically, in the static supine position cardiac output is reduced by approximately 9 percent in the second and third trimesters. This effect has stirred a controversy about the advisability of strength exercises in the supine position [128, 137, 138]. It is important to note that no detriment has been reported despite theoretical considerations. During supine exercise, the woman is moving and generally remains on her back for only a few minutes at any one time. Pregnant women have sharp protective instincts concerning movements with which they are not comfortable or of which they are fearful. In practice, approximately one woman in 30 will decline to perform exercises in this position [139].

While exercising in an upright, weight-bearing alignment, the pregnant woman may find blood pooling in her fingers or lower legs after 15 to 20 minutes of sustained aerobic work. It is very important to use a cooldown that includes repeated contractions of proximal muscles—that is, deep muscles close to the core of the body, such as those controlling movement and position in the iliofemoral joint, spine, abdomen, thorax, and shoulder girdle—in order to drive the blood back toward the heart and gut. To avoid the possibility of hypotensive syndromes resulting from relaxation of vasculature, the following modifications are recommended for exercise during pregnancy:

1. Limit supine exercise to two or three minutes and perform them prior to aerobic exercise or cardiovascular conditioning activities. Avoid supine position in late pregnancy. There are many creative alternatives to exercises ordinarily done in the supine position and they should be employed after the first trimester.
2. Limit aerobic exercise duration on the feet at any one time to 20 to 30 minutes for less fit women and 30 to 45 minutes for more fit women.
3. Avoid sudden changes of position or level (e.g., sitting up quickly after lying down).
4. Include a thorough cooldown to prevent pooling of blood in the extremities.
5. Rest daily in the side-lying position to maximize blood flow during the second and third trimesters.

Hypertensive Disorders. The occurrence of hypertensive disorders in pregnancy was traditionally considered a contraindication for exercise. However, regular moderate exercise continued into and through pregnancy, or commenced early enough in pregnancy, provides some protection. The ability of exercise to improve antioxidant processes, lipid metabolism, and sympathetic nervous system regulation of vascular responses provides the basis for this protection [140, 141]. Because maternal hypercholesterolemia has a downstream effect on offspring atherogenesis and vascular dysfunction [141], exercise is helpful both to mother and fetus and avoids undesirable side effects that may be incurred with pharmaceutical interventions.

A prospective study published in 2000 examining the effect of exercise on blood pressure in pregnant women with risk factors for hypertension in pregnancy found that following 10 weeks (18–28 weeks' gestation) of exercise at a rate of perceived exertion (RPE) of 13 on a scale of 6 to 20, or *somewhat hard*, there was a strong trend in the exercise group for lowered diastolic blood pressure among pregnant women at risk for hypertensive disorders [142]. The exercise sessions lasted for 30 minutes three times per week. The RPE was moderate and resulted in a mean metabolic equivalent (MET) level for the exercise of 4.7, with a standard deviation of 0.8. One MET equals 3.5 ml O_2/kg/min. The more METs a woman can tolerate, the greater her functional capacity (FC), or ability to metabolize oxygen and recover rapidly. The FC rate improves with regular, sustained exercise as it enhances cardiovascular and hemodynamic parameters.

The complex of biological and psychosocial factors that can contribute to hypertensive disorders makes exercise an interesting topic for study in this regard. Are the physical changes induced by exercise the only factors that could influence the development of these disorders? Could group fitness activities that provide social support and stress management techniques also be factors in reducing the incidence or severity of hypertensive disorders?

Uteroplacental Blood Flow. In the 1970s and early 1980s the question of diversion of maternal blood flow away from the uterus to the skeletal muscles gave rise to an extremely conservative view of exercise in pregnancy. Animal research, conducted primarily on sheep, raised the question of how much could the blood flow be diverted in humans before any detriment occurred, when in animals it was considered to be about 50 percent [143, 144]. It is thought that in moderate recreational exercise, the diversion is approximately 50 percent and in competition can be 70 to 80 percent. There is no documentation of detrimental fetal outcomes in women who participate in regular moderate- to high-intensity exercise on the basis of uterine perfusion. The primary reason for this lack of detrimental fetal outcome is probably the feto-protective combination of increased blood plasma due to both the aerobic training effect and pregnancy [129, 145, 146]. This over-expansion reduces the fall in visceral blood flow and helps maintain fetal substrate delivery during exercise. The increased hematocrit associated with exercise, as well as enhancements of placental function in fit women, also help account for the ability of the cardiovascular system to deliver needed nutrients [129, 147].

Since the mid-1980s, research has continued to evaluate the effects of exercise on uterine blood flow in human subjects. Using Doppler echocardiogram technology, investigators have looked at both the systolic to diastolic (S/D) ratio and the pulsatility index (PI) of the uterine arteries during bicycle and aerobic dance exercise with mixed results [148–153]. There continues to be no documentation of detrimental fetal outcomes in healthy women who participate in regular moderate- to high-intensity exercise. One study reports fetal cerebral vasodilation induced by submaximal exercise [154], which the authors speculate could be due to moderate fetal hemoglobin desaturation. However, they report no significant alteration in uterine profusion. Another study tested the hypothesis that pregnancy increases portal vein blood flow, and regular exercise during pregnancy limits the shunting of blood flow away from the uterus in response to gravity (i.e., standing) or exercise-induced hemodynamic stress. The researchers concluded that portal vein flow increases significantly during pregnancy and that exercise training in mid- and late pregnancy reduced the shunting of blood flow away from the uterus during exercise and improved recovery at five minutes post exercise [155].

Deconditioning. Individuals placed on bedrest rapidly become deconditioned, by as much as 25 percent in three weeks [156]. It is important to keep this in mind with women who must rest in bed or reduce their level of activity during the first trimester, near the end of their pregnancy, or postpartum. Following bedrest, reconditioning is slow but steady, whether the individual is returning to exercise or simply to the activities of daily living. Regaining a previous state of fitness takes longer than the deconditioning process [156] in the nonpregnant population. Cardiovascular enhancements of pregnancy may alter this formula in the pregnant population, but no specific data are available and a conservative approach is wise.

Recently, the efficacy of prolonged hospital bedrest has been called into question for conditions such as premature rupture of membranes (PROM), premature labor, and intrauterine growth restriction (IUGR) [157]. While the major detriment is maternal muscle atrophy, lower birth weight among infants of mothers on prolonged bedrest than those of mothers who are returned to daily activities has been observed for these conditions [157]. Women placed on bedrest for at least 20 hours per day for three weeks or more described a high level of physical, emotional, familial, and economic hardship resulting from the experience [158]. A clue regarding the negative effects of bedrest may be found in two studies conducted on rats. These indicate that when cardiovascular conditioning has occurred pre-pregnancy, cessation of exercise during early pregnancy negatively affects offspring viability [159, 160].

Fetal Responses Many mechanisms that protect the fetus are at work during pregnancy. Although it might seem counterintuitive, it appears that some mechanisms of vigorous exercise also protect the fetus. Maternal cardiovasculature, thermoregulation, metabolism, and respiratory responses seem to enhance the environment in which the fetus grows. The fetus itself appears to adapt to exercise through its own mechanisms.

Fetal Cardiovasculature and Hemodynamics. The fetal heart rate normally accelerates but maintains variability during and after maternal exercise [126, 161–167]. Gestational age and exercise type, intensity, and duration influence the extent of change in fetal heart rate during and following exercise. Accelerations of a few beats to 20 beats per minute for periods up to 30 to 90 minutes following the exercise session are not uncommon. In healthy pregnancies, reports of

greater increases in fetal heart rate (and maternal temperature) after higher intensity or longer duration have been noted without adverse fetal heart changes [168]. One study reports "signs of transient fetal impairment" including adverse fetal heart and movement changes after very heavy exercise [169]. However, this study demonstrates a difference in interpretation of exercise levels from the findings of other studies. Transient fetal bradycardia may occur occasionally in maximal exertion, but no ill effects are reported as a result [170]. Two studies documented fetal bradycardia, but both involved untrained women in rapidly progressing cycle ergometry near maximal capacity, suggesting the potential for fetal hypoxia in the unconditioned population during acute strenuous exertion [126, 171]. Another study found slight fetal cerebral vasodilation in submaximal maternal exercise, which could be due to fetal hemoglobin desaturation, although there was no significant alteration in uterine perfusion [154]. Another study—involving mothers with high trait anxiety scores—found significantly higher PI values in the umbilical artery, significantly lower PI values in the fetal middle cerebral artery, and significantly lower cerebro-umbilical PI ratios, suggesting a shift in blood distribution in favor of the fetal brain in these mothers [172].

Placental Function and Birth Weight. The frequency, intensity, and duration of physical activity in which a woman engages and at what level during the final months of gestation may have a profound effect on birth weight, with continuing high-intensity exercisers producing infants with low body-fat levels that account for the reduced birth weight (as opposed to small-for-gestational-age structure and weight). Women who reduce or cease exercise during the final months may produce higher weight infants because placental function has been well established and the fetus has little competition for nutrients during the restriction in exercise level.

Fetal Movement. Studies on fetal body or breathing movements have found changes to be small, inconsistent, and transient [162, 166, 167]. In practice, during group exercise classes mothers seem to be most aware of fetal movement during relaxation, at which time they frequently report high levels of activity, or during strength and flexibility activities. There are no reports in the literature of detrimental fetal outcomes in this regard. There is one report that fetuses of mothers with relatively high trait anxiety spent significantly more time in quiet sleep and had less gross body movement when in active sleep during the last few weeks of gestation than fetuses of mothers with low trait anxiety [173]. The level of recreational physical activity in these mothers was not tracked. Since there is a relationship between physical activity and trait anxiety (see the discussion below on stress and childbearing), it could be of interest to know if fetal movement is also affected by exercise in women with high trait anxiety.

Thermoregulation An early theoretical consideration of researchers was the possibility of detrimental teratogenic effects due to elevated core body temperatures associated with moderate- to high-intensity aerobic exercise. The risk of neural tube defects during the first trimester owing to this effect was considered grave. The first set of conservative exercise guidelines issued by the American College of Obstetricians and Gynecologists reflects concern over this matter [174]. Exposure to elevated temperatures—such as a hot tub—in early pregnancy has been shown to have detrimental effects [175, 176]. However, no evidence of this phenomenon in association with exercise has been forthcoming [177]. Research in this area [178, 179] has yielded the following considerations:

1. Core temperature falls in the early stages of exercise during pregnancy, in part due to high blood volume to carry off heat.
2. Pregnant women begin to perspire more rapidly than nonpregnant women.
3. Greater skin area and increased vasculature allow added evaporation surface to promote cooling.
4. Pregnancy-induced increased ventilation promotes cooling.
5. Habitual exercisers' regulation of internal temperature is enhanced.

A paramount concern during maternal exercise is hydration. The availability of water to contribute to the cooling process and to ensure adequate blood expansion is a fundamental principle that must be emphasized. Prior to participating in an exercise session, pregnant women should drink four to eight ounces of water, and they should drink two to four ounces every 20 to 30 minutes thereafter. The importance of consuming at least two quarts of water or other hydrating fluids per day cannot be overemphasized. Up to twice this amount may be needed at high elevations. Very active women should be en-

couraged to drink water until their urine is clear. During hot, humid weather, exercise should take place only in a cooled or air-conditioned room.

Metabolism Two major physiological priorities in pregnancy are the nourishment and protection of the fetus. It thus makes sense that human development includes a complex glycemic response that encourages storage of nutrients as fat and diversion of energy supplies from the mother to the fetus. The maternal endocrine system is in a state of chronic metabolic stress. An increased need to deliver fuel combined with hormonal actions that rapidly deplete available fuel creates a situation of large fluctuations between postprandial and fasting blood glucose levels [180].

Gestational Diabetes. The incidence of pregnant women with gestational diabetes mellitus depends upon the criteria used to screen for this disorder; reports range from 1.4 to 12.3 percent [181]. Physiologically, there is good reason to view exercise as an effective method for prevention and management of gestational diabetes. During pregnancy, there is an increased presence of hormones that have a diabetogenic effect, including estrogen, progesterone, cortisol, prolactin, and human chorionic somatomammotropin (HCS) [182]. Exercising muscles, on the other hand, participate in contraction-stimulated glucose transport, while other factors such as catecholamines, corticosteroids, and thyroid and growth hormones also affect this transport [182]. Following exercise, glucose tolerance temporarily increases, the length of time depending on insulin and contractile activity [183]. Benefits to a woman with gestational diabetes are most likely derived from insulin receptor regulation and improved insulin sensitivity that occurs post-exercise [184–186], as well as a decrease in glucose-stimulated levels of serum insulin [187], which happens in the nonpregnant population. The effects of exercise are associated with improved functions of carbohydrate and lipid metabolism. Consequently, exercise is being used as an adjunct treatment for both diabetes and obesity. This protection extends to pregnancy as well [188,189], and both the Second and Third International Workshop-Conference on Gestational Diabetes Mellitus endorsed the concept of pregnant diabetic women pursuing an active lifestyle under medical supervision [190, 191]. The management of gestational diabetes through nutrition and exercise is well accepted [192, 193].

Weight Gain and Obesity. Healthy, fit women who continued regular sustained recreational exercise throughout pregnancy at any level above a baseline for cardiovascular conditioning gained less weight and deposited less subcutaneous fat than women who stopped exercising, but this effect was limited to the latter portion of pregnancy [194]. Women who were fit prior to pregnancy and ceased exercise, or dropped their amount of exercise below conditioning levels during pregnancy, had increased weight gain and subcutaneous fat deposition. This effect may reflect excessive calorie intake on their part rather than any nutritional inadequacies in the exercising group [194–197].

As our ability to uncover metabolic markers and genetic predispositions increases, we are better able to specify which clients are at risk for excess weight gain and the extent to which exercise can mitigate this outcome. Researchers looking at two metabolic markers (tumor necrosis factor alpha and leptin) that reflect changes in fat mass and insulin resistance concluded that regular weight-bearing exercise during pregnancy suppresses the pregnancy-associated increases in both of these markers that indicate increases in body fat and insulin resistance [198]. It has been noted that first-time mothers of the G protein beta3 subunit 825 TT genotype are at high risk of obesity and post-pregnancy weight retention if they do not exercise regularly, because this is an energy-thrifty genotype [199].

Stress and Childbearing. In practice, prenatal exercise instructors encounter the question of the extent to which exercise has a salubrious effect on stress or anxiety during pregnancy. There is a relationship between the mediation of stress by corticotropin-releasing hormone (CRH) and opioid peptides, and the effect of stress on disturbed reproductive function—disrupted menstruation, parturition, and lactation—via increases in corticotropin and beta-endorphin, and their ability to inhibit gonadotropins and oxytocin [200, 201]. During labor, corticotropin and beta-endorphin are found at levels exhibited by athletes during maximal exercise; in addition, the placenta produces increasing amounts of CRH toward the end of pregnancy, signaling that the placenta may be involved in adaptive stress mechanisms to help mother and fetus withstand the stress of labor [200].

How exercise influences this equation is unknown, although it would seem theoretically possible that exercise helps mediate the stress of labor. In

a small sample, researchers found the responses of stress hormones and placental steroids in late pregnancy exercisers to be similar to those of nonpregnant exercisers [202]. Although the researchers found some incidence of uterine contractions brought on by increased levels of norepinephrine, the increase in epinephrine mitigates this effect and regular contractions did not start in any subjects [202]. Another study found that women who participated in recreational activities had a decreased risk of spontaneous preterm birth [203].

Another exercise factor that might mitigate stress is a group exercise setting. Clearly, social support is a valuable tool in the effort to avoid low maternal weight gain, premature birth, and low birth weight that may result from, or be exacerbated by, anxiety, stress, or life tensions [204–212]. Women who participate in well-run group prenatal exercise programs report that the group support is at least as important to their well-being as the actual exercise component [213].

One uncontrolled study compared exercise modalities and found different results depending upon the conditions under which the exercise took place. As a result of their findings, the researchers suggest that for exercise to reduce stress it must be enjoyable, aerobic, devoid of competition, predictable, and repetitive [214]. The release of stress hormones during exercise is related to both intensity and psychotropic effects. During the ergotropic (fight or flight) response, increased levels of norepinephrine contribute to uterine irritability. This response is often present in competitive exercise situations. In practice, we have found that, during periods of rapid uterine growth (often in weeks 24 to 34), it is helpful to avoid work or exercise environments in which the ergotropic response is activated.

Relaxation. By contrast, the trophotropic—or relaxation—response is marked by an organizing alpha brain wave, leading to a sense of calm alertness and a reduction in stress response [9]. Athletes who develop the capacity to remain relaxed during strenuous work by using an associative mental focus are at less risk for injury [215]. This has profound implications for the design of prenatal exercise activities. Midwives can help women avoid inappropriate activities by inquiring into the prevailing attitude toward exercise in women's classes or workout sessions: Is the setting flexible and conducive to teamwork and support, or is it competitive and tension-filled?

Immune System Responses. Women are more susceptible than men to all of the diseases of the immune system. The impact of gonadal hormones on immunologic function appears to be mediated through special receptors [216]. Findings show that estrogen stimulates transcriptional regulation of the CRH gene, which is the likely source of sex differences in immune/inflammatory reactions and the prevalence of autoimmune disorders in women [217]. CRH coordinates the stress response and immune/inflammatory reaction [218]. In pregnancy, the intensity of immune responses is blunted [219–221]. During the secretory phase of the menstrual cycle, progesterone fosters the production of immunological suppressor substances by the proliferative endometrium, without affecting the secretory endometrium during the time that implantation might occur [222]. Natural killer (NK) cell activity is depressed just prior to ovulation [223]. These and other mechanisms are responsible for a complex relationship between sex hormones and immune function. Theoretically, the female body would have the ability to depress immune function in order to tolerate the presence of foreign DNA belonging to the fetus. Unfortunately, the price appears to be an increased susceptibility to autoimmune disorders. The relationship between exercise and immune function in the nonpregnant population is itself a new subject about which little is known, although adequate activity appears to have positive effects. How exercise in pregnancy might affect a woman's immune system is an interesting question that will require longitudinal data.

Energy Needs and Nutrition. Both pregnancy and exercise require additional energy beyond normal levels. Standard assessment of additional nutritional needs during pregnancy is about 300 kcal, with 30 grams (120 calories) of protein per baby. How many extra calories are required beyond that for exercise will depend on the activity level of the woman.

A regular supply of simple and complex carbohydrates (fruits, vegetables, grains) with a protein complement (milk, meat, poultry, fish, nuts, and legumes in combination) is essential. A good rule of thumb for exercising women is to take in 200 to 300 kcal every two to three hours—depending upon gestational stage, size of the mother, and level of activity—and to eat a wide variety of foods. Approximately 70 to 90 grams of protein per day for a single baby, spread among the various meals, is essential, along with a minimum of two quarts of water to maintain an adequate blood supply.

Women should eat high-quality fats, such as olive or canola oil, avocados, nuts, and seeds, and avoid saturated fats and fast foods.

Careful attention to fatigue when exercising is critical. Women should stop exercising at the point of muscle fatigue, and not begin exercise when fatigued. Watered juice or sports drinks can be taken during the workout. Alternating cycles of activity, nutrition and side-lying rest/relaxation are beneficial as this allows the body systems time to complete metabolic processes and maximize circulation.

Respiration and Acid-Base Balance Ventilation and ventilatory responses to exercise are affected by pregnancy. Although some of the mechanisms are understood and their effects have been validated, there continue to be questions regarding the various responses. One key issue is whether the collection of data that compares pregnant with nonpregnant exercisers, or data comparing pregnant exercisers with themselves postpartum, produces a more accurate picture of the situation. Furthermore, there is a question of when postpartum comparisons should be made in order to reflect true values.

Another issue is the effect of conditioning on exercise test responses. The total effect of changes in ventilation due to pregnancy is generally considered to be a decrease in oxygen availability for aerobic activity and a lowering of the level of onset of blood lactate accumulation. However, in fit women, including those who become fit in the course of the pregnancy, maximal aerobic power and the capacity for sustained submaximal exercise is greater than in nonexercising pregnant women [135]. Regular exercise also contributes to the preservation of anaerobic working capacity in late gestation [135], clearly a desirable attribute for the second stage of labor. When comparing physically active pregnant women (mean gestational age 33 weeks) with nonpregnant controls, researchers found that the pregnant group had reduced PCO_2 and weak acid concentrations, which are important mechanisms to regulate hemoglobin concentration and maintain a less acidic plasma environment at rest and after exercise in late gestation, compared with nonpregnancy [224]. Additional research has found that cardiovascular conditioning reduces both ventilatory demand and respiratory perception of effort in late gestation [225].

The practical reality of pregnancy is that breathing is affected at two points. Toward the end of the first trimester many women experience an uncomfortable tendency to hyperventilate resulting from the effects of increasing levels of progesterone as the placenta takes over from the corpus luteum as the primary progesterone producer, affecting the respiratory control center in the medulla oblongata [226]. This increase is tied to lowering levels of carbon dioxide and increasing oxygen levels that benefit the fetus. The increased metabolic activity in pregnancy causes an increase in carbon dioxide levels. Hyperventilating lowers the carbon dioxide level. As pregnancy progresses, the upward growth of the uterus puts pressure on the diaphragm. There is some widening of the rib cage, and the total effect is a reduction in functional residual volume. This may cause a sense of labored breathing and a tendency to hyperventilate in response. Both of these breathing difficulties fall under the heading of *dyspnea*. Even women who are very fit may experience these sensations. To alleviate the symptoms, women should breathe slowly and deeply, taking advantage of intercostal expansion, and slow down if they are exercising.

Biomechanics The potential for damage in pregnancy and the postpartum period to a woman's neuro-musculo-skeletal structure is great. Shifts in the center of gravity (COG) forward and slightly up destabilize her posture and realign the carriage of weights and forces through her joints, predisposing nerves, muscles, bones, and connective tissues to damage. Increased levels of relaxin and elastin further aggravate this situation.

In the antepartal period, changes in posture occur gradually and can be responsible for a great many discomforts over the course of the pregnancy. Women can relieve these structural stresses by doing the following:

1. strengthening muscles that are overstretched (hamstrings, gluteals, abdominals, and upper back)
2. stretching muscles that are shortened (psoas, low back, and chest)
3. engaging in centering activities that promote efficient alignment
4. resting in the side-lying position when muscle fatigue occurs

The brain receives a continuous supply of afferent information about the shifting postural dynamic and eventually accepts the altered arrangement and balance of body segments. This process involves feedback from cutaneous, joint, and muscle receptors. By the end of pregnancy, the brain has reconfigured its image of the body in balance.

Pregnant women are particularly subject to nerve compression syndromes, such as carpal tunnel syndrome and piriformis muscle impingement of the sciatic nerve. Methods to alleviate these problems during exercise include stabilizing and elevating the affected part, avoiding weight-bearing on the affected part, and avoiding extreme range of motion. During relaxation, it is also useful to focus on releasing the muscles surrounding the joints in the region of the insertion of affected nerves into the spine—i.e., upper back, chest and shoulder for carpal tunnel syndrome, or sacroiliac and posterior iliofemoral joints for sciatica.

Strength work and stretching help alleviate discomforts due to joint stress and instability. Striking a balance between strength and elasticity among the muscles that control a given joint tends to balance and protect the joint. Physical balance is one of the components of centering. When the joints are balanced, the neuromusculature is less busy with remaining upright than when misalignment or unbalanced muscle development places demands on the superficial skeletal muscles to help maintain the body upright as well as to cause movement in space. Instead, when joints are balanced, incipient contractions of deep muscle fibers nearest the joint centers are the primary righting mechanism.

When balanced, relaxed, and able to breathe deeply, a person is centered. Movement or behavior goals are easily and efficiently achieved as there is less physiological stress within the system to claim the brain's attention [227–229].

Psychophysiological Responses The physical gains in strength, endurance, flexibility, and motor control that accrue through exercise, coupled with associated gains in self-awareness, confidence, mental discipline, and attention to healthy behavior (good hydration and nutrition, avoidance of smoking or drugs), predictably result in physiologically enhanced function. These attributes also accrue in the childbearing period. In addition, persons who participate in regular exercise, athletics, or dance demonstrate psychophysiological adaptations, including a sense of well-being [230, 231] and relief from discomfort [232–235]. Women participating in regular exercise throughout their pregnancies report lower levels of perceived exertion during pregnancy and labor, experience less discomfort, and recover more quickly than those who do not exercise or stop exercising during pregnancy [11].

The question of whether and how physical fitness affects a woman's perception of pain and might therefore alter her tolerance for pain in labor is an interesting and complex issue. It appears that the level of beta-endorphins—or endogenous painkillers—in the blood, while stimulated by the aerobic component of exercise, is primarily connected to fatigue, discomfort, and/or anaerobic activity [236] and that improved aerobic capacity does not lead to improved performance of psychological tasks [237]. Clearly, components of exercise other than aerobic fitness play fundamental roles in the capacity of the exerciser, athlete, or dancer to deal mentally with what is commonly perceived as pain. A survey published in 1978 sheds light on how the ability to deal with pain in a constructive way may work. In comparing average marathon runners with exceptional marathon runners, W. P. Morgan discovered that the average runners tend to dissociate from their bodies, while the exceptional runners tend to associate with their body sensations except in situations where the end was well within sight or there was no other successful strategy than dissociation [215]. The average marathoners created elaborate schemes (such as designing and constructing buildings) for distracting themselves from discomfort, often fearing *the wall*—the 20-mile mark in the 26-mile race where many runners experience severe distress. The exceptional runners, on the other hand, claimed the wall was a myth and only happens if you are not paying attention to your body, monitoring discomfort, staying relaxed, and making necessary adjustments in your form.

What one person might call a *pain*, a highly skilled athlete or dancer might call a *tight spot* or *tense area*, and make some adjustment in form to relieve the discomfort. This capacity to sense, compute, and modify movement is an aspect of the phenomenon of *attention* [238]. By directing attention to goals of being relaxed, fluid, balanced, and achieving the desired movement (such as releasing a baby from one's body), it is possible to acquire the kind of mentation that promotes ease of movement even under difficult circumstances [227, 239–241]. Research into women's views of fulfillment in the birth process supports the theory that sensation associated with difficult but purposive physical events may bear the title *pain* but has a different emotional content than pain associated with nonvoluntary body trauma [242].

Pregnancy and Birth Outcomes Associated with Exercise

There is no evidence that exercise contributes to congenital anomalies, spontaneous abortion,

abruptio placentae, intrauterine growth restriction (IUGR), pregnancy-induced hypertension (PIH), or fetal demise [129, 243]. Rather, there may be a slight protective factor for some of these conditions [143]. Evidence also suggests that heart rate abnormalities, cord entanglement, and the presence of meconium are significantly reduced for babies of exercising women [129, 143]. In addition, while there is no increase in gestations of fewer than 260 days, there may be fewer postdate gestations [37, 38]. The incidence of low Apgar scores is reduced among infants of exercising mothers, there is no indication of long-term neurological or physical deficit [143, 244, 245], and research indicates some psychomotor enhancement for these infants [143].

Those who engage in vigorous exercise require less intervention in labor—including a substantially decreased rate of cesarean birth—and may have shorter active phases of the first stage and shorter second stages of labor than nonexercisers [129, 245–247], according to studies in the late 1980s and 1990s. A study released in 2000 concerning aerobic exercise participation during the first two trimesters and type of delivery in first-time mothers demonstrated that sedentary women were 4.5 times as likely as exercising mothers to deliver by cesarean [248].

Pregnant Adolescents and Exercise

Only one study has directly addressed exercise in pregnant adolescents. This research examined the effects of a six-week aerobic exercise program and found that the exercise group had a significant decrease in depressive symptoms over time and and an increase in total self-esteem, while the nonexercising group reported a significant increase in physical discomforts associated with pregnancy [249]. The study's author concluded that aerobic activity should be viewed as an important aspect of prenatal self-care for healthy pregnant adolescents.

Researchers looking at outcomes among adolescent mothers and infants found that both those who sought prenatal health care in the first trimester and those who delayed prenatal care until the third trimester reported similar self-care knowledge and practices regarding diet, exercise, and other topics. However, those who sought early prenatal care had significantly more positive outcomes [250], suggesting the need for combining early prenatal care with development of self-efficacy in this population as a means of improving outcomes.

Management of Exercise in Pregnancy

Supporting and monitoring prenatal exercise can be integrated relatively simply into the caregiving process. Gathering relevant information, assessing and evaluating the information, helping a woman choose her activities, assessing her progress, and evaluating the outcome can all be done within the existing framework for management of care. The following steps can be included in the management process during the antepartal period:

1. Establish a database
   - **a.** motivation
   - **b.** exercise history and classification
   - **c.** nutritional status
2. Screen
   - **a.** contraindications to exercise
   - **b.** conditions for assessment
   - **c.** conditions that may benefit from exercise
   - **d.** warning signs
3. Make exercise recommendations
   - **a.** priorities and components of exercise
   - **b.** appropriate types of activities
   - **c.** special exercises for pregnancy
   - **d.** safety issues
4. Periodically assess and evaluate the exercise program
5. Evaluate the exercise program in relationship to outcome

Establishing a Database

Motivation. Women exercise during pregnancy for a number of reasons. An exercise habit, a desire to be with other pregnant women, and/or fear of losing control of her body are some of the major reasons a pregnant woman might choose to exercise. In order to satisfactorily determine an appropriate exercise regimen for any individual, it is important to ascertain her motivation. Exercise—like pregnancy—requires a commitment, and unless she is involved in activity that engages her attention, loss of interest is likely to occur. When a woman has a strong desire to be with other pregnant women, a prenatal group exercise class may be a good choice for her primary weekly activity. A certified prenatal group fitness instructor will be able to create a setting in which support and education occur and to provide safe and effective exercise routines. The instructor can also monitor participants' other activities to ensure they are accumulating sufficient amounts of necessary exercise components.

If a woman has acquired an exercise habit and is fearful of losing her sense of accomplishment with her regular routine, she may be encouraged to combine parts of her weekly routine with more gentle, new activities that will provide a challenge without pointing out her new limitations. Or she may benefit from joining a prenatal class where she can learn to modify her activities without embarrassment, bringing what she learns back to her regular exercise setting. A personal trainer, qualified to deal with pregnancy, might be a solution for a hightly competitive or professional athlete or dancer.

Many women turn to exercise out of fear or worry that their bodies will become foreign to them or that they will lose control of themselves in some manner. This is not an ungrounded fear and should be treated seriously. Assurances should be given that physical activity will promote familiarity with a changing body. Being in a prenatal exercise group for support is also helpful. Other women—particularly those who have already experienced a previous pregnancy—are a great source of information and reassurance.

Exercise History and Classification. It is important to gain as much information as possible about the type and quantity of exercise in which a woman has engaged in the year or two prior to her pregnancy and in the first few weeks of gestation. Conditioning is specific and will vary depending upon the recent activities of any given individual. Remember that the best adaptations are small changes in the routine. Taking an exercise history, such as the one presented in Figure 9-2, is essential. It helps the midwife determine how much of what type of activity the pregnant woman has as a base, how much guidance she may need as she progresses, and whether or not to refer her to a specialist.

If a woman claims to get little exercise but has a physically demanding job and a toddler at home with whom she plays several hours each day, she may need a recreational activity that permits her to slow down, such as a prenatal yoga class. On the other hand, a woman who was accustomed to doing regular vigorous aerobics classes, lifting weights, and swimming for the year prior to her pregnancy but has been ill and inactive for the last two months may need to find a group class where she can be safely monitored and slowly return to an appropriate level of fitness.

Women's impressions of their activity levels can be at odds with reality. Sometimes women claim to be highly active but in fact are highly stressed, getting very little activity that truly produces health and fitness. Others—especially those with small children at home—may think they do very little exercise but actually are on the go for much of the day. Finding out as much specific information as possible will be of great help in establishing an appropriate regimen for a given woman during a given pregnancy.

Once a history has been taken and reviewed, it is useful to classify a woman as to her activity level to help determine how much activity may be appropriate. If a woman is motivated by a desire to obtain the beneficial outcomes of exercise in pregnancy, such as relief of discomforts, increased stamina, help with her labor, and quick postpartum recovery, being in at least the "active" category is critical. If she is so motivated and is not very active, positive feedback about progress, encouragement, and rewards in the form of verbal praise are very important in assisting her to become sufficiently active to attain benefits. Five gross classifications of activity level are typically used when designing a prenatal regimen [139]:

1. *Inactive or sedentary:* no exercise; may perform most activities of daily living, but not more strenuous tasks, such as moving furniture or mowing the lawn.
2. *A little active:* accumulates one to three 30-minute activity sessions over the course of a week; may involve walking, gardening, bicycling, badminton, or other recreational activities.
3. *Active:* accumulating at least 30 minutes of activity or exercise almost daily, with at least three days involving 15 to 30 minutes of sustained moderate-intensity aerobic work, two days involving strength and stretch work, and some centering, relaxation, and/or imagery.
4. *Very active:* more than five regular exercise days per week, with regular moderate and/or high-intensity aerobics, strength, stretch, relaxation, centering, and/or imagery.
5. *Professional or competitive:* exercise as a job or lifestyle; strenuous exercise daily and appropriate recovery work.

The first three levels parallel adolescent girls' activity levels, but at the high end of activity participation, we can identify two categories instead of one. As physically gifted or motivated girls become college athletes and move into adulthood, some retain their high activity level as a recreational outlet (classification 4), while others become professional or competitive athletes and dancers (classification 5), who may require special consideration.

Exercise History (Prenatal)

Name:_____ Date:_____ Due Date:_____

For the year prior to your pregnancy, which of the following things did you do regularly?

Aerobic exercise

No. of sessions/week_____ Approx. length of each session_____

What was your target heart rate range?_____bpm

What was your RPE (rate of perceived exertion) range? (Circle lowest and highest intensity)

Very light Light Fairly light Somewhat hard Hard Very hard Very, very hard

List your activities (running, aerobic dancing, etc.): _____

_____

Strength activities (weight lifting, calisthenics, etc.)

No. of sessions/week ____ Hip and knee flexors/extensors and ab/abductors

____ Chest and back; shoulders and arms

____ Abdominals; spine (core strength)

____ Pelvic floor

Flexibility activities (yoga, stretching, dance, etc.)

No. of sessions/week ____

Combination activities (advanced dance, martial arts, basketball, etc.)

No. of sessions/week ____ List your activities:_____

Relaxation (progressive relaxation, autogenic training, hypnosis, etc.)

No. of sessions/week ____

Centering (mediation, dance, t'ai chi, etc.)

No. of sessions/week ____

Do you have one or more children in the 1- to 5-year-old range who are very active? (circle one) Yes No

If so, how much time do you spend with her/him/them?_____

Do you have a physically demanding job? (circle one) Yes No Is it stressful? Yes No

Are you on your feet a lot? (circle one) Yes No Describe your work activities:_____

Describe your exercise and/or physical activities since the start of this pregnancy: _____

_____

FIGURE 9-2 Exercise history (prenatal). *Source:* © 1996 Ann Cowlin. Used by permission.

Nutritional Status. It is also critical to gather information about a woman's nutritional status, including her hydration. Clearly, women who refuse to eat an adequate amount of food or drink enough water should not exercise. Those who refuse to make healthy choices about nutrition should be persuaded to make whatever changes are possible. Nutrition, exercise, rest, and avoidance of drugs and alcohol form the bases of the optimal approach to childbearing, based on the premise that a healthy mother makes a healthy baby.

There are two major considerations in analyzing nutrition for women who choose to be active in pregnancy. One is the protein and hydration status: Is the woman taking in sufficient quantities of usable protein and water that she is able to (1) produce the additional blood volume required to sustain both fetal growth and her own muscle efficiency and (2) grow a neurologically adequate fetus? The second consideration is the carbohydrate status: Is the woman taking in sufficient quantities of carbohydrates (and especially complex carbohydrates and whole fruits and vegetables) to meet the energy requirements of her own body and her fetus? In addition, her fat intake should include high-quality fats—that is, vegetable oils, nuts, seeds, avocados, and, occasionally, fish such as salmon.

A food diary is a useful tool for both gathering information about a woman's nutritional status and helping to educate her about her dietary needs as a mother-to-be. The sample shown in Figure 9-3 includes the information needed to make a determination about the adequacy of the daily food intake. After asking for a recall of the day's food, the care provider, patient educator, or fitness specialist can go over the list, determining calories and grams of protein. A glance at the types of foods eaten will provide an idea about whether or not there is adequate intake of calcium, iron, folic acid, and other vitamins and minerals, as well as fluids and fiber. Reviewing the diary with the woman is helpful in adjusting a diet that has room for improvement.

Screening Assessment of medical conditions, physical signs, and symptoms is an essential ongoing function of monitoring the exercise regimen, and screening is a fundamental first step in the assessment process. Adequate screening protects the mother and baby, the midwife, and the perinatal fitness instructor or trainer. By eliminating conditions that are contraindications to exercise, noting conditions that may benefit from exercise, reviewing conditions that may require ongoing assessment, and paying attention to warning signs and symptoms, problems are most easily avoided and the chance of a positive outcome is maximized. A perinatal fitness specialist will require completion of a screening form before taking a woman into a group class or as a one-on-one client. The screening form serves as another educational tool for the mother-to-be and gives the care provider and fitness specialist an important means of ensuring that a woman is not engaged in inappropriate activities. An example of a medical screening form is shown in Figure 9-4. Care providers may also wish to refer to recommendations about contraindications in the 2002 committee opinion paper issued by the American College of Obstetricians and Gynecologists concerning exercise in pregnancy and the postpartun period [174].

If a woman is a competitive athlete or a professional athlete or dancer who plans to continue working at a high level throughout her pregnancy, prepregnancy fitness testing is advisable. This should be done in conjunction with a member of the health care team trained in both exercise physiology and obstetrics. The woman's activities and fetal responses should be recorded and reviewed regularly thoughout the pregnancy.

Most women who wish to exercise, however, will present themselves after the fact of conception, often at six to ten weeks' gestation. Screening all women at this point may be useful to locate not only those who may have problems but also those for whom it may be an advantage to be more active. The advisability of continuing exercise or making alterations should be reviewed whenever conditions for assessment or warning signs and symptoms occur.

Making Exercise Recommendations

Priorities. Above all else, safety must be accounted for. Women who have conditions for which exercise is contraindicated obviously must be discouraged from strenuous exertion. Some conditions will allow for gentle activities that include centering, relaxation, and imagery—for example, meditation, t'ai chi, or prenatal yoga. Others will not. Conditions that require monitoring—such as a low-lying placenta—may require patience on the part of the expectant mother, especially if she is used to a high level of activity. But safety is an acceptable issue to most women as a reason to be cautious. In the first trimester, fatigue or nausea may also slow women down. When returning to exercise, a reminder about the effects of deconditioning is advisable, along with a caution to go slowly.

Food Diary

Name:_____ Date:_____

Age:_____ Weight:_____ Gestational age in weeks:_____

How much water, juice, milk, or other noncaffeine, nonalcohol fluids do you drink each day?_____

How many times a day do you eat?_____ Approximately how many calories each time?_____

Food Diary for One Typical Day

Time of Day	Name of Food(s)	Quantity	Calories	Protein Grams

FIGURE 9-3 Food diary. *Source:* Reprinted by permission of Dancing Thru Pregnancy, Inc.

Medical Screening Form for Prenatal Exercise Participants

Name:_____ Date: _____

Signature of care provider: _____

TO THE CARE PROVIDER: Review these conditions and indicate if any now exist or existed previously. Add any notes you think may be helpful to the fitness instructor.

Contraindications for Exercise
____ Placenta previa
____ Premature rupture of membranes (PROM)
____ Incompetent cervix
____ Chronic heart disease
____ Premature labor
____ Toxemia or PIH
____ Tearing or separation of placenta (abruptio)
____ Fever (or presence of infection)
____ Acute and/or chronic life-threatening condition

Conditions That May Benefit from Exercise
____ Diabetes
____ Gestational diabetes
____ Hyperinsulinemia
____ Overweight
____ Discomforts
____ Depression
____ Weakness
____ Lack of stamina

Conditions for Assessment
____ Marginal or low-lying placenta
____ History of IUGR
____ Diabetes or hyperinsulinemia
____ Irregular heartbeat or mitral valve prolapse
____ Anemia
____ Multiple gestations
____ Thyroid disease
____ Three or more spontaneous abortions
____ Excessive over- or underweight
____ Extremely sedentary lifestyle
____ Asthma

Warning Signs or Symptoms
____ Edema of face and hands
____ Severe headaches
____ Hypertension
____ Dizziness or disorientation
____ Palpitations or chest pain
____ Difficulty walking
____ Nausea
____ Bleeding or fluid discharge
____ Regular strong contractions
____ Cramps
____ Fever

FIGURE 9-4 Medical screening form for prenatal exercise participants. *Source:* © 1985, 1995, 2002 Ann Cowlin.

For a woman starting a first-time regular exercise routine during the first or second trimester, it is wise to do so under the direction of a perinatal fitness specialist who can monitor her progress and is aware of potential problems. If the woman is enrolled in a special prenatal class where she is seen two or three times per week, the instructor is often the first to notice warning signs or symptoms that warrant immediate referral to the midwife. A well-trained instructor will ask her client who shows up one day with edema of the fingers, hands, and face to refrain from class, go to her care provider, and have her blood pressure checked.

An inactive woman should be discouraged from starting vigorous exercise after 26 weeks. Placental enhancement that takes place in exercising mothers during the first and second trimester will protect the fetus of high-intensity or high-volume exercisers in the third trimester; however, women who have been sedentary will not have that protection. Walking at a comfortable pace and special prenatal exercises such as abdominal hiss/compress, Kegels, and pelvic rocks are always suitable as long as no contraindications are present.

Modifications of ballistic or high-impact movements are important, even for highly trained individuals. Sports such as soccer or squash that require complicated equipment or a potentially hazardous environment may involve motions that are perfectly

safe by themselves but become unsafe because of the situation. A safe alternative for accomplished athletes or dancers is to execute the movements of the sport in a safe setting, without equipment or other players, or with a partner who is willing to be noncompetitive.

To determine what will be an effective program, the care provider must consider two items: (1) the individual woman, her motivations, exercise and medical histories, genetic potential, age, lifestyle, and preferences, and (2) current research findings, which emphasize the variation in individual responses to exercise in pregnancy. Clearly, if a woman is interested in being healthy, taking care of herself and her baby, being prepared for the challenges of labor, birth, and nursing, and has an active lifestyle, it will be easy to steer her toward an exercise regimen with activities she enjoys on three to five days a week. For women whose motivation is more vague or intuitive ("I know I should be exercising..."), ascertaining interests and previous experience is a key. Being a little active and enjoying it throughout the entire pregnancy will be more beneficial than pushing early on, possibly being injured or discouraged, and quitting.

Women who have the mental capacity and exercise background to work hard throughout the pregnancy may require subtle encouragement to be sure to stay attentive to kinesthetic cues and fatigue. In general, women's instincts to protect themselves and their babies are keen.

The effectiveness of any exercise regimen is tied to compliance. The gains to be had are achieved in the actual practice. When practice is fun, it is easy to comply. If exercise is viewed as a recreational activity, a game, or time to be with friends, it becomes its own reward.

Components. The following exercise components are safe and effective elements of a prenatal exercise program:

1. *Centering:* Balancing the body's bony levers and achieving the relaxation response (see below) through deep breathing and associative mental focus; often done at the beginning of activities such as t'ai chi or modern dance to promote safe biomechanics and fluid movement. Commonly used postures are shown in Figure 9-5. Upright seated postures, with weight on the ischial tuberosities and not on the coccyx—either tailor fashion or in a chair with feet flat on the floor and knees parallel to the hip joints—are commonly used. Some methods involve standing with hips, knees, and ankles slightly flexed and active. When centering, incipient righting motion will occur.
2. *Aerobic or cardiovascular conditioning:* Large, rhythmic and repetitive movements using more than 50 percent of the body's muscle mass in a sustained manner, challenging the circulatory system and elevating the pulse; use Table 9-1 to assess the range of appropriate intensities for an individual. Submaximal exercise measure-

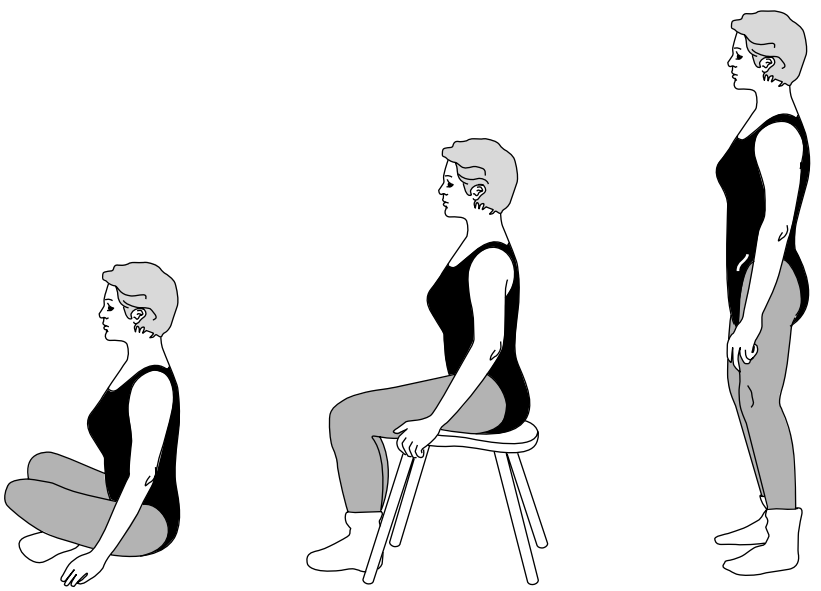

FIGURE 9-5 Centering postures.

TABLE 9-1 Range of Aerobic Intensities for Healthy Pregnant Women

Intensity	Rate of Perceived Exertion (RPE)[a]	Functional Capacity[b] (% VO_2 max)	Heart Rate[c] (beats/minute)	
	Very light			
		50	100	120
			103	123
Low			106	126
	Fairly light		109	129
			112	132
		60	115	135
			118	138
			121	141
	Somewhat hard		124	144
			127	147
		70	130	150
Moderate			133	153
			136	156
	Hard		139	159
			142	162
		80	145	165
			148	168
			151	171
	Very hard		154	174
			157	177
High		90	160	180
			163	183
			167	187
	Very very hard	95	170	190

[a] RPE is a subjective measure of how hard a person is working. There is a rough correlation between most people's subjective sense of exertion and objective measures of their oxygen consumption or heart rate.

[b] Functional capacity is a measure of how much oxygen a person is consuming during work and is given as milliliters of oxygen consumed per kilogram of body weight per minute. The unit of measurement is the MET; 1 MET = 3.5 mL O_2/kg/min. The number of METs an individual can tolerate is her or his functional capacity. Aerobic training effects occur in the range of 40 to 85% of the maximum amount of oxygen an individual can consume (VO_2 max). The maximum capacity varies with individual genetic potential and conditioning. Anaerobic threshold is approached at approximately 85 to 90% VO_2 max.

[c] Heart rates shown are for women in the age range of 20 to 40. Rates in the left column are likely values for women who are closer to 40 or who are less fit; those in the right column are likely values for women who are closer to 20 or who are extremely fit. The correspondence between exercising heart rates and the percentage of functional capacity is a complex relationship that depends on genetic potential, training, and age and is further complicated by the responses of pregnancy.

Source: Reprinted by permission of Dancing Thru Pregnancy, Inc.

ments vary somewhat from nonpregnant values. However, in practice, perceived exertion has proved to be an effective method of estimating how hard a woman is working in pregnancy. Subjective perceptions of working "somewhat hard" to "hard" three to five times per week for a minimum of 20 minutes provides cardiovascular enhancement and improves delivery of nutrients as well as outcomes.

3. *Strength conditioning:* Contracting the skeletal muscles against resistance, using equipment or the body's own weight; protects the skeleton and connective tissue, increases lean body mass, and raises the resting metabolic rate.
4. *Flexibility exercises:* Elongating the muscles in a controlled fashion employing balanced alignment, small increases in range of motion (ROM), and static stretching; relieves discomfort and promotes proprioception (balance) and kinesthesia (awareness of position and movement).
5. *Relaxation:* Resting in a comfortable position and achieving the relaxation response; reduces stress and elicits feelings of well-being. After the first trimester, women should rest in the

side-lying position, not on the back. The following prerequisites are needed to elicit the relaxation response, as outlined by Benson [9]:

a. a quiet location
b. conscious relaxation of skeletal muscles
c. a single mental device, such as a word, phrase, or image
d. a passive attitude toward intrusive thoughts

There are five physiological measures that indicate a person has achieved the relaxation response:

a. alpha brain waves
b. low resting pulse
c. slow respiration
d. lowered blood pressure
e. lowered metabolism (decreased oxygen requirements)

During an activity session, observing the rate of respiration is the least invasive means of determining if a woman is actually able to relax.

6. *Imagery (or mental rehearsal) of desired action:* Once relaxed, mentally watching or imagining oneself doing something like properly swinging a tennis racquet or pushing out a baby without actually trying to do it; this activates subcortical neural pathways that most efficiently pattern the action. While physical practice refines movement execution, imagery refines the intention of the action. Neither the physical nor mental aspect can be completely disconnected from each other, but by focusing on one aspect, the entire process is enhanced. Most human movement is composed of unconscious, subcortical reflex actions and rhythmic motor patterns. The cognitive contribution is largely one of seeing in the mind's eye and refining intention by ideation and sensory feedback. Beyond having a precise and accurate intention, there is little one can do to govern execution. Attention to intent is a powerful command to see that it is efficiently patterned at the subcortical level. *Ideokinesis* refers to the practice of refining the image (*ideo-*) of movement (*-kinesis*) while in the relaxation response, such as watching oneself shoot a basketball or open the birth canal.

Appropriate Activities. Deciding which activities are appropriate for a particular individual is sometimes an easy process and sometimes it is not. If a woman has been participating in low-impact aerobic dancing for many years prior to her pregnancy, she may simply need to adjust her intensity level on any given day if she feels like taking it easy. If she is fine with the physical aspect of the activity but is feeling like a fish out of water, she may need to find a prenatal group class where she will get the support of her peers.

On the other hand, a professional downhill skier may need a lot of help finding something challenging yet safe. If she is comfortable with the biomechanics, perhaps a water class or beginning African dance class would provide an interest that she can work to master over the course of her pregnancy. As an anonymous beginner, she may not feel compelled to compete and yet may have plenty of small learning moments ahead of her that will be rewarding.

A sedentary woman who may be a health risk if she does not begin to work with her body may provide a great challenge to the care provider. Unless she is highly motivated, it is likely she will require much education and support, even if a simple walking program is all that she can do. Depending on her circumstances, the best approach may involve a personal trainer, a group situation, or merely a friend with whom she can walk on a regular basis. Someone trained to evaluate the physical capabilities and assess the motivational requirements of an untrained individual can be of great assistance at this point.

It is important to take into account the inherent challenges of a given activity, including movement patterns (which parts of the body do which actions in what sequence); effort-shapes (the way the energy takes form—for example, some actions are gliding while others are slashing motions); and the dangers from equipment, other players, or the environment. Obviously, more active women will have more movement skills, which means that more activities will be reasonably appropriate for them. Nonetheless, if changes need to be made in a woman's typical activity for safety reasons, it is good to look at similar activities that may be less risky. Doing more than one type of activity also has benefits. Cross-training—or varying activities from session to session—helps prevent overuse injuries and avoids boredom.

Table 9-2 lists common recreational sport, exercise, and dance activities that may be suitable for women during pregnancy. On the basis of movement patterns, effort-shapes, the requirements of the equipment, and special skills, the suitability of each activity has been assessed for women with varying activity levels, during each trimester. Every woman must ultimately make her own decision about whether or not to participate in a given activity, but it is useful to have some guidance based on the difficulty of the activity and the experience of the participant.

TABLE 9-2 Prenatal Activity Chart

Activity	Inactive	A Little Active	Active	Very Active	Competitive or Professional
Walking	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3
Speedwalking		2 3	1 2 3	1 2 3	1 2 3
Jogging*			1 2	1 2 3	1 2 3
Running*			1 2	1 2	1 2 3
Track events*			1	1 2	1 2
Treadmill*		1 2	1 2 3	1 2 3	1 2 3
Stair machine*			1 2	1 2 3	1 2 3
Slide‡					
Glidewalker*†				1 2	1 2
Stationary cycling	1 2	1 2	1 2 3	1 2 3	1 2 3
Recreational cycling*†		1 2	1 2	1 2	1 2
Competitive cycling*†					1
Recreational swimming*†	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3
Water aerobics	2	1 2 3	1 2 3	1 2 3	1 2 3
Lap swimming*			1 2 3	1 2 3	1 2 3
Competitive swimming*†				1 2	1 2
Snorkeling*†		1 2	1 2 3	1 2 3	1 2 3
Water skiing‡					
Scuba diving‡					
Surfing‡					
Day sailing*†		1 2	1 2	1 2	1 2
Sailboarding*†				1	1
Rowing or sculling*†				1 2	1 2 3
Ergometer rowing*			1 2	1 2 3	1 2 3
White water canoeing, kayaking‡					
Prenatal aerobic/exercise class	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3
Low-impact/low-intensity aerobics		1 2	1 2 3	1 2 3	1 2 3
Low-impact/high-intensity aerobics*			1 2	1 2 3	1 2 3
High-impact/high-intensity aerobics‡					
Low-step aerobics, beginning*		1 2	1 2 3	1 2 3	1 2 3
Low-step aerobics, advanced*†			1 2	1 2 3	1 2 3
High-step aerobics, advanced*†				1	1
Modern dance, beginning	1 2	1 2	1 2 3	1 2 3	1 2 3
Modern dance, advanced*			1 2	1 2 3	1 2 3
African/Caribbean dance, beginning		1 2	1 2 3	1 2 3	1 2 3
African/Caribbean dance, advanced			1	1 2	1 2
Ballet, beginning*		1 2	1 2 3	1 2 3	1 2 3

TABLE 9-2 Prenatal Activity Chart (continued)

Activity	Inactive	A Little Active	Active	Very Active	Competitive or Professional
Ballet, advanced*			1 2	1 2	1 2 3
Jazz dance, beginning*			1 2	1 2	1 2
Jazz dance, advanced*†			1	1 2	1 2
Ballroom dance, beginning	1 2	1 2 3	1 2 3	1 2 3	1 2 3
Ballroom dance, advanced*†			1 2	1 2	1 2 3
Contra dance		1 2	1 2 3	1 2 3	1 2 3
Gymnastics*†				1	1
Prenatal yoga	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3
Yoga, beginning*			1	1 2	1 2
Yoga, advanced*			1	1	1
T'ai chi	1 2	1 2 3	1 2 3	1 2 3	1 2 3
Karate, beginning*			1	1	1 2
Karate, advanced‡					
Judo, beginning*	1	1	1 2		
Judo, advanced‡					
Badminton*	1 2	1 2 3	1 2 3	1 2 3	1 2 3
Basketball*†			1	1 2	1 2
Frisbee*†	1	1 2	1 2	1 2	1 2
Golf		1	1 2	1 2	1 2
Handball‡					
Ping pong*		1	1 2	1 2	1 2
Racketball*†			1	1	1
Soccer*†			1	1	1
Softball*†			1	1	1
Squash‡					
Tennis*†			1 2	1 2	1 2 3
Volleyball*†			1	1 2	1 2
Cross country skiing*†			1 2	1 2	1 2
Ski machine*†			1	1	1
Downhill skiing‡					
Snow- or skateboarding‡					
Roller skating or blading*†			1	1 2	1 2
Ice skating*†			1 2	1 2	1 2 3
Rock climbing*†				1	1
Skydiving‡					

KEY: 1 = first trimester; 2 = second trimester; 3 = third trimester.

* Requires special skills and/or familiarity with equipment and poses dangers because of demands of those skills or equipment.

† Risky even with previous experience because the environment cannot be controlled; becomes increasingly dangerous as pregnancy progresses.

‡ Not recommended for women in any stage of pregnancy.

Reminder: The appropriateness of any activity is ultimately a matter that only the expectant mother herself can assess.

Source:

Special Exercises for Pregnancy. The following movements, performed regularly for many months prior to birth, provide relief of discomfort during pregnancy and preparation for labor:

1. *Hiss/compress—in a seated position:* Exhale by making a hissing sound and compressing the transverse abdominal muscle, then relax the abdomen and inhale through the nose. Hissing sets up a resistance that is overcome by the forced exhalation action of the transverse abdominal muscle as it compresses the abdominal contents. Repetition of this action in two or three sets of five compressions strengthens this muscle in preparation for pushing or bearing down in the second stage of labor, which combines contraction of the transverse abdominal and downward effort of the diaphragm toward the vaginal opening with the release of the pelvic floor muscles. Postpartum, this muscle helps flatten the lower abdomen and protect the lumbar spine.
2. *Spinal c-curve:* Flex the spine forward while exhaling. Try to focus on the abdominal muscles and avoid tightening the gluteals or pelvic floor. Beginning with a hiss/compress, increase the action by curving the spine, bringing the more superficial abdominal muscles (obliques and rectus abdominus) into play. This can also be done on hands and knees.
3. *Curl-downs:* In a seated position, exhale and roll onto the sacrum, exaggerating the spinal curve and placing a greater load on the abdominal muscles; after 20 weeks' gestation, splint the abdomen by placing hands on the sides of the abdomen and pressing toward the center to prevent the development of diastasis recti.
4. *Side bending and lateral pelvic rock or rotation:* Usually standing and curving slightly between the ribs and pelvis; there is a slight rotation of the ribs or pelvis around the vertical axis at the level of the lumbar spine, with accompanying iliofemoral (hip) extension and sacroiliac flexion on the forward side and the reverse on the other side; this is often also accompanied by lateral flexion in the lumbar spine. The movement can also be achieved by bringing one leg forward and lifting it several feet off the ground, or by making a lunge to one side. Trained dancers and athletes will sometimes seek to counteract the natural tendency of the pelvis to twist when lifting the leg forward or lunging to the side, but they should allow the natural motion to occur. These actions involve the oblique and lumbar muscles in the trunk, as well as muscles controlling the pelvis and hip joints, and allow for changes in the internal space and resistance within the birth canal, all of which helps the baby move down in labor.
5. *Anterior-posterior pelvic tilt:* Flex the lumbar spine and extend both iliofemoral joints by contracting the gluteals to achieve posterior tilting (top of pelvis goes back); in neutral position the pelvis is vertical; to achieve an anterior tilt, bring the buttocks back and arch the lumbar spine.
6. *Kegel exercises:* Contract and release the ischiocavernous and transverse perineal muscles, the levator and diaphragm muscles, and the pubococcygeal (sphincter) muscle, separately and in unison. These exercises strengthen and relax the muscles of the pelvic floor and birth canal.
7. *Deeply folded position:* From a crawling position on hands and knees, pull pelvis back and down over feet, knees apart, and flexing deeply in the iliofemoral and knee joints; relax the spine by dropping the head forward; breathe deeply and slowly (Figure 9-6).
8. *Squats:* Sitting on the floor, bring one knee toward the armpit and place the foot on that side on floor; lean forward until weight is on that foot and both hands; bring other foot onto floor. If both feet will not stay flat on the floor, lift one heel as high as possible and bring pelvis over that foot; alternate sides (Figure 9-7).
9. *Side-lying position:* Assume the side-lying position and practice relaxation and imagery.

Safety Issues. The following guidelines can serve as a review of the safety issues arising from the interactions of pregnancy and exercise. It is a good idea to go over them with the expectant mother and to keep a copy of this list somewhere visible (perhaps on the back of the frequently used door in the office or on a bulletin board).

1. Exercise regularly and moderately, avoid jarring movements of the abdomen, and include

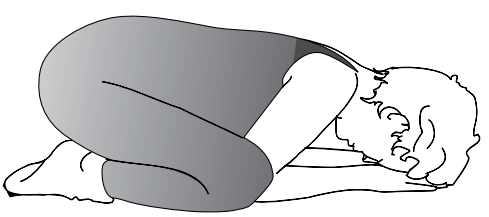

FIGURE 9-6 Deeply folded position. Begin on hands and knees. Pull pelvis back and down over feet, flexing deeply in the hip and knee joints (contraindicated for women with knee problems). Relax the spine by dropping the head forward. Relax the arms.

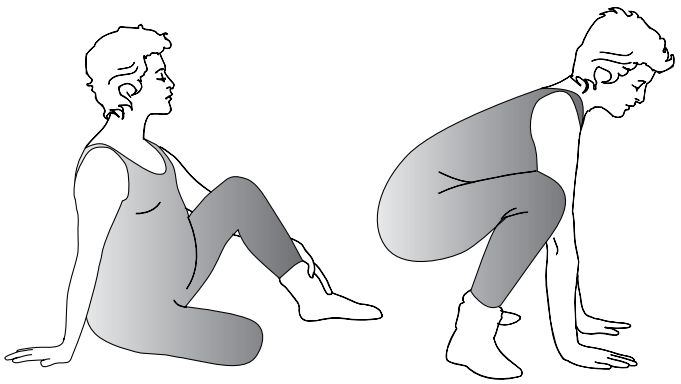

FIGURE 9-7 Squat. Begin seated on the floor. Bring one knee toward the armpit and place that foot flat on floor. Lean forward onto both hands. Bring other foot onto floor.

some relaxation in your routine. Avoid binge exercise! Although exercise will reduce blood flow to the uterus, moderate exercise is not a problem because your placenta has adjusted and provides the baby with plenty of oxygen and nutrition.

2. Make sure your midwife screens you for contraindications (conditions that exclude you from exercising), and make sure you know the warning signs that should be reported to your midwife.
3. Avoid lying on your back or standing up for long periods of time after the first trimester; your blood pressure might drop, you might get light-headed, or you may have swelling in your hands or feet. If any of these things happen, lie down on your side to rest. Tell your midwife.
4. Avoid fatigue and overtraining.
5. Eat a combination of healthy foods, in small amounts, all through the day.
6. Drink at least eight cups of water or fluids daily and avoid hot, humid situations.
7. Make sure any equipment you use is in good condition and is safe (for example, make sure it can't hit you in the abdomen). Wear clothes in layers, so you can remove something if you get too warm. Make sure your shoes are comfortable and provide good support.
8. If you are a professional or competitive athlete or dancer, you may need extra food, fluids and rest. Your baby's growth must be monitored carefully by your health care provider.

Periodically Assessing and Evaluating the Exercise Program During regular visits, inquiring into exercise activities allows the midwife to learn not only how the individual woman is progressing in her program, but also enriches the midwife's knowledge of what is available to women in her area. Having the expectant mother maintain an exercise log, including the day, time of day, activity, components of exercise included (centering, aerobics, strength, stretch, relaxation, imagery, special exercises such as Kegels, tilts, etc.), and how she felt before, during, and after the session, is a good tool for evaluation. If a woman is enjoying her activities, is feeling good, is healthy and feels she is benefiting from her program, and her baby is growing properly, this is obviously a successful situation. If she is unhappy, complaining of discomfort, or not healthy, it is important to determine if there is something in her program that is detrimental or if she herself is unable to comply with a safe program. Clearly, if conditions that require assessment, contraindications, or warning signs apppear, adjustments must be made. This may include cessation or modification of activities. It is helpful in this case to remind the woman of the primary goal: a healthy baby. Commitment, planning, flexibility, and compromise are all helpful here.

Evaluating the Exercise Program in Relation to Outcome It is useful to maintain records regarding a woman's activities during pregnancy. Comparing her original motivations for exercise with her feelings regarding the contribution of exercise to her pregnancy and birth experience will provide an important component of evaluating the success of the exercise program. Health care practices may also want to track birth outcomes to see if there is any difference between mothers who exercise and those who do not. The following are major items to track:

1. length of the active phase of the first stage of labor

2. length of second stage of labor
3. complications
4. type of birth
5. use of monitoring technology
6. procedures
7. use of analgesia, epidural, etc.
8. fetal responses and Apgar scores

Exercise Guidelines for Pregnant Adolescents

Including exercise in teen pregnancy programs can offer positive results. A variety of activities can be offered in such a program:

1. *Cardiovascular exercise:* Provide activities that incorporate a practical learning experience—What makes your heart beat faster? How do you count your pulse? How do you feel during exertion? How does exercise affect your baby? Taking a pulse before, during, and after 20 minutes of step aerobics could lead to a discussion of these questions.
2. *Special exercises:* Demonstrate or explain Kegels, abdominal exercises, squatting, relaxation, centering, and other preparatory exercises that will develop practical skills the girls will need in labor and the postpartum period. Other strength and flexibility activities can be included, providing diet and physical development are adequate. As with all fitness components, this population needs to uncover their significance through a combination of doing and learning about them—what various exercises do and why they are important.
3. *Self-care elements:* Explain topics of self-care for girls, including personal hygiene, nutrition and exercise, preventing sexually transmitted diseases (STDs), getting to prenatal visits, techniques of stress management, and academic education as a means for survival.
4. *Childbirth education:* Create interactive learning units around major topics, including pregnancy, labor and delivery, and recovery. By integrating this component into a school-based setting, barriers to this information can be greatly reduced and healthy behaviors improved [251].

Exercise for Postpartum Recovery

The postpartum period represents a challenging mix of potentials. There are positive cardiovascular changes associated with pregnancy that continue for some time following birth, providing the new mother with survival enhancements during this stressful period. However, motherhood also produces the greatest barriers to exercise participation of any of her roles in life [252]. Modern influences and social structures can lead to a lifestyle that is detrimental to physical and psychological well-being. Without informal social support, institutional supports for child care, education on healthy behaviors, safe environments, and transportation, women in a variety of settings undergo lifestyle and psychosocial changes that lead to postpartum weight gain, inactivity, isolation, and depression. One British study has demonstrated that women with postpartum weight gain are at increased risk of long-term weight gains [253], raising their long-term disease risk. For women of color, these problems are exacerbated by a greater lack of exercise settings that encourage them to participate [254]. Poor women and adolescent mothers are other groups disenfranchised by a lack of suitable, accessible programming and education. Yet, bringing an active lifestyle or recreational exercise to these populations is possible and can provide benefits in both short- and long-term well-being.

The Impact and Benefits of Exercise in the Postpartum Period

Technically, the postpartum period—or puerperium—refers only to the first six weeks following birth. Returning the body to a true nonpregnant state takes longer than six weeks. This longer duration is sometimes referred to as the extended postpartum period by fitness professionals, and may last six months or more. Generally, giving birth is a long-duration event, which means that the mother may be tired and bruised and her reproductive system will need time to recover from the birth itself. Over a longer time the body can return to a nonpregnant alignment and normal muscle balance. In addition to the physical healing that must take place, the mother needs time to adapt to her new identity and to get used to caring for the new person who has come into her world—a baby who will need care—including stimulation for growth and development—for survival. Even if she has a partner or extended family who shares the caregiving, in the first few weeks, months, or years, much of the physical labor falls to the mother.

When surveyed concerning self-care and baby-care topics of interest at seven weeks postpartum, more than three-fourths of the 1161 women questioned in one study wanted more information on at least one topic, and the largest percentage wanted

more information on exercise, diet, and nutrition [255]. While women who exercised in pregnancy are more likely to continue exercise afterward than those who did not [256], there are still significant numbers of women who join postpartum fitness programs who were not active during pregnancy, and very likely more would join such a program if it were accessible. There is less information available concerning the interaction of exercise with the postpartum period than with pregnancy; however, it is sufficient to conclude that appropriate exercise has both physical and psychosocial benefits for mothers and infants.

Cardiovasculature and Breast Milk Production One area in which we know that physiological shifts due to pregnancy do not return to nonpregnant parameters in six weeks is cardiovascular change. Stroke volume and end-diastolic volume remain elevated over preconception values at six and 12 weeks [257]. Systemic vascular resistance remains decreased at one year; the effect is additive with successive pregnancies [258]. Mothers who nurse and exercise continue to need sufficient fluids. Before working out, a nursing mother should be sure to drink an extra six or eight ounces of water. The volume of milk production will not be compromised if the mother is drinking adequately [259, 260]. Counseling by the care provider of a nursing and exercising mother should include information on increased fluid intake [261]. If the infant of an elite athlete is not gaining weight at an acceptable pace, supplementation may be necessary.

The effect of exercise intensity on milk composition has been studied. Research in the late 1980s and early 1990s demonstrated the accumulation of lactic acid (LA) and its persistence for 90 minutes in the milk of women exercising at maximal levels [262, 263] and reported problems with infant acceptance of postexercise breast milk [264]. Consequently, women who find their infants have an aversion to postexercise breast milk often express milk prior to exercise to give to their infants afterward, and express and discard postexercise breast milk. Studies in the late 1990s also focused on the composition of breast milk of exercising mothers with more detailed findings. Looking at the accumulation of LA at various exercise intensities, along with changes in milk pH, lipid, ammonium, and urea levels, one study found that while milk LA was significantly elevated through 90 minutes postexercise following a maximal-intensity treadmill session, there was no significant increase following sessions at 50 percent or 75 percent VO_2 max, nor were there any significant differences in the other measures at any level of intensity [265]. Another study found that maximal exercise did not alter concentrations of phosphorous, calcium, magnesium, potassium, or sodium in breast milk at 10, 30, or 60 minutes postexercise [266]. A study concerning the effects of maximal exercise on immunoglobulin A (IgA) in breast milk found significantly decreased concentrations of IgA at 10 and 30 minutes postexercise, but levels at 60 minutes were similar to controls [267]. In addition, levels of IgA1 showed a significant decrease at 10 minutes postexercise, but returned to control concentrations at both 30 and 60 minutes. No significant changes in IgA2 concentrations were found at any time [267].

The effects of calorie restriction (as opposed to malnutrition) and maternal weight loss are also of interest. A review of research findings concluded that short-term energy deficit in conjunction with exercise and resulting weight loss did not adversely affect lactation, due perhaps to the increase in maternal plasma prolactin concentration associated with a negative energy balance [268]. A comparison of lactation-induced bone changes in women who participated in self-selected recreational exercise in the early postpartum period with those who did not found that exercise had no impact on the BMD loss associated with early postpartum lactation [269].

Respiration, Thermoregulation, and Metabolism Breathing returns to normal within a couple of months after giving birth, but the ribs may remain expanded for a year or more. The amount of time it takes to return to normal thermoregulation varies among postpartum women. In many women, six weeks is adequate. For others, especially those who are breastfeeding, it may take longer. The biochemistry of energy is also returning to a nonpregnant state. If the mother is not breastfeeding, her metabolic rate will be slowing, reducing the need to eat as much or as often. If she is breastfeeding, it is generally agreed that an additional 300 to 500 calories are needed, so the need for food and fluids will remain elevated during this time, and even more calories and fluids will be needed for exercise. Additional metabolic changes are beyond the scope of this chapter, but the changing endocrine status may affect inflammatory responses that produce tendonitis, affecting comfort during movement.

Biomechanics After giving birth, a woman undergoes a sudden and dramatic shift in her center of

gravity, without accompanying changes in bone alignment and neuromuscular adaptations. Postural reeducation in the postpartum period is a major concern. The midwife can suggest the following methods to achieve this:

1. Use the constructive rest position (see Figure 9-8) [227].
2. Strengthen abdominals, gluteals, pelvic floor, and upper back.
3. Stretch psoas, low back, and pectoral muscles.
4. Consciously adopt healthy alignment patterns in movement.

Among the common structural conditions that can arise as result of the changing body dynamics of pregnancy and the demands of birth are diastasis recti, separation of the symphysis pubis, broken coccyx, SI joint dysfunction, back pain, and lower limb problems. Postpartum women are also susceptible to tendonitis and aching joints of the hands, shoulders, low back, knees, ankles, and feet due to postpartum changes in the center of gravity, hormone shifts, and poor techniques of carrying and holding their infants. These can be alleviated by taking the following steps:

1. Carry the baby close to the central axis of the body, using the muscles proximal to the central axis to bear the weight.
2. When nursing in a seated position, support the baby with enough pillows or blankets to bring her/him to the breast; this relieves the weight at the shoulders, reduces kyphosis in the thoracic spine, and frees the arms to manipulate the infant and the environment.
3. Wear socks and/or high-top exercise shoes to provide the ankle with cutaneous proprioceptor stimulus to help the brain re-image proper alignment in the leg.
4. Keep the hips, knees, and ankles slightly flexed and active when standing to provide mechanoreceptor stimulus to the brain.
5. Practice the hiss/compress abdominal exercise and splint the abdomen when doing curl-ups for the first few weeks until the abdominal muscles are strong enough to stabilize the trunk.

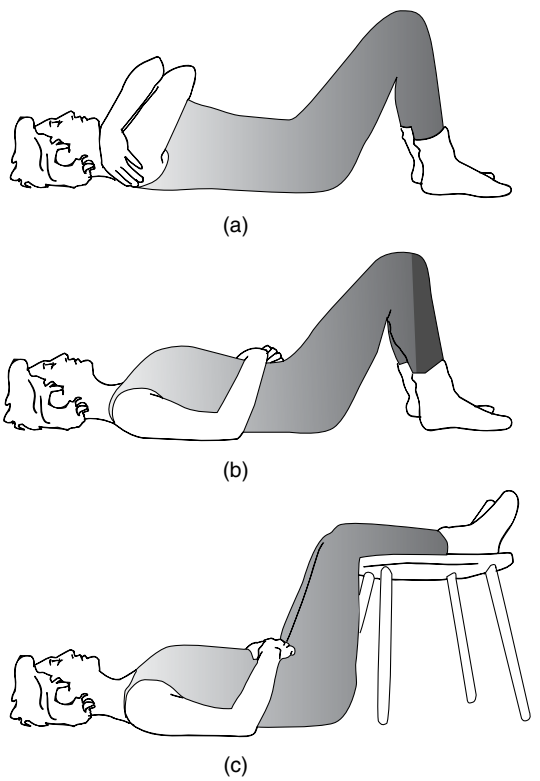

FIGURE 9-8 Constructive rest position. In this position, the pull of gravity assists in maximizing relaxation of skeletal muscles (a). If upper back and/or arms are tense when crossed over the chest, allow the elbows to slide to the floor and hands to rest on the abdomen (b). If the low back is tight, place the lower legs parallel to the floor with the knees directly over the iliofemoral joint (c).

Psychophysiological Interactions Mood and anxiety disorders following birth are receiving increasing attention from mental health professionals. The role of physical activity in establishing feelings of well-being make this a rich area for future research. From experience, we know that postpartum women report that their exercise group plays a significant role in their well-being [270]. There has been a small amount of research that helps us understand why this may be. Examining the psychological effects of an aerobic exercise session and a rest session on postpartum women, researchers concluded that both factors resulted in decreased anxiety and depression, and that the exercise was associated with significant decreases in total mood disturbance and significant increases in vigor [271]. Sampselle et al. [6] found two markers of postpartum well-being were significantly improved in women who participated in self-reported vigorous physical activity by six weeks postpartum. In the first marker—postpartum weight retention—women with higher levels of activity retained less weight than the inactive group. In the second marker—Lederman's postpartum maternal adaptation questionnaire—vigorous exercisers had better scores on all adaptation subscales. When combined with the

positive effects of group support and the health effects of regular physical activity, it becomes clear why postpartum group exercise produces positive psychological outcomes.

Management of Exercise in the Postpartum Period

The following steps can be incorporated into the management process during the postpartum period:

1. Establish a database
   a. prenatal fitness
   b. course of labor, birth, and first two weeks
   c. maternal-infant adjustment
2. Screen
3. Make exercise recommendations
   a. Kegels exercises
   b. abdominals
   c. walking
   d. returning to a regular exercise regimen
4. Assess and evaluate the exercise program
5. Return to mainstream exercise program

Establishing a Database

Prenatal Fitness. A woman's level of fitness going into birth will play a large role in her recovery. The same physiological augmentations that enhanced oxygen and nutrient delivery in the antenatal period will enhance tissue recovery in the period immediately following birth. The general rule is that the more fit a woman is going into the birth, the faster she will return to normal activity.

Course of Labor, Birth, and First Two Weeks. A fit woman with a relatively easy labor and no complications may be walking a mile or two every other day by the end of the second week postpartum. At the other end of the spectrum, an inactive woman with a difficult labor may not be able to execute all of her activities of daily living by the end of the second month. The range of variation is so great that it is critical to review the information on an individual woman's labor and birth, and to inquire about what activities the woman has been able to execute at her two-week visit.

Maternal-Infant Adjustment. For a first-time mother in today's world, bringing a baby home can involve a dramatic adjustment. To complicate matters, the baby's disposition as well as the adjustment of the new mother and baby will play a significant role in the commencement of a regular exercise program. If the baby is adjusting well and the mother is getting some regular periods of sleep, it is likely that some health and fitness activities can be started during the first few weeks. A difficult adjustment may prolong the start of activities other than essentials.

For women who find it difficult to adjust but who are connected with an ongoing exercise group, it can be very beneficial to return to the group for support, even if the actual exercising has to wait. Because exercise helps to alleviate depression, once it is resumed or even taken up for the first time, it is a great outlet for new mothers, including those who are adolescents.

Screening The midwife should assess the following prior to advising a woman about commencing a regular exercise regimen involving sustained activity:

1. Lochia should have stopped or nearly stopped; walking a mile should not cause an increase in bleeding the next day; there should be no bright red blood in any case.
2. The episiotomy or lacerations should be healed sufficiently that there is little or no discomfort.
3. The cesarean incision should be healed, intact, and with no evidence of infection.
4. Pelvic relaxation should have lessened and there should be no or minimum stress incontinence.
5. Milk production should be adequate for the infant's needs.

The following conditions are common results of the structural stresses of pregnancy and birth. The first item—diastasis recti—is almost universal, although negligible in many fit women. All of these conditions need to be checked for and if found, assessed for their impact on movement range and whether exercise restrictions are indicated.

1. *Diastasis recti:* A mild to moderate separation of abdominal muscles away from the linea alba will heal over time with careful exercise; the hiss/compress abdominal exercise and splinting for the first few weeks will be helpful.
2. *Separation of the symphysis pubis:* A wide lateral stance must be avoided for two or three months; if the condition does not gradually abate, medical attention is imperative.
3. *Broken coccyx:* Exercise may be restricted for six to eight weeks; the woman should sit directly on her ischial tuberosities and should not sit on a rubber donut as this will place weight directly on the broken coccyx (see Figure 9-9).
4. *Upper back pain:* Extreme shoulder tension or a difficult position held for a long time during

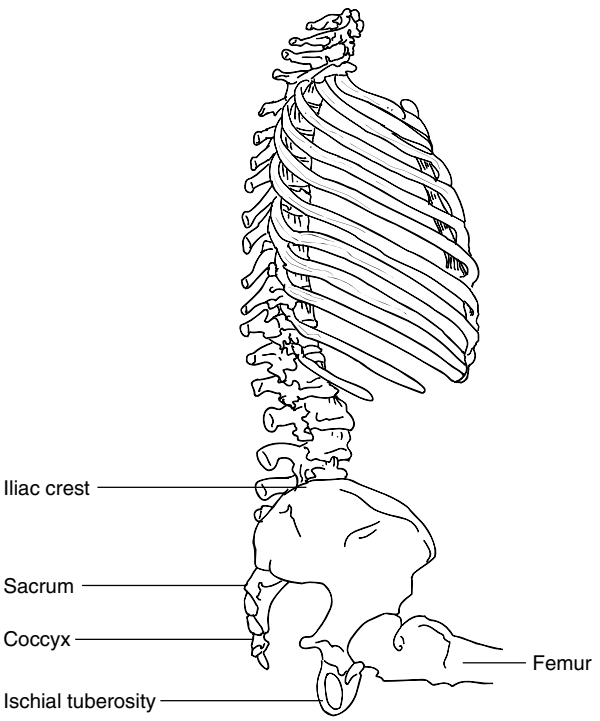

FIGURE 9-9 Sitting upright on the pelvis, not the coccyx. Three-dimensional view of pelvis and spine (with ribs represented). Notice that in the upright seated position, the weight is totally supported on the ischial tuberosities, not on the spinal column or the femur.

the second stage of labor will sometimes cause muscle spasms. Faulty positioning of the baby during nursing may also cause pain.

5. *Low back pain and/or mid-back pain:* Back pain is often related to biomechanics and abdominal strength; it may also be due to epidural discomfort; most back pain abates in the deeply folded position (see again Figure 9-6).
6. *Sacroiliac dysfunction or sciatica:* Such conditions may be caused by sacroiliac slippage, spasm in the medial gluteal or, if sciatica is suspected, spasm in the piriformis muscle.
7. *Slow-healing surgical closure:* If there is infection or the incision from a cesarean or episiotomy is slow to heal, delay start of exercise.

Figure 9-10 presents an example of a screening and assessment form that can be used at the six-week checkup—or whenever the woman is preparing to return to a regular, sustained exercise program.

Making Exercise Recommendations

Kegel Exercises. If there are no complications with a vaginal birth, the new mother may begin to try to tighten her pelvic floor muscles within a *few* hours of birth. Regaining control of these muscles is a very significant contribution to well-being.

Abdominals. Within a day or two of an uncomplicated vaginal birth, the new mother should be able to lie in the constructive rest position (see again Figure 9-8) and tighten her abdominal muscles by doing the hiss/compress exercise: inhaling through the nose and relaxing the abdomen, then exhaling with a hissing sound and tightening a few inches below the surface, pulling the abdomen toward the back of the waist. This activates the transverse abdominal muscle (described above). When well-toned, this muscle holds in the contents of the abdominal cavity and thereby aids in the protection of the low back. It lies beneath the abdominus recti, the internal obliques, and the external obliques—muscles responsible for motions of the abdomen such as the curl-up, spinal c-curve, oblique curl-up, and twisting motions.

During pregnancy, the transverse muscle, along with all the abdominal muscles, is stretched. When bearing down, or pushing the pelvic floor to open, this muscle can distend. It is not uncommon to find that postpartum women will begin a curl-up with this distending motion, probably due to effects of its stretching during pregnancy. It is imperative, therefore, to ensure that the new mother can maintain the contraction of the transverse muscle as she begins curl-ups or other motions that load the surface abdominal muscles. If the lower abdomen pops up or protrudes as she lifts her head or begins a curl-up, the transverse is not strong enough yet. She should continue with the hiss/compress exercise until she can maintain a flat abdomen when she lifts her head. Combining the Kegels contraction with the exhale and transverse contraction is also recommended.

After ensuring that the deep muscles are properly patterned (which may take from one day to a week or more), the new mother can begin loading the abdominus recti muscles by lifting her head and looking at her knees. If she can do this without pain and she has no persistent diastasis, she can begin abdominal strengthening exercises, paying attention to muscle fatigue and other kinesthetic cues such as pain or numbness. If she has a wide or a deep diastasis, she should splint her abdomen for a few weeks (see the description in the section on management in pregnancy) until it improves. If a diastasis does not improve, she should be referred to physical therapy for evaluation. Following cesarean birth, exercises for abdominal muscles may

Six-Week Postpartum/Return to Regular Exercise Medical Screening and Exercise Assessment

Fill this form out with your care provider and bring it to your instructor or trainer.

Name: _____ *Date: _____

Weeks postpartum: _____ Care Provider's Signature: _____

*Lochia (bleeding/flow due to the separation of the placenta): (circle one) Has ceased Has not ceased

What is the most vigorous activity you have done? _____

Any problems? _____

*Episiotomy: Discomfort? (circle one) Yes No

*Cesarean closure: Discomfort? (circle one) Yes No Numbness? (circle one) Yes No

*Pelvic relaxation: Are the pelvic bones stable? (circle one) Yes No

If not, describe: _____

Pelvic floor: Can you stop the flow of urine during a Kegel? (circle one) Yes No Don't know

Abdominal tone: Do this test: Inhale, relax abdomen. Exhale, hiss, and compress abdomen. Do a curl-up. Does your abdomen stay compressed? (circle one) Yes No, it bulges

*Conditions resulting from birth (and notes):

Diastasis _____

Symphysis separation _____

SI joint _____

Broken coccyx _____

Back pain _____

Lower body _____

Other _____

Milk production, if nursing: Any problems? _____

What do you do weekly in each of the following components:

Centering: _____

Cardiovascular or aerobic conditions: _____

Core strength: Hiss/compress _____ Curl-ups _____

Upper body strength: Upper back _____ Push-ups _____

Relaxation: _____

Realignment: _____

Mother-baby activities: _____

Support: _____

*Notes: _____

_____

*These items should be filled out by your care provider.

FIGURE 9-10 Six-week postpartum/return to regular exercise medical screening and exercise assessment.

Source: © 1993 Ann Cowlin.

be delayed one or two weeks, due to the need for the closure to heal properly before strain is placed on it.

Walking. During the first week to ten days, short walks of five or ten minutes once or twice a day are feasible for most women, providing there is no discomfort. Attention to nutrition and hydration should also be given a high priority in preparation for more extensive activity. Some women will be walking, or even jogging, 20 to 30 minutes at a time by the end of the third week and may be ready to start a special mother-infant class.

Returning to a Regular Exercise Regimen. Once a new mother can do Kegels and simple curl-ups and can walk a mile with no discomforts or complications, she is ready to begin a more structured regimen. Going slowly, working at an intensity and duration that does not produce discomfort or fatigue is critical. In practice, we find that women who were fit during their pregnancies commonly return to exercise between three and six weeks postpartum. The form shown in Figure 9-10 will be useful in assessing a woman's readiness for regular, sustained exercise.

Assessing and Evaluating the Exercise Program If a woman is enjoying her activities and she is feeling that she is stronger, healthy, and benefiting from her exercising, then the program can clearly be assessed as successful. Some postpartum conditions that should be recorded in assessing the impact of the postpartum exercise program include complications, depression or psychosis, mother and infant adjustment, discomforts, and recovery of reproductive organs.

In more and more postpartum group exercise classes, she can be with her baby and even incorporate the baby into some activities. This situation allows her to enhance her own well-being while also being an attentive mother.

In practice, women and infants enrolled in a mother-baby program tend to thrive under the direction of a well-trained instructor. Most likely this results from the phenomenon already noted: Women who have the support of other women during difficult periods have a better prognosis than women who do not have this support.

Returning to a Mainstream Exercise Program For some women, mainstreaming as soon as possible is a high priority. They may be very active women who want to be away from what they perceive as their exercise peer group for as short a time as possible. Or they may be returning to work and feel they need to be with a similar group for their exercise activities. If they also feel the need for group support, a weekend "stroller aerobics" class or a mothers' support group may be available in the area. Group support during this time is important, especially for first-time mothers.

Essential Exercise for Menopause

The connections between menopause, aging and disease, and physical activity have become particularly interesting topics in recent years. As modern improvements in sanitation, health care, and women's rights developed, women began regularly outliving their fertility. For some time, the mean age for natural menopause in the West has been around 51 years of age [272–275]. Now that women are regularly living into their seventies, eighties, and beyond, we are asking many new questions. Is menopause just an aspect of aging? Is the underlying mechanism of aging separate from the mechanisms of disease? It has been suggested that the underlying rate of aging is a distinct phenomenon from disease and that it begins in one's thirties [276]. If exercise helps prevent disease and ameliorate the effects of aging, can it also help prevent the disorders of menopause?

Hormonal changes, gravity, and sarcopenia (loss of muscle mass) appear to be major mechanisms in the effects of functional aging on the human body. Physiologic adaptations to exercise can offset the effects of these mechanisms to a degree, but while exercise appears to have direct impact on aging, its impact on menopause is more complex.

The Impact and Benefits of Exercise and Menopause

To have a meaningful discussion of the impact of exercise on menopause, it is necessary to alter our perspective. Although we will still focus on potential, we will look more closely at how the long-range effects of physical activity history begin to show up in a midlife woman's state of health. The quality of life for a menopausal woman will be as much—or more—a result of how she has lived her life to this point as what she chooses to do in the future. While some women are protected from heart

disease or diabetes by their exercise histories, some are at risk because of inactivity. Some women are at risk of osteoporosis because their exercise and nutrition histories produced adverse changes in their fertility, while others will have benefited from maintaining an energy balance. The loss of powerful estrogens that protect the heart, muscles, bones, and brain enter onto a preset stage.

Hormone Loss, Hormone Replacement, and Exercise

The idea that menopause is reproductive aging in women, or the physiological decline in the function of the hypothalamic-pituitary-ovarian (HPO) axis, is a twentieth-century concept. The view that this condition can be cured or treated through medical intervention—much like a disease such as Type I diabetes—has also been a popular perspective since the 1960s when Wilson published *Feminine Forever* [277] and advocated the wholesale use of estrogen replacement. A wide range of conditions—from heart disease and osteoporosis to autoimmune disorders and Alzheimer's—have been attributed to the loss of estrogen during the perimenopausal process, and it was believed that hormone replacement therapy offered a degree of protection from these conditions. But there is a cascade of complex, sex-specific, metabolic events for each of these conditions. In coronary artery disease (CAD), for example, the adverse effects of dyslipidemia— independent of the loss of estrogen protection—has been demonstrated through research explicating the role of diabetes in causing CAD in premenopausal women [278]. In order to elevate HDL and lose central obesity—two risk factors for CAD associated with dyslipidemia—women require exercise, unlike men who require only a proper diet [279]. During menopause, if we add estrogen in order to elevate HDL, the risk of endometrial cancer increases, so we must also add progesterone or testosterone. But, although estrogen is protective of HDL, progesterone and testosterone have the opposite effect.

Health benefits of exercise extend to menopausal women as they do to all populations. Specific benefits that accrue to this group include reduction in the risk of cardiovascular disease resulting from obesity, poor lipid profiles, insulin resistance and high blood pressure; limiting of bone loss and increases in balance and strength contributing to the prevention of falls and fractures; some reduction in cancer risk; and improvements in cognition and mood.

Cardiovascular Disease and Exercise. Each year about a half million women die of cardiovascular disease, and most of them are postmenopausal. The issue of whether or not an adequate and ongoing exercise history obviates the need for HRT in relation to heart disease is controversial. Clearly, cardiovascular or aerobic conditioning extends its benefits to midlife women. Strength training with its ability to increase muscle mass thus improves metabolic functions and takes on increasing importance as women age. Barriers to exercise exist for women in their perimenopausal years. Employment history can have a detrimental impact on both exercise participation and health risk factors. In one study, women approaching menopause who were employed both at baseline and three-year follow-up had the lowest HDL profile at follow-up, and those employed at baseline were less likely to increase exercise and more likely to gain weight than those who were not employed at baseline [280]. Threshold levels for activity may be dependent upon the nature of an individual's risk. One group of researchers found that walking five times per week for 20 to 30 minutes provided a dose effect that reduced levels of excess stored iron in previously sedentary postmenopausal women (significant increases of stored iron following menopause and excess stored iron are risk factors for coronary artery disease) [281].

The effect of HRT and aerobic exercise on blood pressure is not symmetrical. Researchers measured maximum oxygen consumption, waist-to-hip ratio (central obesity), waist circumference, casual and 24-hour BP, and daytime and nighttime systolic and diastolic BPs. They found that in active women VO_2 max was higher, waist-to-hip ratio and waist circumference lower, and that there were lower levels of casual, 24-hour and daytime systolic BP, lower daytime systolic BP loads (percentage of recordings >140/90), lower daytime and nighttime BP variabilities, and a reduced systolic BP response to submaximal exercise [282]. Women on HRT tended to have lower levels of 24-hour and nighttime diastolic BP, and smaller daytime and 24-hour diastolic BP loads [282]. After stepwise multiple regression analysis, the researchers determined that waist circumference was the primary predictor of most of the systolic BP-related cardiovascular risk factors, and that HRT was the best predictor for diastolic BP loads [282]. Other studies have shown either none or a small but statistically significant decrease in BP on HRT [283–285], and one study

demonstrated that a few women on HRT experienced increased BP [273].

Osteoporosis and Exercise. The greatest long-term impact of exercise on bone is its capacity to facilitate optimal peak development of bone mineral density (BMD) during the premenopausal years [286–295]. Participation in high-impact activities in young, healthy athletes results in the highest peak BMD [296, 297]. The effect of exercise on BMD in the perimenopausal and postmenopausal periods has been more difficult to assess. It appears that loading specific bones through strength-conditioning exercises can help delay mineral loss in those bones or, in postmenopausal women, produce small increases over time, as well as reducing the risk of fractures by lowering the incidence of falls [298–301].

BMD loss is greatest in the perimenopausal years; women may experience nearly half their bone loss before menopause actually occurs [302]. In the United States the rate of fracture of the proximal femur for white women rises abruptly between ages 40 and 44 [303]. White women have a lifetime risk rate of 15 percent for what is usually termed a *hip fracture*, but is actually a fracture in the neck or trochanters of the femur [304], while risk rates for Asian and African-American women are much lower. However, researchers studying Australian women of Asian descent concluded that ethnicity was not related to BMD in this group, but that clinical and lifestyle factors were [305]. A study of Taiwanese women concluded that physical activity played a major role in BMD levels in postmenopausal women [306]. In a number of cultural settings, exercise has a positive association with the BMD level of women in midlife and older years [307–311]. However, the American College of Sports Medicine (ACSM) warns against making a false assumption that exercise, or exercise and diet, can substitute for hormone replacement [312]. While a decline in activity level clearly results in profound loss of bone mass, the results of increased activity are slower and less clear. The ACSM notes that the results of cross-sectional studies have demonstrated a more positive effect of exercise on bone than prospective studies [312].

Cancer and Exercise. Following the development of synthetic estrogen in 1938, replacement therapy for natural and surgical menopause grew in practice. Beginning in 1975, strong evidence of the increased risk of endometrial cancer among users of unopposed conjugated estrogens began to be published [313–315]. Progestogen was added to estrogen to combat this effect and the term *hormone replacement therapy* (HRT) was born. Estrogen-dependent cancers (breast, ovarian, and endometrial) have etiologies that are not totally understood, although it does appear that estrogen is implicated in a process that stimulates the expression of estrogen receptor sites [316–318].

Heavy exercise may play a role in decreasing the risk of breast cancer. Changes in 4-hydroxycatecholestrogen metabolism in response to heavy exercise include changes that may undermine fertility, while preventing free radicals and exposure of breast epithelium to endogenous estrogens [319]. One study followed 25,624 women aged 20 to 54 at entry into the program over a mean period of 13.7 years [320]. Findings included a correlation between recreational exercise and breast cancer showing that the greater the leisure-time activities of the participants, the lower the risk of breast cancer. In regular exercisers, the reduction of risk was greater in premenopausal than in postmenopausal women. Risk was lowest in lean women (<22.8 BMI) who exercised at least four hours per week. Risk also was reduced with higher levels of activity at work.

Brain, Mind, Mood, and Exercise. The impact of exercise on mood in midlife is profound. A review of mood and symptom reporting found that both chronic and acute exercise had a positive effect on mood and reduced the level of somatic and vasomotor symptoms compared with nonexercisers, regardless of menopause status or whether or not the women were taking hormone replacement [321]. The degree of a woman's psychosomatic symptoms in perimenopause has been found to be inversely related to the degree of exercise from age 30 on. These researchers also concluded that the greater the degree of exercise from age 40 on, the less the degree of her symptoms after menopause, and that exercising moderately from the subjective point of view in the perimenopausal period may alleviate symptoms [322].

Hot flashes, or vasomotor symptoms, are experienced at some point by perhaps 80 or 90 percent of women with a changing gynecological status in the West [302, 323, 324]. Temperature regulation requires integration of autonomic, endocrine, and skeletomotor responses in the hypothalamus [325]. The sensation of being overheated is related to the metabolism of the neurotransmitter norepinephrine, which is mediated by estrogen in the hypothalamus.

With estrogen at a low ebb, malfunctions in the body's thermostat occur. The condition is aggravated by stress, which results in increased norepinephrine, and generally abates postmenopausally. In addition, the increasing level of follicle stimulating hormone causes altered signals concerning the internal temperature set point. The ability of exercise to contribute to stress management may well be a factor for reduction of vasomotor symptoms.

It seems possible that adequate levels of estrogen in the female brain are necessary for memory storage and learning new tasks [326]. The parietal lobes of the cerebral cortex—important for organizational thinking—are affected in early menopause by a changing estrogen concentration, and probably account for the reports of "fuzzy thinking" by midlife women. Alzheimer's disease (AD), while clearly related to estrogen levels, has many more dimensions than fuzzy thinking. (AD is discussed in the section on senescence.)

The Importance of Gravity in Exercise Spaceflight has provided interesting insight into the relationship between aging and changes in reproductive status, as well as into why weight-bearing and resistance exercise play critical roles in lessening the effects of aging and menopause. The factor influencing endocrine function during spaceflight appears to be the absence of gravity acting on the body. This factor affects a number of endocrine subsystems as well as bone demineralization, anemia, insulin resistance, and the sympathetic system [327]. Some endocrine systems—particularly those regulating bone and muscle metabolism and reproduction—undergo changes that resemble functional aging; however, recovery always occurs within weeks or months of the return to gravity [327]. Malfunction also occurs in space with immune, neurosensory, and cardiovascular systems [327]. Over many thousands of years, the human body has adapted to function in the force field of gravity. Antigravity exertion affects biochemical and biomechanical functions, playing a mitigating role in the development of symptoms associated with aging and menopause. No significant relationship has been found between the degree of exercise in life stages and the age at menopause [323]. However, large doses of strenuous exercise at a young age may result in the female athlete triad (see the section on adolescence) and acceleration of aging symptoms such as osteoporosis. The first menstrual irregularities in a healthy woman frequently appear when she is in her late forties, but asymptomatic hormonal fluctuations and anovulatory cycles begin sooner, often in her thirties. By perimenopause, she may be well into the period that triggers the need for concerted antigravity exertion to fend off the effects of menopause and aging.

Management of Exercise in Perimenopause

To help women incorporate exercise into their lifestyle during their menopausal transition, the following steps can be included in management procedures:

1. Establish a database
   - **a.** establish needs and make medical referrals
   - **b.** menopause, health, and nutritional status
   - **c.** exercise history and preferences
   - **d.** activity domain(s)
2. Screen
   - **a.** criteria for a stress test
   - **b.** indications for myocardial perfusion scintigraphy
   - **c.** special screening procedures
3. Make exercise recommendations
   - **a.** bone-loading resistance and/or impact training
   - **b.** weight-bearing aerobic or cardiovascular conditioning
   - **c.** centering, relaxation, and other stress-management activities
4. Assess and evaluate the exercise program

Establishing a Database When midlife women begin to exercise or enter organized fitness programs for the first time, it is critical to do efficient data collection in order to ensure safety. It is even necessary to gather information about women who have been active prior to menopause; assessing their life stage may cause women to refocus the intent of their physical activities. While efforts need to be made to acquire as much information as possible for safety reasons, some women—especially those with high levels of psychosocial risks or time constraints—may not tolerate extensive data collection. Nonmedical information may not be essential at first, especially if these women are not initially involved with vigorous exercise forms, but rather with gaining a sense of kinesthesia, body acceptance, or starting at a very low level of activity.

Establishing Needs and Making Medical Referral. Sometimes group programs are formulated around specific

concerns, goals, or purposes—for example, women who have been abused or want to lose weight or have had various cancers. Notations should be made when women are referred to organized exercise for health-related purposes. Their group instructor or personal trainer may request a medical referral or supply a form letter for this purpose. If a woman is motivated to participate in an activity because she perceives potential health and/or social benefits, it is still a good idea for her to have a referral or approval from a health care provider as a first step in ensuring that regular exercise is appropriate to her health status or needs. An example of a form that can be used for this purpose is shown in Figure 9-11. In all cases, a woman's motivation for participation should be noted. As always, the keys to compliance lie within meeting the desire or need.

Menopause, Health, and Nutritional Status. There are issues around dose-effect that depend upon a woman's particular menopause status and health status. For example, a former runner who is postmenopausal with osteoarthritis and high levels of stored iron may be asked to walk five days a week, rather than jog three days a week. Before making any recommendations, the midwife will look closely at the reproductive and health history of the individual woman.

In addition, nutrition plays a critical day-to-day role for an active menopausal woman. Factors such as calcium turnover require attention to a nutrient-dense diet. Adequate levels of the three macronutrients—protein, carbohydrate, and fat—are necessary, with attention to whole foods containing high levels of micronutrients, including vitamins and minerals. Sources of isoflavones, or plant-derived estrogen precursors (phytoestrogens), include soybeans, cashews, peanuts, almonds, oats, corn, wheat, apples, and melons as well as most fruits and vegetables to a lesser degree [328–330]. Water and other hydrating fluids are also important to maintaining a high central blood volume. A food diary—kept for several days or a week—will enable the midwife to assess the food and fluid intake of her midlife patients.

Exercise History and Preferences. To make sure that activities are appropriate for a given woman, having an exercise history and a record of activity preferences are essential pieces of information. Questions similar to those asked in the form shown in Figure 9-2 can be asked of perimenopausal women. Her exercise history and the domain (sports/exercise, active living, occupational, and household/caregiving) in which she is most active will also produce variables affecting the type and amount of activity in which she participates [294].

Activity Domain. Health care providers who promote physical activity in midlife women need to take into account differences in the demographic and psychosocial correlates of activity domain. It can be extremely useful for creative purposes and for helping women develop self-efficacy to know in which arenas a woman has experienced being physically active. Habitual movement patterns form a rich base from which to expand a woman's activity vocabulary. Asking questions about her domains of activity will provide a starting point. Such a form is shown in Figure 9-12.

Screening An exercise stress test, health and fitness assessments, and nutritional status assessment are screening procedures that are standards of practice used by fitness professionals in developing an exercise prescription. Sometimes a participant must be restricted or turned away from a vigorous group activity on the basis of findings, and referred to a clinical exercise setting.

Criteria for a Stress Test. The leading cause of death in the United States is myocardial infarction, with 63 percent of the women who die suddenly from acute coronary events having no prior symptoms or coronary artery disease [331]. While regular aerobic activity promotes heart health, intense activity in persons with heart disease can be fatal. For women over 50 and those with multiple cardiac risk factors, the American College of Sports Medicine recommends an exercise stress test (EST) prior to starting a vigorous exercise program [332].

Indications for Myocardial Perfusion Scintigraphy. Women with an intermediate likelihood of coronary artery disease may be referred for myocardial perfusion scintigraphy, a nuclear imaging technique that has been developed to overcome the limitations of EST. A multicenter study of emergency room protocol in which myocardial perfusion nuclear imaging was used reduced the rate of myocardial infarction from 1.8 to 0.1 percent in patients discharged with chest pain [333]. While this procedure is invasive and still not readily available, for women with the resources and the risk factors, it may prove a helpful procedure. The technique is also useful for the diagnosis of hyperthyroidism, including Graves' disease and postpartum thyroiditis.

Health Care Provider's Referral

Dear Health Care Provider: _____ Date: _____

Your patient _____ has contacted me to help her develop a program of physical activity appropriate for the condition(s) you have identified. To ensure safety and effectiveness in this endeavor, I request that you fill in the needed information, sign the referral form, and return it in the envelope provided.

I am referring this patient for physical activity due to the following condition(s): _____

_____

_____

It is appropriate for this patient to participate in the following exercise components, as long as they are appropriate to her age and fitness level:

____ Cardiovascular conditioning activities ____ Strength or resistance training

____ Flexibility exercises ____ Activities to improve balance and coordination

____ Stress management techniques (such as relaxation)

Regarding cardiovascular health, I consider this patient:

____ Class I: Presumably healthy without apparent heart disease

____ Class II: Presumably healthy with one or more risk factors for heart disease

____ Class III: Patient is not eligible for cardiovascular conditioning

Does this patient have any preexisting medical/orthopedic conditions not described above requiring continued or long-term medical treatment or follow-up? (circle one) Yes No

If yes, please describe: _____

_____

Please list any currently prescribed medications: _____

_____

Referring Provider's Signature: _____ Date: _____

Thank you for your time. Please feel free to contact me at any time should you have questions.

Sincerely,

FIGURE 9-11 Health care provider's referral.

Activity Domain Questionnaire

1. Do you have children? How many? When were they born? How were the births?

2. What did you do when they were toddlers?

3. What are your favorite memories (trips, games, events, etc.) of playing with your children?

4. If you don't have children, have you been around children? What do you remember doing with them?

5. Do you provide care for children, elderly parents, or others? Describe these activities. How much time do you spend doing this on a daily basis?

6. What are your most favorite and least favorite household tasks?

7. How much time do you spend each week on household tasks?

8. Do you do the grocery shopping? Do you carry your own bags?

9. Do you work? Describe your work activities. Are they light, fairly light, somewhat hard, hard, or very hard physically?

10. Do you play sports? Which ones? How many days per week do you play each activity? How long is each session?

11. Do you participate in recreational exercise? Describe the activity, including information about how many days per week, how much time per session, and how hard you work.

FIGURE 9-12 Activity domain questionnaire.

Special Screening Procedures. When women have had surgery, chemotherapy, and/or radiation treatments for breast cancer or have had a hysterectomy or other invasive procedures, the midwife must rely on the particular medical specialist to approve any physical activity. There are specialized fitness professionals who are trained to provide appropriate exercise programs for a number of special medical conditions, such as cancer recovery, diabetes, autoimmune disorders, and cardiac rehabilitation.

Making Exercise Recommendations A woman's own view of her gynecologic status [334], awareness of her personal value system [335], and access to appropriate educational materials [334–336] allow her to be confident that the chosen menopause plan of action is appropriate and promotes high levels of adherence, whatever the treatment of choice [336]. There is a need for public education that helps women interpret the information on health risks [337] and on how to achieve a healthy, active lifestyle within their particular domain, time, family, and individual constraints [338].

The variety of activity histories, predispositions, lifestyles, and life situations encountered in midlife women result in a vast array of effective exercise regimens for this population. During adolescence, the goal is to introduce girls to the myriad possibilities for an active life. During childbearing, all participants—regardless of variations in exercise history and body type—are involved in the same athletic event (pregnancy, birth, and recovery). But, at midlife we are confronted by huge differences in skill, functional capacity, and will.

There are common essential fitness needs that face this population, regardless of history or body type. For an ideal activity program aimed specifically at the needs of midlife women, essential components include bone-loading resistance and/or impact training two or three days per week, weight-bearing moderate intensity aerobic activity for 20 to 30 minutes five days per week, and centering, relaxation, and other stress management techniques as needed. Beyond this, many women are capable of many things. Some will be capable of only the minimum, and reaching them will produce the greatest gain in public health.

Bone-Loading Resistance and/or Impact Training. A major determinant of bone strength, mass, and microarchitecture is age [339] as well as loading; consequently it is important to participate in bone-loading training throughout the aging years. There is a concomitant loss of muscle strength and bone density in women between 45 and 65 irrespective of HRT, with loss of lower-body strength 50 percent greater than loss of upper-body strength [340]. It is critical that women are participating in activities that load bone, especially the spine, pelvis, and femurs, by their forties, to help minimize bone and muscle loss. Stretching can easily be incorporated into the strength routine, where it is most effective.

Both high-load and high-repetition regimens—with high load defined in one study as 80 percent of the weight that could be lifted once, with 8 repetitions (80 percent 1RM, 8 reps) and high repetition as 40 percent 1RM, with 16 reps—were shown effective for increases in muscle strength and size in early postmenopausal women. Neither regimen had significant increases in spine or hip BMD over a six-month period, with calcium supplementation to 1500 mg daily [341]. The threshold for an intensity that has an effect on bone may be sensitive to genetics [342] and sex [343].

Bone is also responsive to impact activities. In a five-year follow-up study of jumping in weighted vests, researchers found that the program helped prevent significant loss of femoral neck, trochanter, and total hip BMD in older postmenopausal women [344]. An exciting finding of this particular study was the long-term compliance of participants [344], indicating that a high-intensity, impact activity involving coordination skills can be challenging and interesting enough to retain women in their mid-to-late sixties.

Weight-Bearing Aerobics or Cardiovascular Conditioning. For most women, 20 or 30 minutes, almost every day, of rhythmic, repetitive motion that propels the whole body through space supported by the feet is beneficial. Most women are doing some activity that involves moving on their feet, so there is always a starting point, whether it is making beds, stacking inventory, or delivering the mail. Figure 9-13 categorizes various activities by METs—metabolic equivalents—providing a useful tool to locate the intensity of a woman's preferred or habitual activities.

Delineating appropriate intensity levels for midlife women includes consideration of prior activity level and medication use. Medications that may alter heart rates require following medical instructions, and relevant guidelines for cardiovascular intensity are absolutely necessary. Other medications, such as insulin, may also indicate a need for careful exercise planning.

METs

METs are a useful starting point for assessing the level of physical activity for a given individual. They are also helpful for locating an appropriate perceived exertion for moderate activity—for example, saying "Do this as if you were changing the sheets!"

Home Maintenance or ADL

Light Activities: 1–3 METs
Daily bed making
Driving a car
Ironing
Kneading dough
Light auto maintenance
Light cleaning (dusting, picking up, wiping)
Light meal preparation
Loading and unloading dishwasher
Mowing lawn (riding)
Peeling vegetables
Polishing furniture
Scrubbing pots and pans
Setting and clearing the table
Short errands (in the car)
Sweeping the floor
Washing a few dishes
Washing small clothes by hand
Watering the yard

Moderate Activities: 3–4 METs
Beating carpets
Cleaning windows
Grocery shopping/carrying bags
Hanging wash
Laundry (light loads)
Light carpentry
Light gardening
Light home repairs
Meal preparation
Mopping floors
Mowing lawn (light power mower)
Pushing wheelbarrow (with a 100-lb load)
Stocking shelves
Taking out trash containers on wheeled carts
Vacuuming
Wringing clothes by hand

Moderate Activities: 4–6 METs
Auto repair (moderate)
Bed making (changing sheets)
Heavy carpentry
Heavy gardening
Hoeing
Laundry (heavy loads)
Lifting more than 20 lbs.
Paper hanging
Raking leaves
Sawing soft wood
Shoveling light soil
Washing or painting walls
Washing ceilings
Washing or polishing car

Moderate Activities: 6–7 METs
Auto repair (heavy)
Mowing lawn (by hand)
Shoveling light snow
Splitting wood

Heavy Activities: 7–9 METs
Digging ditches
Sawing hardwood
Shoveling heavy snow
Tending furnace

Occupational

Light Activities: 1–2 METs
Auto driving
Clerical work
Computer operator
Desk work
Drafting
Electric calculating, machine operator
Light assembly line
Setting type
Typing/keyboarding computer
Watch repair

Light Activities: 2–3 METs
Assembly work
Auto repair (light)
Bartending
Janitorial work
Machine work
Radio repair
Shoe repair
Television repair
Typing

FIGURE 9-13 METs.
Sources: See references 332, 377, 378.

Moderate Activities: 3–4 METs
Bricklaying
Driving trailer truck in traffic
Machine assembly
Plastering
Sheet metal work
Stocking shelves (light objects)
Welding (medium load)

Moderate Activities: 4–5 METs
Auto repair (moderate)
Carpentry (light)
Hairstyling
Masonry
Painting
Paper hanging

Moderate Activities: 5–7 METs
Auto repair (heavy)
Carpentry (heavy)
Pneumatic tools
Sawing soft wood

Heavy Activities: 7–9 METs
Carrying up to 80 lbs
Digging ditches
Planing
Sawing hardwood
Tending furnace
Using a pick and shovel

Heavy Activities: 9 METs and over
Heavy labor
Lumberjack

Recreational

Light Activities: 1–2 METs
Attending a concert
Crocheting
Desk work
Flying in airplane
Knitting
Listening to music
Making a mosaic
Motorcycling
Movies
Needlework
Painting
Playing cards
Puzzles
Reading
Sewing
Table games
Television
Typing
Writing

Light Activities: 2–3 METs
Billiards
Block printing
Bowling
Calisthenics (very light)
Canoeing
Darts
Golfing
Horseback riding (walk)
Leather carving and stamping
Light woodworking
Macrame
Model building
Photography
Playing a musical instrument
Playing with children
Powerboat driving
Shuffleboard
Singing
Walking (level, 2 mph)

Moderate Activities: 3–4 METs
Archery
Badminton
Calisthenics (light)
Ceramics
Croquet
Cycling (light)
Fly fishing (standing with waders)
Golfing
Horseback riding (trot)
Horseshoes
Playing musical instruments (energetic)
Pottery
Rug hooking
Sailing (small boat)
Walking (3 mph)
Weaving (floor loom)
Woodworking (moderate)
Volleyball

Moderate Activities: 4–5 METs
Badminton (singles)
Calisthenics (many)
Cycling (8 mph)

FIGURE 9-13 METs. (*continued*)

Dancing
Golfing
Swimming
Table tennis
Tennis (doubles)
Walking (3.5 mph)

Moderate Activities: 5–6 METs
Backpacking (light)
Canoeing
Cycling (10 mph)
Gymnastics (moderate)
Hiking
Horseback riding
Ice skating (9 mph)
Roller skating (9 mph)
Soccer (light)
Softball
Stream fishing
Walking

Moderate Activities: 6–7 METs
Badminton (competitive)
Cycling (11 mph)
Dancing (vigorous)
Skiing
Ski touring (cross country)
Tennis (singles)
Walking (5 mph)
Water skiing

Heavy Activities: 7–9 METs
Basketball (moderate)
Canoeing (5 mph)
Cycling (12 mph)
Horseback riding (gallop)
Ice hockey
Jogging (5 mph)
Mountain climbing
Paddleball
Scuba diving
Skiing (vigorous downhill)
Sledding (tobogan)
Snowshoeing (slow)
Swimming (moderate)
Touch football

Heavy Activities: 8–9 METs
Basketball (vigorous)
Cycling (13 mph)
Fencing
Handball, squash
Rope jumping
Running (5.5 mph)
Ski touring (vigorous)

Heavy Activities: 10 METs and Over
Backpacking
Handball, squash (competitive)
Running (6 mph)
Ski touring (5 mph)
Snowshoeing (vigorous)

FIGURE 9-13 METs. (*continued*)

The moderately or highly fit woman may know her preferred heart rate and it may be above her age-predicted maximum, although well within an appropriate perceived exertion range. Medical clearance and liability waivers are necessary in this case. For a woman who has never exercised, learning certain skills is necessary, including recognizing signs of exertion (breathing changes, heat, alterations in awareness, fatigue), how to take her own pulse, and the assessment of her own level of exertion. Once her functional capacity has been assessed, appropriate intensities can be determined.

Centering, Relaxation, and Other Stress-Management Activities. Some women need to take a few minutes to center and clear their minds every day, while others only need relaxation activities on the weekend or to take an occasional yoga class. One study demonstrated that jogging and progressive relaxation, in eight-week programs, each independently reduced trait anxiety and improved self-efficacy for working women significantly and nondifferentially, with both benefits maintained at an eight-week follow-up [345].

Searching for clues to why different women experience more or less discomfort from the physiologic changes associated with menopause, psychosocial factors and their association with physical activity come to the fore [346–348]. Individuals who were successful at maintaining weight loss reported regular physical activity, self-monitoring, and coping skills [349] as their methodology. They also reported that there was a triggering event that precipitated the weight loss and that they often used structured programs to help them develop coping mechanisms [349]. While they have been criticized for not always being scientifically rigorous, socially oriented group weight

loss programs have the best record for enabling this long-term behavior change. Fitness professionals are borrowing from this model to effect positive physical activity changes for midlife women. One study has demonstrated that by reframing the psychosocial context, physical activity interventions can be made more relevant and thereby more effective for midlife women [350].

Assessing and Evaluating the Exercise Program For a woman with a history of exercise who is currently active, there may still be changes in her routine that will bring about greater health benefits. Perhaps she has osteoporosis but prefers swimming, or has urogenital prolapse problems but likes to play basketball. Are the changes necessary? How difficult will they be to make? Will they dramatically affect her quality of life? On the other hand, for women who are relatively inactive almost any increase in frequency, intensity, or duration of activity will bring benefits.

To determine if a program of activity is working for an individual woman, basic health issues may be the first step of assessment. Has health been maximized? Whatever the health risk factors are, have they been minimized? The second step may be to ask about quality of life issues. Is this woman as comfortable and as able as possible to cope with her life stressors and daily hassles? The evaluation of outcomes may take a little longer. To determine if midwives—together with other health care providers and fitness professionals—are promoting the health of midlife women will require epidemiologic assessment.

Exercise in the Senior Years

Following menopause a woman's body continues to make adjustments. During the later years of life, the aging process—sometimes referred to as *senescence* in this period—poses yet another set of challenges. An anthropological perspective on the changing body was given impetus by research conducted on postmenopausal women of the Hadza tribe in Tanzania. The theory proposed was that menopause is an evolutionary adaptation with advantages for women, their offspring, and the community, and that senior females who are not fertile provide a hunter-gatherer community with a desirable evolutionary advantage for offspring survival. By not tying the older females' contribution to their direct lineage, the researchers demonstrated that the superior ability of postmenopausal women to gather edible food and to maintain information that is useful over the long run (wisdom), benefited children in the extended family and the larger community [351].

The researchers' observations involved the ability of the older women to spend seven or eight hours a day in the strenuous job of gathering food. Once children become independent, if life is vigorous, might the need for the protection that estrogen provides during the childbearing and nurturing years (when physical activity is lessened for nursing infants and overseeing children's welfare) be unecessary? Given the contemporary trend toward sedentary existence, one is forced to inquire into the nature of postmenopausal disorders such as heart disease, loss of muscle mass, osteoporosis, and diabetes. Can these be as much disorders of aging in an unhealthy, sedentary population as the result of a change in reproductive status?

The Impact and Benefits of Exercise During Senescence

Of all groups, the elderly may respond more dramatically to the enhancements offered by physical conditioning than any other group. Aerobic and resistance (strength) training—especially in combination—result in significant gains in functional capacity, muscle mass, bone density and spontaneous activity [352]. Cardiovascular exercise significantly improves cardiovascular disease risk profiles in postmenopausal women, while results of HRT are somewhat mixed [353]. Increases in muscle mass through resistance training positively affect metabolism by slowing age-related sarcopenia. The basic muscle cell aging processes that result in sarcopenia, especially mitochondrial production of free radicals and their secondary effects, may help explain other adverse cellular changes [354]. Basic cell aging results from intrinsic changes in the cell but also from shifts in hormonal and neurotransmitter signals, affecting the response of skeletal muscle to exercise [354]. Consequently, both exercise and hormone replacement may be important mechanisms for slowing the age-related decline in protein turnover [355, 356].

Exercise and Muscle Enhancement Understanding the more subtle effects on muscle of acute or chronic exercise in the elderly is largely limited to studies on men, but these do provide some insight. Two studies tell us about the relationship of endurance

versus power (or speed) as men age. One study of sedentary men demonstrated that older males (ages 60 to 75) had significantly lower maximum oxygen uptake than their younger comparison group (age 30 or younger); however, endurance-related parameters were less diminished with aging than maximal capacity, and the researchers found age was associated with an increase in the relative magnitude of moderate submaximal exercise [357]. These findings concur with other findings that progressive resistance training in elderly men increases muscle cell size, strength, contractile velocity, and power in both slow- and fast-twitch muscle fibers; however, the changes are more pronounced in the slow-twitch, or endurance-related, muscle fibers [358]. Because activities of daily living (ADL) primarily involve slow-twitch muscle fibers, or endurance patterns of activity, the greater preservation of this function in the aging process may indicate a preference for slower or more fluid motion as a person ages. Unfortunately, quick or powerful motions, such as preventing a fall if one trips on a rug, become less quick or powerful in this scenario. Fortunately, these studies provide insight into the fact that quick motions can be improved by exercise, as we see in the case of reductions in falls when the elderly—including women—exercise.

Exercise and Relief of Discomforts The capacity of physical activity to relieve physical discomfort is exemplified by its beneficial effect on fibromyalgia—a condition primarily affecting midlife and older women in which tendons, ligaments, and muscles are painfully tender and that often involves fatigue and stiffness. Its symptoms are somewhat characteristic of autoimmune or inflammatory disorders. Maintaining one position for long periods is poorly tolerated by this population [359], so that movement is necessary. Exercise seems the most effective therapy [360], with stretching, strength training, and moderate cardiovascular activities proving helpful [361]. In addition, both land-based and aquatic exercise programs for individuals ages 45 to 70 with osteoarthritis of the knee produce improvements in range of motion, thigh strength, time for one-mile walk, and decreases in overall pain [362].

Collagen is responsible for the elastic quality of connective tissue in muscles and tendons, and persons with low levels are subject to connective tissue plasticity due to forced stretching, as well as reduced flexibility due to tightness. One study found low levels of collagen in the urogenital organs and skin of women with genital prolapse [363]. The postmenopausal women with prolapse also had impairment of pulmonary function and researchers concluded that the associating factor may be lack of collagen, as the lungs depend on abundant connective tissue for their capacity to expand and contract [363]. Another study looked at the effect of endurance exercise on passive stiffness via the alteration of elastic properties of collagen in older mice [364]. Our understanding of these factors is sufficient to make us aware that extreme stiffness, tightness, or damage from overstretching may be indications to check for prolapse and refer appropriate cases to physical therapy. In any case, pelvic floor exercises are indicated for older women, while high-impact activities may not be.

Exercise and the Brain That group exercise improves cognitive function and mood in older women as a transient phenomenon has been demonstrated [13]. Whether chronic exercise provides protection for disorders such as Alzheimer's remains to be elucidated. There are indications that estrogen is protective for Alzheimer's disease [302, 365–368]. It is well-accepted that there is an association between Alzheimer's and premature menopause. Because early menopause can be an autoimmune disorder, described by Northrup [302], this raises questions about whether estrogen loss is a cause of Alzheimer's or the ovarian failure that leads to both menopause and Alzheimer's are related to an autoimmune/inflammation disorder. The inflammatory component of AD, demonstrated by the protective role of NSAIDs [369–372], along with vascular pathologies and neurotoxic metabolism [371, 373, 374], join genetics as cofactors in this complicated disease.

Management of Exercise in Older Women

The steps involved in management of exercise in menopausal women can be used in the management of exercise for senior women. Tools are available to help determine the activity levels of older women [375]. When older, frail women are being referred to structured rehabilitation programs or research studies, screening and assessment will occur in the clinical setting. When making recommendations for activity, it is helpful to remember that for older women, developing muscle strength best predicts continued participation in structured exercise [376].

Summary

Throughout her life cycle, a woman who participates in regular, moderate exercise is providing herself with one of the best available defenses against disease and debilitation, as well as a chance to feel involved in wholesome and meaningful action. A midwife who understands how exercise protects health, and who develops the ability to support and monitor an adequate level of activity for each of the women in her practice, provides an important element in state-of-the-art care. During adolescence, pregnancy, the postpartum period, menopause, and senescence, women undergo physical and psychosocial experiences unique to each of these phases. For the midwife, each woman represents the opportunity to help an individual harness her growth potential by identifying needs and motivations, and by supporting the methods and rewards of being an active participant in life.

References

1. Blair, S. N., Kohl, H. W. III, Paffenbarger, R. S., Clark, D. G., Cooper, K. H., and Gibbons, L. W. Physical fitness and all-cause mortality: a prospective study of healthy men and women. *JAMA* 262:2395–2401, 1989.
2. U.S. Dept. of Health and Human Services. *Physical Activity and Health: A Report of the Surgeon General*. Atlanta, GA: HHS, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1996.
3. DiPeitro, L. Habitual exercise activity among women. In Bar-Or, O., Lamb, D. R., and Clarkson, P. M. (Eds.) *Perspectives in Exercise Science and Sports Medicine*, Vol. 9, *Exercise and the Female—A Life Span Approach*. Carmel, IN: Cooper Publishing Group, 1996.
4. Gillis, A., and Perry, A. The relationships between physical activity and health-promoting behaviours in mid-life women. *J. Adv. Nurs.* 16(3):299–310, 1991.
5. Ward, J. A., Lord, S. R., Williams, P., Anstey, K., and Zivanovic, E. Physiologic, health and lifestyle factors associated with femoral neck bone density in older women. *Bone* 16(4 Suppl.):373–378S, 1995.
6. Sampselle, C. M., Seng, J., Yeo, S. A., Killion, C., and Oakley, D. Physical activity and postpartum well-being. *JOGNN* 28(1):41–49, 1999.
7. Mosca, L., McGillen, C., and Rubenfire, M. Gender differences in barriers to lifestyle change for cardiovascular disease prevention. *J. Womens Health* 7(6):711–715, 1998.
8. Cooper, K. A. *Aerobics*. New York: Evans, 1968.
9. Benson, H., Beary, J. F., and Carol, M. P. The relaxation response. *Psychiatry* 37:37–46, 1974.
10. Moison, J., Meyer, F., and Gringras, S. Leisure physical activity and age at menarche. *Med. Sci. Sp. Exerc.* 23(10):1170–1175, 1991.
11. Pivarnik, J. M., et al. Physiological and perceptual responses to cycle and treadmill exercise during pregnancy. *Med. Sci. Sp. Exerc.* 23 (4):470–475, 1991.
12. Nelson, M. E., Fiatrarone, M. A., Morganti, C. M., et al. Effects of high-intensity strength training on multiple risk factors for osteoporotic fractures. *JAMA* 272(24):1909–1914, 1994.
13. William, P., and Lord, S. R. Effects of group exercise on cognitive functioning and mood in older women. *Austr. NZ J. Public Health* 21(1):45–52, 1997.
14. Gotlieb, B. H., and Sylvestre, J. C. Social support in the relationships between older adolescents and adults. In Nestmann, F., and Hurrelman, K. (Eds.), *Social Networks and Social Support in Childhood and Adolescence*, Berlin: de Gruyter, 1994.
15. Hirsch, B. J., Boerger, R., Levy, A. E., and Mickus, M. The social networks of adolescents and their mothers: Influences on Blacks and Whites in single- and two-parent families. In Nestmann, F., and Hurrelman, K. (Eds.) *Social Networks and Social Support in Childhood and Adolescence*. Berlin: de Gruyter, 1994.
16. Allen, J. P., Aber, J. L., and Leadbeater, B. J. Adolescent problem behaviors: the influence of attachment and autonomy. *Psychiatr. Clin. NA* 13:455–467, 1990.
17. Coates, D. L. Gender differences in the structure and support characteristics of black adolescents networks. *Sex Roles* 17:667–686, 1987.
18. Konopka, G. *Young Girls: A Portrait of Adolescence*. Englewood Cliffs, NJ: Prentice Hall, 1986.
19. Strommen, E. A. Friendship. In Donelson, E., and Gullahorn, J. (Eds.) *Women: A psychological perspective*. New York: Wiley, 1977.
20. Garbarino, J., Burston, N., Raber, S., Russell, R., and Crouter, A. The social map of children approaching adolescence. *J. Youth Adolesc.*

7:417–428, 1978.

21. Blyth, D. A., Hill, J. P., and Thiel, K. S. Early adolescents' significant others: grade and gender differences in perceived relationships with familial and nonfamilial adults and young people. *J. Youth Adolesc.* 11:425–450, 1982.

22. Chodorow, N. *Feminism and Psychoanalysis*. San Francisco: Jossey-Bass, 1992.

23. Collins, P. H. The meaning of motherhood in black culture and black mother/daughter relationships. *Sage* 4:3–10, 1987.

24. Wilson, M. N. The black extended family: an analytical consideration. *Develop. Psychol.* 22:246–258, 1986.

25. Dore, M. M., and Dumois, A. O. Cultural differences in the meaning of adolescent pregnancy. *J. Contemp. Human Serv.* 2:93–105, 1990.

26. Ramirez, O. Mexican American children and adolescents. In Gibbs and Huang (Eds.) *Children of Color: Psychological Interventions with Minority Youth*. San Francisco: Jossey-Bass, 1989.

27. Escobar, J. I., and Randolph, E. T. The Hispanic and social networks. In Becerra et al. (Eds.) *Mental Health and Hispanic Americans, Clinical Perspectives*. New York: Grune and Stratton, 1982.

28. Rhodes, J. E., and Davis, A. B. Nonparent adults and urban adolescent girls. In Leadbeater, B. J. R., amd Way, N. (Eds.) *Urban Girls*. New York: NYU Press, 1996.

29. Otis, C. L., Drinkwater, B. L., Johnson, M., Loucks, A. B., and Wilmore, J. H. American College of Sports Medicine stand: the female athlete triad. *Med. Sci. Sports. Exerc.* 29(5):i–ix, 1997.

30. Yeager, K. K., Agostini, R., Natiiv, A., and Drinkwater, B. The female athlete triad. *Med. Sci. Sports. Exerc.* 25:775–777, 1993.

31. Taylor, J. M. *Philosophical Arguments*. Cambridge, MA: Harvard University Press, 1995.

32. Hancock, E. *The Girl Within*. New York: Ballantine, 1990.

33. Jaffee, L., and Wu, P. After-school activities and self-esteem in adolescent girls. *Melpomene J.* (15)2:18–24,1996.

34. Jaffee, L., and Ricker, S. Physical activity and self-esteem in girls: the teen years. *Melpomene J.* (12)3:19–26, 1993.

35. Edwards, P., and Capella, A. *Self-esteem and Adolescent Women*. Ottawa: Canadian Teachers Federation and Canadian Association for the Advancement of Women and Sport and Physical Activity, 1992.

36. Dzewaltowski, D. A. Physical activity determinants: a social cognitive appproach. *Med. Sci. Sports Exerc.* 26:1395–1399, 1994.

37. Pender, N. J., Bar-Or, O., Wilk, B., and Mitchell, S. Self-efficacy and perceived exertion of girls during exercise. *Nurs. Res.* 51(2):86–91, 2002.

38. Sallis, J. F., Hovell, M. F., Hofstetter, C. R., et al. A multivariate study of determinants of vigorous exercise in a community sample. *Prev. Med.* 18:20–34, 1989.

39. Brown, K. M., McMahon, R. P., Biro, F. M., et al. Changes in self-esteem in black and white girls between the ages of 9 and 14 years. *J. Adolesc. Health* 23:7–19, 1998.

40. Lever, J. Sex differences in the games children play. *Social Problems*, 23:476–487, 1976.

41. Erkut, S., Fields, J. P., Almeida, D., DeLeon, B., and Sing, R. *Strength in Diversity*. New York: Girl Scouts of the USA, 1994.

42. Raglin, J. S., and Morgan, W. P. Influence of exercise and quiet rest on state anxiety and blood pressure. *Med. Sci. Sports Exerc.* 19(5):456–463, 1987.

43. Raglin, J. S., and Morgan, W. P. Influence of vigorous exercise on mood states. *Behav. Therapist* 8(9):179–183, 1985.

44. Morgan, W. P. Psychological effects of exercise. *Behav. Med. Update* 4(1):25–30, 1982.

45. Bahrke, M. S., and Morgan, W. P. Anxiety reduction following exercise and meditation. *Cogn. Therapy Res.*, 2(4):323–333, 1978.

46. Driscoll, R. Anxiety reduction using physical exertion and positive images. *Psych. Record* 26:87–94, 1976.

47. Morgan, W. P. *Influence of Acute Physical Activity on State Anxiety*. Proceedings of the National College Physical Education Association for Men, January 1973, pp. 114–121, 1973.

48. Brownell, K. D. Dieting and the search for the perfect body: Where physiology and culture collide. *Behav. Ther.* 22:1–12, 1991.

49. Brownell, K. D. Get slim with higher taxes (editorial). *New York Times*, December 15, p. A29, 1994.

50. Battle, E. K., and Brownell, K. D. Confronting a rising tide of eating disorders and obesity: treatment vs. prevention and policy. *Addictive Behav.* 21(6):755–765, 1996.

51. Striegel-Moore, R. Psychological factors in the etiology of binge eating. *Addictive Behav.* 20(6):713–723, 1995.

52. Warren, M. P. The effects of exercise on pubertal progression and reproductive function in girls. *J.*

Clin. Endocrinol. Metab. 51:1150–1157, 1980.

53. Jenkins, P. F., Obanez-Santos, X., Holly, J., et al. IGFBP-1: A metabolic signal associated with exercise-induced amenorrhea. *Neuroendocrinology* 57(4):600–604, 1993.

54. Brooks-Gunn, J., Warren, M. P., and Hamilton, L. H. The relation of eating problems and amenorrhea in ballet dancers. *Med. Sci. Sports Exerc.* 19(1):41–44, 1987.

55. Calabrese, L. H., and Kirkendall, D. T. Nutritional and medical considerations in dancers. *Clin. Sports Med.* 2(3):539–547, 1983.

56. Calabrese, L. H., Kirkendall, D. T., Floyd, M., et al. Menstrual abnormalities, nutritional patterns and body composition in female classical ballet dancers. *Physician Sports. Med.* 11:86–98, 1983.

57. Dale, E., Gerlack, D. H., and Wilhite, A. L. Menstrual dysfunction in distance runners. *Obstetr. Gynecol.* 54:47–53, 1979.

58. Erdelyi, G. J. Gynecological survey of female athletes. *J. Sports Med. Phys. Fitness* 2:174–197, 1962.

59. Feicht, C. B., Johnson, T. S., Martin, B. J., Sparkes, K. E., and Wagner, W. W. Jr., Secondary amenorrhea in athletes. *Lancet* 2:1145–1146, 1978.

60. Frisch, R. E., Gotz-Welbergen, A. V., McArthur, J. W., et al. Delayed menarche and amenorrhea of college athletes in relation to age of onset of training. *JAMA* 246:1559–1563, 1980.

61. Frisch, R. E., Wyshak, G., and Vincent, L. Delayed menarche and amenorrhea in ballet dancers. *N. Eng. J. Med.* 303:17–18, 1980.

62. Loucks, A. B., and Horvath, S. M. Athletic amenorrhea: a review. *Med. Sci. Sports Exerc.* 17(1):56–72, 1985.

63. Stager, J. M., Robertshaw, D., and Miescher, E. Delayed menarche in swimmers in relation to age at onset of training and athletic performance. *Med. Sci. Sports Exerc.* 16:550–555, 1984.

64. Nelson, D. P., and Chatfield, S. J. What do we know from the literature about the prevalence of anorexia nervosa in female ballet dancers? *J. Dance Med. Sci.* 2(1):6–13, 1998.

65. Constantini, N. W., and Warren, M. P. Menstrual dysfunction in swimmers: a distinct entity. *J. Clin. Endocrinol. Metab.* 80(9):2740–2744, 1995.

66. Gutin, B., Islam, S., Treiber, F., Smith, C., and Manos, T. Fasting insulin concentration is related to cardiovascular reactivity to exercise in children. *Peds.* 96(6):1123–1125, 1995.

67. Suter, E., and Hawes, M. R. Relationship of physical activity, body fat, diet, and blood lipid profile in youths 0–15 yr. *Med. Sci. Sports Exerc.* 25(6):748–754, 1993.

68. Gutin, B., Owens, S., Treiber, F., Islam, S., Karp, W., and Slavens, G. Weight-independent cardiovascular fitness and coronary risk factors. *Arch. Ped. Adolesc. Med.* 151(5):462–465, 1997.

69. Zonderland, M. L., Erich, W. B., Erkelens, D. W., et al. Plasma lipids and apoproteins, body fat distribution and body fatness in early pubertal children. *Intl. J. Obesity* 12(12):1039–1046, 1990.

70. Takahashi, Y., Minamitani, K., Kobayashi, Y., Minagawa, M., Yasuda, T., and Niimi, H. Spinal and femoral bone mass accumulation during normal adolescence: Comparison with female patients with sexual precocity and with hypogonadism. *J. Clin. Endocrinol. Metab.* 81:1248–1253, 1996.

71. Kroger, H., Kotaniemi, A., Kroger, L., and Alhava, E. Development of bone mass and bone density of the spine and femoral neck—a prospective study of 65 children and adolescents. *Bone and Miner.* 23:171–182, 1993.

72. Theintz, G., Buchs, B., Rizzoli, R., et al. Longitudinal monitoring of bone mass accumulation in healthy adolescents: Evidence for a marked reduction after 16 years of age at the levels of lumbar spine and femoral neck in female subjects. *J. Clin. Endocrinol. Metab.* 75:1060–1065, 1992.

73. Bonjour, J.-P. H., Theintz, G., Buchs, B., Slosman, D., and Rizzoli, R. Critical years and stages of puberty for spinal and femoral bone mass accumulation during adolescence. *J. Clin. Endocrinol. Metab.* 73:555–563, 1991.

74. Drinkwater, B. L., Bruemner, B., and Chestnut, C. H. Menstrual history as a determinant of current bone density in young athletes. *JAMA* 263:545–548, 1990.

75. Lloyd, T., Myers, C., Buchanan, J. R., and Demers, L. M. Collegiate women athletes with irregular menses during adolescence have decreased bone density. *Ob. Gyn.* 72:639–642, 1988.

76. Warren, M. P., Brooks-Gunn, J., Hamilton, L. H., Warren, L. F., and Hamilton, W. G. Scoliosis and fractures in young ballet dancers. *N. Eng. J. Med.* 314:1348–1353, 1986.

77. Calabrese, L. H., and Kirkendall, D. T. Nutritional and medical considerations in dancers. *Clin. Sports Med.* 2(3):539–547, 1983.

78. Nelson, M. E., Fisher, E. C., Catos, P. H., Meredith, C. N., Turksoy, R. N., and Evans, W. J. Diet and bone status in amenorrheic run-

ners. *Am. J. Clin. Nutr.* 43:910–916, 1986.

79. Welten, D. C., Kemper, H. C. G., Post, G. B., et al. Weight-bearing activity during youth is a more important factor for peak bone mass than calcium intake. *J. Bone Miner. Res.* 9(7):1089–1096, 1994.

80. Rosenfield, R. L. Normal and almost normal precocious variations in pubertal development, premature pubarche and premature thelarche revisited. *Hormone Res.* 41 (Suppl. 2):7–13, 1994.

81. Apter, D. Hormonal events during female puberty in relation to breast cancer risk. *Euro. J. Cancer Prev.* 5(6):476–482, 1996.

82. Moisan J., Meyer, F., and Gingras, S. Leisure physical activity and age at menarche. *Med. Sci. Sports Exerc.* 23(10):1170–1175, 1991.

83. Kramer, M., and Wells, C. Does physical activity reduce the risk of estrogen-dependent cancer in women? *Med. Sci. Sports Exerc.* 28:322–334, 1996.

84. Friedenreich, C. M., and Rohan, T. E. A review of physical activity and breast cancer. *Epidemiol.* 6(3):311–317, 1995.

85. Mittendorf, R., Longnecker, M. P., Newcomb, P. A., et al. Strenuous physical activity in young adulthood and risk of breast cancer. *Cancer Causes & Control* 6(4):347–353, 1995.

86. McTiernan, A., Stanford, J. L., Weiss, N. S., Daling, J. R., and Voigt, L. F. Occurrence of breast cancer in relation to recreational exercise in women age 50-64 years. *Epidemiol.* 7(6):598–604, 1996.

87. Kriska, A. M., Blair, S. N., and Pereira, M. A. The potential role of physical activity in the prevention of non-insulin-dependent diabetes mellitus: The epidemiological evidence. *Exerc. Sports Rev.* 22: 121–143, 1994.

88. Wing, R. R. Obesity and related eating and exercise behaviors in women. *Ann. Behav. Med.* 15:124–134, 1993.

89. Manson, J. E., Rimm, E. B., Stampfer, M. J., et al. Physical activity and incidence of non-insulin-dependent diabetes mellitus in women. *Lancet* 338:774–118, 1991.

90. Gutin, B., Owen S., Slavens, G., Riggs, S., and Treiber, F. Effects of physical training on heart-period variability in obese children. *J. Ped.* 130(6):938–943, 1997.

91. Epstein, L. H., Coleman, K. J., and Myers, M. D. Exercise in treating obesity in children and adolescents. *Med. Sci. Sports Exerc.* 28(4):428–435, 1996.

92. Ignico, A. A., and Mahon, A. D. The effects of a physical fitness program on low-fit children. *Res. Q. Exerc. Sport* 66(1)85–90, 1995.

93. Gutin, B., Cucuzzo, N., Islam, S., Smith, C., Moffatt, R., and Pargman, D. Physical training improves body composition of black obese 7-to-11-year-old girls. *Obesity Res.* 3(4):305–312, 1995.

94. Epstein, L. H., Baloski, A. M., Vara, L. S., et al. Effects of decreasing sedentary behavior and increasing activity on weight change in obese children. *Health Psychol.* 14(2):109–115, 1995.

95. Gutin, B., Cucuzzo, N., Islam, S., Smith, C., and Stachura, M. E. Physical training, lifestyle education and coronary risk factors in obese girls. *Med. Sci. Sports Exerc.* 28(1):19–23, 1996.

96. Rydall, A. C., Rodin, G. M., Olmsted, M. P., Devenyi, R. G., and Daneman, D. Disordered eating behavior and microvascular complications in young women with insulin-dependent diabetes mellitus. *N. Eng. J. Med.* 336(26):1849–1854, 1997.

97. Gottlieb, N. H., and Chen, M. Sociocultural correlates of childhood sporting activities: Their implications for heart health. *Soc. Sci. Med.* 21:533–539, 1985.

98. Sallis, J. F., Hovell, M. F., Hofstetter, C. R., et al. A multivariate study of determinants of vigorous exercise in a community sample. *Prev. Med.* 18:20–34, 1989.

99. Ford-Gilboe, M. Family strengths, motivation, and resources as predictors of health promotion behavior in single-parent and two-parent families. *Res. Nurs. Health* 20:205–217, 1997.

100. Barr, S. I. Associations of social and demographic variables with calcium intakes of high school students. *JADA* 94:260–266,269, 1994.

101. Lettieri, D. J., Nelson, J. E., and Sayers, M. A. (Eds.). NIAA treatment handbook series 2: alcoholism treatment assessment research instruments. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism, 1985.

102. Jackson, C., Bee-Gates, D. J., and Henriksen, L. Authoritative parenting, child competencies and initiation of cigarette smoking. *Health Ed. Q.* 21:103–116, 1994.

103. Poivka, B. J. Rural sex education: Assessment of programs and interagency collaboration. *Public Health Nurs.* 13:425–433, 1996.

104. In the author's conversations with health care workers and fitness instructors who serve the Hawaiian population, specific terms were identified as part of the culture of helping in

this ethnic group, and which girls learn primarily in the home. Hawaii Department of Health, Physical Activity Promotion Project Training Sessions, Honolulu, November 2000.

105. Blair, S. N. How to assess exercise habits and physical fitness. In Matarazzo, J. D., et al. (Eds.), *Behavioral Handbook of Health Enhancement and Disease Prevention*. New York: Wiley, 1984.

106. Blair, S. N., Haskell, W. L., et al. Assessment of habitual physical activity by a seven-day recall in a community survey and controlled experiments. *Am. J. Epidemiol.* 122:794–804, 1985.

107. Janz, K. F., Golden, J., Hansen, J., and Mahoney, L. Heart rate monitoring of physical activity in children and adolescents. *Pediatrics* 89:256–261, 1992.

108. Garcia, A. W., George, T. R., Coviak, C., Antonakos, C., and Pender, N. J. Development of the child/adolescent activity log: a comprehensive and feasible measure of leisure-time physical activity. *Intl. J. Behav. Med.* 4:324–339, 1997.

109. Godin, G., and Shephard, R. J. A simple method to assess exercise behavior in the community. *Can. J. Appl. Sport Sciences* 10(3):141–146, 1985.

110. Godin, G., Jobin, J., and Bouillon, J. Assessment of leisure time exercise behavior by self-report: a concurrent validity study. *Can. J. Public Health* 77:359–362, 1986.

111. Sallis, J. F., Buono, M. J., Roby, J. J., Micale, F. G., and Nelson, J. A. Seven-day recall and other physical activity self-reports in children and adolescents. *Med. Sci. Sports Exerc.* 25(1):99–108, 1993.

112. Aaron, D. J., Kriska, A. M., Dearwater, S. R., et al. The epidemiology of leisure physical activity in an adolescent population. *Med. Sci. Sports Exerc.* 25(7):847–853, 1993.

113. Aaron, D. J., Kriska, A. M., Dearwater, S. R., Cauley, J. A., Metz, K. F., and LaPorte, R. E. Reproducibility and validity of an epidemiologic questionnaire to assess past year physical activity in adolescent. *Am. J. Epidemiol.* 142(2):191–201, 1995.

114. Aaron, D. J., and LaPorte, R. E. Physical activity, adolescence, and health: an epidemiological perspective. *Exerc. Sport Sci. Rev.* 25:391–405, 1997.

115. McGraw, S. A., Stone, E. J., Osganian, S. K., et al. Design of process evaluation with the child and adolescent trial for cardiovascular health (CATCH). *Health Ed. Q.* (suppl. 2):S5–S26, 1994.

116. Liederbach, M. Screening for functional capacity in dancers: designing standardized dance specific injury prevent screening. *J. Dance Med. Sci.* 1(3):93–106, 1997.

117. Poggini, L., Lossasso, S., and Iannone, S. Injuries during the dancer's growth spurt: etiology, prevention, and treatment. *J. Dance Med. Sci.* 3(2):75–79, 1999.

118. Powell, J. W., and Barber-Foss, K. D. Sex-related injury patterns among selected high school sports. *Am. J. Sports Med.* 28(3):385–391, 2000.

119. Axem, N. H., Newcomb, W. A., and Warner, D. Sports injuries and adolescent athletes. *Delaware Med. J.* 63(6):359–363, 1991.

120. Backous, D. D., Friedl, K. E., Smith, N. J., Parr, T. J., and Carpine, W. D. Jr. Soccer injuries and their relation to physical maturity. *Am. J. Dis. Child.* 142(8):839–842, 1988.

121. McLain, L. G., and Reynolds, S. Sports injuries in a high school. *Pediatrics* 84(3):446–450, 1989.

122. Baker, M. M. Anterior cruciate ligament injuries in the female athlete. *J. Womens Health* 7(3):343–349, 1998.

123. Schultz, T. P. Investments in women, economic development, and improvements in health in low-income countries. *Ann. N Y Acad. Sci.* 569:288–310, 1989.

124. Zhang, J., and Savitz, D. A. Exercise during pregnancy among US women. *Ann. of Epidemiol.* 6(1):53–59, 1996.

125. McGinnis, J. M. The public health burden of a sedentary lifestyle. *Med. Sci. Sport Exerc.* 4:S196–200, 1992.

126. Carpenter, M. W., Sady, S. P., Hoegsberg, B., et al. Fetal heart rate response to maternal exertion. *JAMA* 259:3006–3009, 1988.

127. Clapp, J. F. III, and Dickstein, S. Endurance exercise and pregnancy outcome. *Med. Sci. Sports Exerc.* 16(6):556–562, 1984.

128. American College of Obstetricians and Gynecologists (ACOG). *Exercise During Pregnancy and the Postpartum Period*. Technical bulletin no. 189, February 1994.

129. Clapp, J. F. III. The athletic woman: a clinical approach to exercise during pregnancy. *Clin. Sp. Med.*, 13(2):443–458, 1994.

130. Hatch, M. C., Shu, X. O., McLean, D. E., et al. Maternal exercise during pregnancy, physical fitness, and fetal growth. *Am. J. Epidemiol.* 137(10):1105–1114, 1993.

131. McMurray, R. G., Mottola, M. F., Wolfe, L. A., et al. Recent advances in understanding maternal and fetal response to exercise. *Med. Sci. Sp. Exerc.* 25(12):1305–1321, 1993.

132. Clapp, J. F. III, and Rizk, K. Effect of recreational exercise on midtrimester placental growth. *Am. J. Obstet. Gynecol.* 167(6):1518–1521, 1992.

133. Jackson, M. R., Gott, P., Lyle, S. F., Ritchie, J. W., and Clapp, J. F. III. The effects of maternal aerobic exercise on human placental development: placental volumetric composition and surface areas. *Placenta* 16(2):179–191, 1995.

134. Clapp, J. F. III, et al. Beginning regular exercise in early pregnancy: effect on fetoplacental growth. *Am. J. Obstet. Gynecol.* 183:1484–1488, 2000.

135. Wolfe, L. A., Walker, R. M., Bonen, A., and McGrath, M. J. Effects of pregnancy and chronic exercise on respiratory responses to graded exercise. *J. Appl. Physiol.* 76(5):1928–1936, 1994.

136. Avery, N. D., Stocking, K. D., Tranmer, J. E., Davies, G. A., and Wolfe, L. A. Fetal responses to maternal strength conditioning exercises in late gestation. *Can. J. Appl. Physiol.* 24(4):362–376, 1999.

137. Clark, S. L., et al. Position change and central hemodynamic profile during normal third-trimester pregnancy and postpartum. *Am. J. Obstet. Gynecol.* 164(3):883–887, 1991.

138. Nesler, C. L., Hassett, S. L., Cary, S., and Brooke, J. Effects of supine exercise on fetal heart rate in the second and third trimester. *Am. J. Perinatol.* 5(2):159–163, 1988.

139. Cowlin, A. F. *Women's Fitness Program Development*. Champaign, IL: Human Kinetics Publishers, 2002, p. 102.

140. Yeo S., and Davidge S. T. Possible beneficial effect of exercise, by reducing oxidative stress, on the incidence of preeclampsia [review]. *J. Women's Health Gender-Based Med.* 10(10):983–989, 2001.

141. Napoli, C., and Lerman, L. O. Involvement of oxidation-sensitive mechanisms in the cardiovascular effects of hypercholesterolemia [review]. *Mayo Clin. Proc.* 76(6):619–631, 2001.

142. Yeo, S., Steele, N. M., Chang, M. C., Leclaire, S. M., Ronis, D. L., and Hayashi, R. The effect of exercise on blood pressure in pregnant women with a high risk of gestational hypertensive disorders. *J. Reprod. Med.* 45(4):293–298, 2000.

143. Longo, L. D., Hewitt, C. W., Lorijn, R. H. W., and Gilbert, R. D. To what extent does maternal exercise affect fetal oxygenation and uterine blood flow? Presented at the twenty-fifth annual meeting of soc. gynecol. investigation, Atlanta, *Science Abstracts*, 1978, p. 7.

144. Lotgering, F. K., Gilbert, R. D., and L. D. Longo. Exercise responses in pregnant sheep: oxygen consumption, uterine blood flow and blood volume. *J. Appl. Physiol. 55*:834–841, 1983.

145. Clapp, J. F. III. *Exercise in Pregnancy and the Postpartum Period: Review of Research Findings on Maternal and Fetal Outcomes*, Perinatal Health and Fitness Network Lecture Series, Yale–New Haven Hospital, June 25, 1994.

146. Pivarnik, J. M., Mauer, M. B., Ayres, N. A., et al. Effects of chronic exercise on blood volume expansion and hematologic indices during pregnancy. *Obstet. Gynecol.* 83(2):265–269, 1994.

147. Clapp, J. F. III, and Rizle, K. N. Effect of recreational exercise on mid-trimester placental growth. *Am. J. Obstet. Gynecol.* 167:1518–1521, 1992.

148. Baumann, H., Huch, A., and Huch, R. Doppler sonographic evaluation of exercise-induced blood flow velocity and waveform changes in fetal, uteroplacental and large maternal vessels in pregnant women. *J. Perinatol. Med.* 17:279–287, 1989.

149. Erkkola, R. U., Pirhonen, J. P., and Kivijarvi, A. K. Flow velocity waveforms in uterine and umbilical arteries during submaximal bicycle exercise in normal pregnancy. *Obstet. Gynecol.* 79:611–615, 1992.

150. Hackett, G. A., Cohen-Overbeek, T., and Campbell, S. The effect of exercise on uteroplacental Doppler waveforms in normal and complicated pregnancies. *Obstet. Gynecol.* 79:919–923, 1992.

151. Asakura, H., Nakai, A., Yamaguchi, M., et al. Ultrasonographic blood flow velocimetry in maternal and umbilical arteries during maternal exercise. *Acta Obstet. Gynaecol. Jpn.* 46:308–314, 1994.

152. Veille, J. C., Bacevice, A. E., Wilson, B., et al. Umbilical artery waveforms during bicycle exercise in normal pregnancy. *Obstet. Gynecol.* 73:957–996, 1989.

153. Veille, J. C. Maternal and fetal cardiovascular response to exercise during pregnancy. *Semin. Perinatol.* 20(4):250–262, 1996.

154. Bonnin, P., et al. Evidence of fetal cerebral vasodilation induced by submaximal maternal exercise in human pregnancy. *J. Perinatol. Med.* 25(1):63–70, 1997.

155. Clapp, J. F. III, Stepanchak, W., Tomaselli, J., Kortan, M., and Faneslow, S. Portal vein blood flow—effects of pregnancy, gravity and exercise. *Am. J. Obstet. Gynecol.* 183(1):167–172, 2000.

156. Saltin, B. et al. Response to exercise after bed rest and after training. *Circulation* 38 (suppl 2):1–78, 1968.

157. Maloni, J. A., et al. Physical and psychosocial side effects of antepartum hospital bed rest. *Nurs. Res.* 42(4):197, 1993.

158. Schroeder, C. A. Women's experience of bed rest in high-risk pregnancy. *Image* 28(3):253–258, 1996.

159. Vanheest, J. L., and Rodgers, C. D. Effects of exercise on diabetic rats before and during gestation on maternal and neonatal outcomes. *Am. J. Physiol.* 273(4, Pt. 1):E727–733, 1997.

160. Houghton, P. E., Mottola, M. F., Messapelli, J., Vandermolen, R., and Christopher, P. D. Glycogen storage in fetuses of trained pregnant rats. *Can. J. Appl. Physiol.* 22(4):384–393, 1997.

161. Webb, K. A., Wolfe, L. A., and McGrath, M. J. Effects of acute and chronic maternal exercise on fetal heart rate. *J. Appl. Physiol.* 77:2207–2213, 1994.

162. Clapp, J. F. III, Little, K. D., and Capeless, E. L. Fetal heart rate response to sustained recreational exercise. *Am. J. Obstet. Gynecol.* 168:198–206, 1993.

163. Clapp, J. F., Rokey, R., and Treadway, J. I., et al. Exercise in pregnancy. *Med. Sci. Sp. Exerc.* 24:S294–300, 1992.

164. Bung, P., Huch, R., and Huch A. Maternal and fetal heart rate patterns: a pregnant athlete during training and laboratory exercise tests; a case report. *Eur. J. Obstet. Gynecol. Reprod. Biol.* 39:59–62, 1991.

165. Artal, R., Romen, Y., Rutherford, S., et al. Fetal heart rate response to maternal exercise. *Am. J. Obstet. Gynecol.* 155:729–733, 1986.

166. Clapp, J. F. III. Fetal heart rate response to running in mid-pregnancy and late pregnancy. *Am. J. Obstet. Gynecol.* 153:251–252, 1985.

167. Hauth, J. C., Gilstrap, L. C., and Widmer, K. Fetal heart rate reactivity before and after maternal jogging during the third trimester. *Am. J. Obstet. Gynecol.* 142:545–547, 1982.

168. O'Neill, M. E. Maternal rectal temperature and fetal heart rate response to upright cycling in later pregnancy. *Br. J. Sports Med.* 30(1):32–35, 1996.

169. Manders, M. A., et al. The effects of maternal exercise on fetal heart rate and movement patterns. *Early Hum. Devel.* 48(3):237–247, 1997.

170. Watson, W. J., et al. Fetal responses to maximal swimming and cycling exercise during pregnancy. *Obstet. Gynecol.* 77(3):382–386, 1991.

171. Artal, R. M., and Posner, M. D. Fetal responses to maternal exercise. In Mittlmark, R., Wiswell, R., and Drinkwater, B. (Eds.), *Exercise in Pregnancy*, 2nd ed. Baltimore, MD: Williams and Wilkins, 1991.

172. Sjostrom, K., Valentin, L., Thelin, T., and Marsal, K. Maternal anxiety in late pregnancy and fetal hemodynamics. *Eur. J. Obstet. Gynecol. Reprod. Biol.* 74(2):149–155, 1997.

173. Groome, L. J., Swiber, M. J., Bentz, L. S., Holland, S. B., and Atterbury, J. L. Maternal anxiety during pregnancy: effect on fetal behavior at 38 to 40 weeks gestation. *J. Dev. Behav. Pediatr.* 16(6):391–396, 1995.

174. American College of Obstetricians and Gynecologists. *Exercise during pregnancy and the postnatal period*. May, 1985. Since these conservative guidelines were issued, the American College of Obstetricians and Gynecologists (ACOG) has twice revised its recommendations. The first revision was in 1994 (see reference 128). The second, issued in 2002, is referred to as the *ACOG committee opinion: Exercise during pregnancy and the postpartum period*.

175. Edwards, M. J. Hyperthermia as a teratogen: a review of experimental studes and their clinical significance. *Teratogenesis Carcinog. Mutagen.* 6:563–582, 1986.

176. Milunsky, A., et al. Maternal heat exposure and neural tube defects. *JAMA* 268:882–885, 1992.

177. Mittlemark, R., Wiswell, R. A., and Drinkwater, B. L. *Exercise in Pregnancy*, 2nd ed. Baltimore, MD: Williams and Wilkins, 1990.

178. Clapp, J. F. III, Wesley, M., and Sleamaker, R. H. Thermoregulatory and metabolic responses to jogging prior to and during pregnancy. *Med. Sci. Sports Exerc.* 19:124–130, 1987.

179. McMurray, R. G., Meyer-Goodwin, W. E., and Cefalo, R. C. Thermoregulation of pregnant women during aerobic exercise on land and in the water. *Am. J. Perinatol.* 10(2):178–182, 1993.

180. Metzger, B. E., and Freinkel, N. Effects of diabetes mellitus in the endocrinologic and the metabolic adaptation of gestation. *Semin. Perinatol.* 2:309–318, 1978.

181. Magee, M. S., Walden, C. E., and Benedetti, T. J. Influence of diagnostic criteria on the incidence of gestational diabetes and perinatal morbidity. *JAMA* 269(5):609–615, 1993.

182. Bung, P., and Artal, A. Gestational diabetes and exercise: a survey. *Semin. Perinatol.* 20(4):328–333, 1996.

183. Bjorntorp, P., Fahlen, M., Grimby, G., et al. The effects of physical training and acute physical work on plasma insulin in obesity.

Eur. J. Clin. Invest. 2:274–278, 1972.

184. Pederson, O., Beck-Nielson, H., and Heding, L. Increased insulin receptors after exercise in patients with diabetes mellitus. *N. Eng. J. Med.* 302:886–892, 1980.

185. Burstein, R., Polychronakos, C., Toews, C. J., et al. Acute reversal of the enhanced insulin action in trained athletes. *Diabetes* 34:756–760, 1985.

186. DeFonzo, R. A., Sherwin, R. S., and Kraemer, N. Effect of physical training on insulin action in obesity. *Diabetes* 36:1379–1385, 1987.

187. Bogardus, C., Ravussin, E., Robbins, D. C., et al. Effects of physical training and diet therapy on carbohydrate metabolism in patients with glucose intolerance and non-insulin-dependent diabetes mellitus. *Diabetes* 33:311–318, 1984.

188. Bung, P., et al. Therapeutic exercise for insulin-requiring gestational diabetics—results of a randomized prospective longitudinal study. *J. Perinatol. Med.* 21:125–137, 1993.

189. Jovanovic-Peterson, L., Durak, E. P., and Peterson, C. M. Randomized trial of diet versus diet plus cardiovascular conditioning on glucose levels in gestational diabetes. *Am. J. Obstet. Gynecol.* 161:415–419, 1989.

190. Sandoval-Rodiriguez, T., Partida-Hernandez, C. G., and Arreola-Ortiz, F. Diabetes mellitus. Exercise and pregnancy [Spanish]. *Ginecol. Obstet. de Mexico* 65:478–481, 1997.

191. Metzger, B. E. Summary and recommendations of the Third International Workshop-Conference on Gestational Diabetes Mellitus. *Diabetes* 40:197–201, 1991.

192. Jovanovic-Peterson, L., and Peterson, C. M. Exercise and the nutritional management of diabetes during pregnancy. *Obstet. Gynecol. Clin. North Am.* 23(1):75–86, 1996.

193. Weller, K. A. Diagnosis and management of gestational diabetes. *Am. Family Physician* 53(6):2053–2057,2061, 1996.

194. Clapp, J. F. III, and Little, K. D. Effect of recreational exercise on pregnancy weight gain and subcutaneous fat deposition. *Med. Sci. Sports Exerc.* 27(2):170–177, 1995.

195. Hatch, M. C., Shu, X. O., McLean, D. E., et al. Maternal exercise during pregnancy, physical fitness and fetal growth. *Am. J. Epidemiol.* 137(10):1105–1114, 1993.

196. Collings, C. A., Curet, L. B., and Mullin, J. P. Maternal and fetal responses to a maternal exercise program. *Am. J. Obstet. Gynecol.* 145:702–707, 1983.

197. Kulpa, P. J., White, B. M., and Visscher, R. Aerobic exercise in pregnancy. *Am. J. Obstet. Gynecol.* 156:1395–1403, 1987.

198. Clapp, J. F. III, and Kiess, W. Effects of pregnancy and exercise on concentrations of the metabolic markers tumor necrosis factor alpha and leptin. *Am. J. Obstet. Gynecol.* 182(2):300–306, 2000.

199. Gutersohn, A., Naber, C., Muller, N., Erbel, R., and Siffert, W. G protein beta3 subunit 825 TT genotype and post-pregnancy weight retention [letter]. *Lancet* 355(9211):1240–1241, 2000.

200. Laatikainen, T. J. Corticotropin-releasing hormone and opioid peptides in reproduction and stress. *Ann. Med.* 23(5):489–496, 1991.

201. Magiakou, M. A., Mastorakos, G., Webster, E., and Chrousos, G. P. The hypothalamic-pituitary-adrenal axis and the female reproductive system. *Ann. NY Acad. Sci.* 816:42–56, 1997.

202. Rauramo, I., Andersson, B., and Laatikaines, T. J. Stress hormones and placental steroids in physical exercise during pregnancy. *Br. J. Obstet. Gynecol.* 89:921–925, 1982.

203. Berkowitz, G. S., Kelwey, J. L., Holford, T. R., and Berkowitz, R. L. Physical activity and risk of spontaneous preterm delivery. *J. Reprod. Med.* 28(90):581–588, 1983.

204. DaCosta, D., Brender, W., and Larouche, J. A prospective study of the impact of psychosocial and lifestyle variables on pregnancy complications. *J. Psychosom. Obstet. Gynecol.* 19(1):28–37, 1998.

205. Neter, E., Collins, N. L., Lobel, M., and Dunkel-Schetter, C. Psychosocial predictors of postpartum depressed mood in socioeconomically disadvantaged women. *Womens Health* 1(1):51–75, 1995.

206. Herrara, J. A., Alvarado, J. P., and Restrepo, W. Prenatal biopsychosocial risk and preeclampsia (Spanish). *Atencion Primaria* 16(9):552–555, 1995.

207. Paarlberg, K. M., Vingerhoets, A. J., Passchier, J., Heinen, A. G., Dekker, G. A., and van Geijn, H. P. Psychosocial factors as predictors of maternal well-being and pregnancy-related complaints. *J. Psychosom. Obstet. Gynecol.* 17(2):93–102, 1996.

208. Copper, R. L., Goldenberg, R. L., Das, A., et al. The preterm prediction study: maternal stress associated with spontaneous preterm birth at less than thirty-five weeks' gestation. National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. *Am. J. Obstet. Gynecol.* 175(5):1286–1292, 1996.

209. Hickey, C. A., Cliver, S. P., Goldenberg, R. L., McNeal, S. F., and Hoffman, H. J. Relationship of psychosocial status to low prenatal weight gain among nonobese black and white women delivering at term. *Obstet. Gynecol.* 86(2):177–183, 1995.

210. Shiono, P. H., Rauh, V. A., Park, M., Lederman, S. A., and Zuskar, D. Ethnic differences in birthweight: the role of lifestyle and other factors. *Am. J. Public Health* 87(5):787–793, 1997.

211. Bullock, L. F., Wells, J. E., Duff, G. B., and Hornblow, A. R. Telephone support for pregnant women: outcome in late pregnancy. *NZ Med. J.* 108(1012):476–478, 1995.

212. Zimmer-Gembeck, M. J., and Helfand, M. Low birth weight in a public prenatal care program: behavioral and psychosocial risk factors and psychosocial intervention. *Soc. Sci. Med.* 43(2):187–197, 1996.

213. Both unpublished data and anecdotal accounts covering 1982–1993 in the Dancing Thru Pregnancy®, Inc. program evaluation files give clear indication of the importance of the group setting for prenatal exercise. More than 95 percent of clients responding to confidential evaluation forms and interviews report that being with other pregnant women was one of the most important parts of the program. As part of the same surveys, reports of complications, as measured by need for cesarean birth, were well below local and national percentages for all time periods surveyed.

214. Berger, B. G., and Owen, D. R. Stress reduction and mood enhancement in four modes: swimming, body conditioning, Hatha yoga and fencing. *Res. Q. Exerc. Sport* 59(2):148–159, 1988.

215. Morgan, W. P. The mind of the marathoner. *Psychology Today* 11(11):38–40, 1978.

216. Giguere, V., Yange, N., Segui, P., and Evans, R. M. Identification of a new class of steroid hormone receptors. *Nature* 331:91–94, 1988.

217. Vamvakopoulos, N. C., and Chrousos, G. P. Evidence of estrogenic regulation of human corticotropin-releasing hormone gene expression. *J. Clin. Invest.* 92:1896–1902, 1993.

218. Bateman, A., Singh, A., Kral, T., and Solomon, S. The immune-hypothalamic-pituitary-adrenal axis. *Endocrinol. Rev.* 10:92–112, 1989.

219. Kincade, P. W., Medina, K. L., and Smithson, G. Sex hormones as negative regulators of lymphopoiesis. *Immunol. Rev.* 137:119–134, 1994.

220. Gabrilova, J., Zadjelovic, J., Osmak, M., et al. NK cell activity and estrogen hormone levels during normal human pregnancy. *Gynecol. Obstet. Invest.* 15:167–172, 1988.

221. Thong, Y. H., Steele, R. W., Vincet, M. M., Hensen, S. A., and Bellanti, J. A. Impaired in vitro cell-mediated immunity to rubella virus during pregnancy. *N. Eng. J. Med.* 289:604–606, 1973.

222. Wang, H. S., Kanzaki, H., Tokushige, M., Sato, S., Yoshida, M., and Takahide, M. Effect of ovarian steroids on the secretion of immunosuppressive factors from human endometrium. *Am. J. Obstet. Gynecol.* 158:629–637, 1988.

223. Sulke, A. N., Jones, D. B., and Wood, P. J. Variation in natural killer activity in peripheral blood during the menstrual cycle. *Br. Med. J.* 290:884–886, 1985.

224. Kemp, J. G., Greer, F. A., and Wolfe, L. A. Acid-base regulation after maximal exercise testing in late gestation. *J. Appl. Physiol.* 83(2):644–651, 1997.

225. Ohtake, P. J., and Wolfe, L. A. Physical conditioning attenuates respiratory responses to steady-state in late gestation. *Med. Sci. Sports Exerc.* 30(1):17–27, 1998.

226. Bayliss, D. A., and Millhorn, D. E. Central neural mechanisms of progesterone action: application to the respiratory system. *J. Appl. Physiol.* 73:393–404, 1992.

227. Sweigard, L. *Human Movement Potential; Its Ideokentic Facilitation*. New York: UPA, 1974.

228. Bunker, L. K., Rotella, R. J., and Reilly, A. S. *Sport Psychology: Psychological Considerations in Maximizing Sport Performance*. London: Movement Publishers, 1985.

229. Loehr, R. D., et al. The ideal performance state, Sci Period on Res Tech Sp, Canada: Gov't of Canada BU-1, January 1983.

230. Bahrke, M. S., and Morgan, W. P. Anxiety reduction following exercise and meditation. *J. Cogn. Ther. Res.* 2(4):323–333, 1987.

231. North, et al. Effects of exercise on depression. *Exerc. Sports Sci. Rev.* 18:379–415, 1990.

232. Andrews, C. M., and O'Neill, L. M. Use of pelvic tilt exercise for ligament pain relief. *J. Nurse-Midwifery* 39(6):370–374, 1994.

233. Fuller, A. K., and Robinson, M. E. A test of exercise analgesia using signal detection theory and a within-subjects design. *Percep. Motor Skills* 76:1299–1310, 1993.

234. Guieu, R., et al. Nociceptive threshold and physical activity. *Can. J. Neurol. Sci.* 19:69–71, 1992.

235. Ostgaard, H. C., Zetherston, G., Roos-Hanssen, E., and Svanberg, B. Reduction of

back and posterior pelvic pain in pregnancy. *Spine* 19(8):894–900, 1994.

236. Schwarz, L., and Kinderman, W. Beta-endorphin, adrenocorticotropic hormone, cortisol and catecholamines during aerobic and anaerobic exercise. *Eur. J. Appl. Physiol.* 61:165, 1990.

237. Steptoe, A., et al. Aerobic fitness, physical activity and psychophysiological reactions to mental tasks. *Psychophysiol.* 27(3):264–274, 1990.

238. Kandel, E. R., Schwartz, J. H., and Jessell, T. M. *Principles of Neural Science*, 3rd ed. Norwalk, CT: Appleton and Lange, 1991, p. 681.

239. Annett, J. Imagery and skill acquisition. In Denis, M. (Ed.), *Cognitive and Neuropsychological Approaches to Mental Imagery*. New York: Nijhoff, 1988.

240. Feldenkrais, M. *Awareness Through Movement*. New York: Harper and Row, 1977.

241. Savoyant, A. Mental practice: image and mental rehearsal of motor action. In Denis, M. (Ed.), *Cognitive and Neuropsychological Approaches to Mental Imagery*. New York: Nijhoff, 1988.

242. Salmon, P., Miller, R., and Drew, N. C. Women's anticipation and experience of childbirth: the independence of fulfillment, unpleasantness and pain. *Br. J. Med. Psych.* 63(3):255–259, 1990.

243. Clapp, J. F. III. The effects of maternal exercise on early pregnancy outcome. *Am. J. Obstet. Gynecol.* 161(6):1453–1457, 1989.

244. Lokey, E. A., Tran, Z. V., Wells, C. L., Myers, B. C., and Tran, A. C. Effects of physical exercise on pregnancy outcomes: a meta-analytic review. *Med. Sci. Sports Exerc.* 23(11):1234–1239, 1991.

245. Botkin, C., and Driscoll, C. E. Maternal aerobic exercise: newborn effects. *Fam. Pract. Res. J.* 11(4):387–393, 1991.

246. Clapp, J. F. III. The course of labor after endurance exercise during pregnancy. *Am. J. Obstet. Gynecol.* 163(6):1799–1805, 1990.

247. Hall, D. C., and Kaufmann, D. A. Effects of aerobic and strength conditioning on pregnancy outcomes, *Am. J. Obstet. Gynecol.* 157(5):1199–1203, 1987.

248. Bungum, T. J., Peaslee, D. L., Jackson, A. W., and Perez, M. A. Exercise during pregnancy and type of delivery in nulliparae. *J. Obstet. Gynecol. Neonatal Nurs.* 29(3):258–264, 2000.

249. Koniak-Griffin, D. Aerobic exercise, psychological well-being and physical discomforts during adolescent pregnancy. *Res. Nurs. Health* 17(4):253–263, 1994.

250. Lee, S. H., and Grubbs, L. M. A comparison of self-reported self-care practices of pregnant adolescents. *Nurs. Pract.* 18(9):25–29, 1993.

251. Dieterich, L. Assessment and development of adolescent childbirth education (CBE) to improve health behaviors. *J. Perinatal Ed.* 6(1):25–33, 1997.

252. Verhoef, M. J., and Love, E. J. Women and exercise participation: the mixed blessings of motherhood. *Health Care Women Intl.* 15:297–306, 1994.

253. Harris, H. E., Ellison, G. T., and Clement, S. Do the psychosocial and behavioral changes that accompany motherhood influence the impact of pregnancy on long-term weight gain? *J. Psychosom. Obstet. Gynecol.* 20(2):65–79, 1999.

254. Carter-Nolan, P. L., Adams-Campbell, L. L., and Williams, J. Recruitment strategies for black women at risk for noninsulin-dependent diabetes mellitus into exercise protocols: a qualitative assessment. *J. Natl. Med. Assoc.* 88(9):558–562, 1996.

255. Moran, C. F., Holt, V. L., and Martin, D. P. What do women want to know after childbirth? *Birth* 24(1):27–34, 1997.

256. Devine, C. M., Bove, C. F., and Olson, C. M. Continuity and change in women's weight orientations and lifestyle through pregnancy and the postpartum period: the influence of life trajectories and transitional events. *Soc. Sci. Med.* 50(4):567–582, 2000.

257. Capeless, E. L., and Clapp, J. F. When do cardiovascular parameters return to their preconception values? *Am. J. Obstet. Gynecol.* 165(4):883–886, 1991.

258. Clapp, J. F. III. *Report on Postpartum Exercise*, Second Yale Conference on Women's Health and Fitness, Yale University, New Haven, CT, 2000.

259. Dewey, K. G., Lovelady, C. A., Nommsen-Rivers, L. A., McCrory, M. A., and Lonnerdal, B. A randomized study of the effects of aerobic exercise by lactating women on breast milk volume and composition. *N. Eng. J. Med.* 330(7):449–453, 1994.

260. Lovelady, C. A., Lonnerdal, B., and Dewey, K. B. Lactation performance of exercising women. *Am. J. Clin. Nutr.* 52:103–109, 1990.

261. Hale, R. W., and Milne, L. The elite athlete and exercise in pregnancy. *Semin. Perinatol.* 20(4):277–284, 1996.

262. Wallace, J. P., and Rabin, J. The concentration of lactic acid in breast milk following maximal

exercise. *Intl. J. Sports Med.* 3:328–331, 1991.

263. Wallace, J. P., and Rabin, J. The accumulation of lactic acid in mother's milk following maximal exercise. *Med. Sci. Sports Exerc.* 18:S47, 1986.

264. Wallace, J. P., Inbart, G., and Ernsthausen, K. Infant acceptance of postexercise breast milk. *Pediatrics* 89(6):1245–1247, 1992.

265. Carey, G. B., Quinn, T. J., and Goodwin, S. E. Breast milk composition after exercise of different intensities. *J. Hum. Lact.* 13(2):115–120, 1997.

266. Fly, A. D., Uhlin, K. L., and Wallace, J. P. Major mineral concentrations in human milk do not change after maximal exercise testing. *Am. J. Clin. Nutr.* 68(2):345–349, 1998.

267. Gregory, R. L., Wallance, J. P., Gfell, L. E., Marks, J., and King, B. A. Effect of exercise on milk immunoglobulin A. *Med. Sci. Sports Exerc.* 29(12):1596–1601, 1997.

268. Dewey, K. G. Effects of maternal caloric restriction and exercise during lactation. *J. Nutr.* 128(2 suppl.):S386–389, 1998.

269. Little, K. D., and Clapp, J. F. III. Self-selected recreational exercise has no impact on early postpartum lactation-induced bone loss. *Med. Sci. Sports Exerc.* 30(6):831–836, 1998.

270. In the author's practice, the most common client comment on evaluation forms and personal communications from clients is that exercising in the group was the most critical factor for maintaining a sense of well-being in the postpartum period.

271. Koltyn, K. E., and Schultes, S. S. Psychological effects of an aerobic exercise session and a rest session following pregnancy. *J. Sports Med. Phys. Fitness* 37(4):287–291, 1997.

272. McKinlay, S. M., and McKinlay, J. B. The impact of menopause and social factors on health. In Hammod, C. P., Hazeltine, F. P., and Schiff, I. (Eds.), *Menopause: Evaluation, Treatment, and Health Concerns*. New York: Alan R. Liss, 1989, pp. 137–162.

273. Whelan, E. A., Sandler, D. P., McConnaughy, D. R., and Weinberg, C. R. Menstrual and reproductive characteristics and age at natural menopause. *Am. J. Epidemiol.* 131(4):635–628, 1990.

274. Brambilla, D. J., and McKinlay, S. M. A prospective study of factors affecting age at menopause. *J. Clin. Epidemiol.* 42(11):1031–1039, 1989.

275. McKinlay, S. M., Jefferys, M., and Thompson, B. An investigation of the age at menopause. *J. Biosoc. Sci.* 4:161, 1972.

276. Sehl, M. E., and Yates, F. E. Kinetics of human aging: I. Rates of senescence between ages 30 and 70 years in healthy people. *J. Gerontol.* Series A, *Biol. Sci. Med. Sci.* 56(5):B198–208, 2001.

277. Wilson, R. A. *Feminine Forever*. New York: Evans, 1966.

278. Sowers, J. R. Diabetes mellitus and cardiovascular disease in women. *Arch. Intern. Med.* 158(6):617–621, 1998.

279. Legato, M. Gender-specific aspects of obesity. *Intl. J. Fertil. Womens Med.* 42(3):184–197, 1997.

280. Ickovics, J. R., Morrill, A. C., Meilser, A. W., Rodin, J., Bromberger, J. T., and Matthews, K. A. Employment and coronary risk in women at midlife: a longitudinal analysis. *Am. J. Epidemiol.* 143(2):144–150, 1996.

281. Naimark, B. J., Read, A. E., Sawatzky, J. A., et al. Serum ferritin and heart disease: the effect of moderate exercise on stored iron levels in postmenopausal women. *Can. J. Cardiol.* 12(12):1253–1257, 1996.

282. Stevenson, E. T., Davy, K. P., Jones, P. P., Desouza, C. A., and Seals, D. R. Blood pressure risk factors in healthy postmenopausal women: physical activity and hormone replacement. *J. Appl. Physiol.* 82(2):652–660, 1997.

283. Hassager, C., and Christiansen, C. Blood pressure during estrogen/progestogen substitution therapy in healthy postmenopausal women. *Maturitas* 9:315, 1988.

284. Sullivan, J. M., Vander Sqaag, R., Lemp, G. F., Hughes, J. P., et al. Postmenopausal estrogen use and coronary atherosclerosis. *Ann. Intern. Med.* 198:358, 1988.

285. Wren, B. G., and Routledge, A. D. The effect of type and dose of estrogen on the blood pressure of postmenopausal women. *Maturitas* 5:135, 1983.

286. Bass, S., Pearce, G., Bradney, M., et al. Exercise before puberty may confer residual benefits in bone density in adulthood: studies in active prepubertal and retired female gymnasts. *J. Bone. Min. Res.* 13(3):500–507.

287. Armstrong, A. L., and Wallace, W. A. The epidemiology of hip fractures and methods of prevention. *Acta Orthopaedica Belgica* 60 (suppl. 1): 85–101, 1994.

288. Baran, D. T. Magnitude and determinants of premenopausal bone loss. *Osteoporosis Int.* 4 (suppl. 1):31–34, 1994.

289. Christiansen, C. Prevention and treatment of osteoporosis: a review of different methods. *Ugeskrift for Laeger* 155(31):2383–2386, 1993.

290. Devogelaer, J. P., and Nagant de Deuxchaisnes, C. Osteoporosis; a review. *Br. J. Rheumatol.* 32 (suppl. 4):48–55, 1993.

291. Eisman, J. A., Kelly, P. J., Morrison, N. A., et al. Peak bone mass and osteoporosis prevention. *Osteoporosis Int.* (3 suppl.):56–60, 1993.

292. Notelovitz, M. Osteoporosis: screening, prevention, and management. *Fertil. Steril.* 59(4):707–725, 1993.

293. Seitz, M. Osteoporosis—prevention and therapy. *Therapeutische Umschau.* 51(6):410–417, 1994.

294. Suominen, H. Bone mineral density and long-term exercise; an overview of cross-sectional athlete studies. *Sports Med.* 16(5):316–330, 1993.

295. Ravnikar, V. A. Diet, exercise, and lifestyle in preparation for menopause. *Obstet. Gynecol. Clin. North Am.* 20(2):365–378, 1993.

296. Dook, J. F., James, C., Henderson, N. K., and Price, F. I. Exercise and bone mineral density in mature female athletes. *Med. Sci. Sports Exerc.* 29(3):291–296, 1997.

297. Taafe, D. R., Robinson, T. L., Snow, C. M., and Marcus, R. High-impact exercise promotes bone gain in well-trained female athletes. *J. Bone Min. Res.* 12(2):255–260, 1997.

298. Petranick, K., and Berg, K. The effects of weight training on bone density of premenopausal, postmenopausal and elderly women: a review. *J. Strength Cond. Res.* 11(3):200, 1997.

299. Nelson, M. E., Fiatrone, M. A., Morganti, C. M., et al. Effects of high-intensity strength training on multiple risk factors for osteoporotic fractures. *JAMA* 272(24):1909–1914, 1994.

300. Simkin, A., Ayalon, J., and Leichter, I. Increased trabecular bone density due to bone-loading exercise in postmenopausal osteoporotic women. *Calcif. Tissue Int.* 40:59–63, 1987.

301. Shimegi, S., Yanagita, M., Okano, H., et al. Physical exercise increases bone mineral density in postmenopausal women. *Endocrinol. J.* 41(1):49–56, 1994.

302. Northrup, C. *Women's Bodies, Women's Wisdom*. New York: Bantam, 1994, p. 444.

303. Wallace, W. A. The increasing incidence of fractures of the proximal femur; an orthopaedic epidemic. *Lancet* 1413–1414, 1983.

304. Avioli, L. Osteoporosis: a growing national health problem. *Female Patient* 17:84, 1992.

305. Larcos, G., and Baillon, L. B. An evaluation of bone mineral density in Australian women of Asian descent. *Australasian Radiol.* 42(4):341–343, 1998.

306. Chien, M. Y., Wu, Y. T., Yang, R. S., Lai, J. S., and Hsu, A. T. Physical activity, physical fitness, and osteopenia in postmenopausal Taiwanese women. *J. Formosan Med. Assoc.* 99(1):11–17, 2000.

307. Heikkinen, J., Kyllonen, F., Kurttila-Matero, E., et al. HRT and exercise: effects on bone density, muscle strength and lipid metabolism. A placebo controlled 2-year prospective trial on two estrogen-progestin regimens in healthy postmenopausal women. *Maturitas* 26(2):139–149, 1997.

308. Goto, S., Shigeta, H., Hyakutake, S., and Yamagata, M. Comparison between menopause-related changes in bone mineral density of the lumbar spine and the proximal femur in Japanese female athletes: a long-term longitudinal study using dual x-ray absorptiometry. *Calcif. Tissue Int.* 59(6):461–465, 1996.

309. Parra-Cabrera, S., Hernandex-Avila, M., Tamayo-y-Orozoco, J., Lopez-Carrillo, L., and Meneses-Gonzalez, F. Exercise and reproductive factors as predictors of bone density among osteoporotic women in Mexico City. *Calcif. Tissue Int.* 59(2):89–94, 1996.

310. Ueda, A., Yoshimura, N., Morioka, S., Kasamatsu, T., Kinoshita, H., and Hasimoto, T. A population based study on factors related to bone mineral density in Wakayama Prefecture. *Jpn. J. Pub. Health* 43(1):50–61, 1996.

311. Cheng, S., Suominen, H., Rantanen, T., Parkatti, T., and Heikkinen, E. Bone mineral density and physical activity in 50–60 year old women. *Bone Min.* 12:123–132, 1991.

312. American College of Sports Medicine position stand: osteoporosis and exercise. *Med. Sci. Sports Exerc.* 27(4):i–vii, 1995.

313. Ziel, H., and Finkle, W. Increased risk of endometrial carcinoma among users of conjugated estrogens. *N. Eng. J. Med.* 293:1167–1170, 1975.

314. Mack, T., Picke, M., Henderson, B., et al. Estrogens and endometrial cancer in the U.S. *N. Eng. J. Med.* 294:1262, 1976.

315. Weiss, N., Szekely, D., and Austin, F. Increasing incidence of endometrial cancer in the United States. *N. Eng. J. Med.* 294:1259, 1976.

316. Chien, C. H., Wang, F. F., and Hamilton, T. C. Transcriptional activation of c-myc protooncogene by estrogen in human ovarian cancer cells. *Mol. Cell Endocrinol.* 99(1):11–19, 1994.

317. Galtier-Dereure, F., Capony, F., Mandelonde, T., and Rochefort, H. Estradiol stimulates cell

growth and secretion of procathepsin D and a 120 kilodalton protein in the human ovarian cancer cell line BG-1. *J. Clin. Endocrinol. Metab.* 75(6):1467–1502, 1992.

318. Bernstein, L., Ross, R. K., and Henderson, B. E. Relationship of hormone use to cancer risk. *Monogr. Natl. Cancer Inst.* (12):137–147, 1992.

319. DeCree, C., Van Kranenberg, G., Guerten, P., Fujimori, Y., and Keizer, H. A. 4-Hydroxycatecholestrogen metabolism responses to exercise and training: possible implications for menstrual cycle irregularities and breast cancer. *Fertil. Steril.* 67(3):505–516, 1997.

320. Thune, I., Brenn, T., Lund, E., and Gaard, M. Physical activity and the risk of breast cancer. *N. Eng. J. Med.* 336(18):1269–1275, 1997.

321. Slaven, L., and Lee, C. Mood and symptom reporting among middle-aged women: the relationship between menopausal status, hormone replacement therapy, and exercise participation. *Health Psychol.* 16(3):203–208, 1997.

322. Ueda, M., and Tokunaga, M. Effects of exercise experienced in the life stages on climacteric symptoms for females. *J. Physiol. Anthropol. Appl. Hum. Sci.* 19(4):181–189, 2000.

323. Kronenberg, F. Hot flashes: epidemiology and physiology. *Ann. N Y Acad. Sci.* 592:52–86, 1990.

324. McKinlay, S. M., and Jefferys, M. The menopausal syndrome. *Br. J. Prevent. Soc. Med.* 28(2):108, 1974.

325. Kandel, E. R., Schwartz, J. H., and Jessell, T. M. *Principles of Neural Science*, 3rd ed. Norwalk, CT: Appleton and Lange, 1991, pp. 752–753.

326. Barinaga, M. Watching the brain remake itself. *Science* (December 2):1475–1476, 1994.

327. Strollo, F. Hormonal changes in humans during spaceflight. *Adv. Space Biol. Med.* 7:99–129, 1999.

328. Taafe, D. R., Robinson, T. L., Snow, C. M., and Marcus, R. High-impact exercise promotes bone gain in well-trained female athletes. *J. Bone Min. Res.* 12(2):255–260, 1997.

329. Petranick, K., and Berg, K. The effects of weight training on bone density of premenopausal, postmenopausal, and elderly women: a review. *J. Strength Cond. Res.* 11(3):200, 1997.

330. Nelson, M. E., Fiatrone, M. A., Morganti, C. M., et al. Effects of high-intensity strength training on multiple risk factors for osteoporotic fractures. *JAMA* 272(24):1909–1914, 1994.

331. American Heart Association. '97 Update debunks cardiovascular disease myths [press release]. Dallas, TX: AHA, NR 97-4488, 1997.

332. American College of Sports Medicine. *Guidelines for Exercise Testing and Prescription*, 6th ed. Baltimore, MD: Williams and Wilkins, 2000.

333. Janowitz, W. R., Nateman, D. R., and Ziffer, J. A. Nuclear imaging facilitates patient care at chest pain center. *Diagn. Imaging* 20(12):C13–14, 1998.

334. Bastian, L. A., Courchman, G. M., Rimer, B. K., McBride, C. M., Feagames, J. R., and Siegler, I. C. Perceptions of menopausal stage and patterns of hormone replacement therapy use. *J. Womens Health* 6(4):467–475, 1997.

335. O'Connor, A. M., Tugwell, P., Wells, G. A., et al. A decision aid for women considering hormone therapy after menopause: decision support framework and evaluation. *Patient Ed. Counsel* 33(3):267–279, 1998.

336. Rothert, M. L., Holmes-Rovner, M., Rovner, D., et al. An educational intervention as decision support for menopausal women. *Res. J. Nurs. Health* 20(5):377–387, 1997.

337. Giardina, E. G. Call to action: cardiovascular disease in women. *J. Womens Health* 7(1):37–43, 1998.

338. DiPietro, L. Habitual physical activity among women. In Bar-Or, O., Lamb, D. R., and Clarkson, P. M. (Eds.), *Perspectives in Exercise Science and Sports Medicine,* Vol. 9, Exercise and the Female—A Life Span Approach. Carmel, IN: Cooper Publishing Group, 1996.

339. Mosekilde, L. Age-related changes in bone mass, structure, and strength—effects of loading [review]. *Zeitschrift fur Rheumatol* 59 (suppl.) 1:1–9, 2000.

340. Humphries, B., Triplett-McBride, T., Newton, R. U., Marshall, S., et al. The relationship between dynamic isokinetic and isometric strength and bone mineral density in a population of 45 to 65 year old women. *J. Sci. Med. Sport.* 2(4):364–374, 1999.

341. Bemben, D. A., Fetters, N. L., Bemben, M. G., Nabavi, N., and Koh, E. T. Musculoskeletal responses to high- and low-intensity resistance training in early postmenopausal women. *Med. Sci. Sports Exerc.* 32(11):1949–1957, 2000.

342. Woods, D., Onambele, G., Woledge, R., et al. Anti-tensin-I converting enzyme genotype-dependent benefit from hormone replacement therapy in isometric muscle strength and bone

mineral density. *J. Clin. Endocrinol. Metabol.* 86(5):2200–2204, 2001.

343. Hohsi, A., Watanabe, H., Chiba, M., and Inaba, Y. Bone density and mechanical properties in femoral bone of swim loaded aged mice. *Biomed. Environ. Sci.* 11(3):243–250, 1998.

344. Snow, C. M., Shaw, J. M., Winters, K. M., and Witske, K. A. Long-term exercise using weighted vests prevents hip bone loss in postmenopausal women. *J. Gerontol.*, Series A, 55(9):M489–491, 2000.

345. Long, B. C., and Haney, C. J. Coping strategies for working women: aerobic exercise and relaxation interventions. *Behav. Ther.* 19:75–83, 1988.

346. Dennerstein, L., Dudley, E., Guthrie, J., and Barrett-Connor, E. Life satisfaction, symptoms, and the menopausal transition. *Medscape Womens Health* 54(4):E4, 2000.

347. Ueda, M., and Tokunaga, M. Effects of exercise experienced in the life stages on climacteric symptoms for females. *J. Physiol. Anthropol. Appl. Hum. Sci.* 19(4):181–189, 2000.

348. Morse, C. A., Dudley, E., Guthrie, J., and Dennerstein, L. Relationships between premenstrual complaints and perimenopausal experiences. *J. Psychosom. Obstet. Gynecol.* 19(4):182–191, 1998.

349. Klem, M. L., Wing, R. R., McGuire, M. T., Seagle, H. M., and Hill, J. O. A descriptive study of individuals successful at long-term maintenance of substantial weight loss. *Am. J. Clin. Nutr.* 66:239–246, 1997.

350. Segar, M. L. *Fitting in Fitness: Midlife Women Reframe Physical Activity and Remain Active.* Paper presented at the Third Yale Conference on Women's Health and Fitness, New Haven, CT, 2000.

351. Hawkes, K., O'Connell, J. F., and Blurton-Jones, N. G. Hadza women's time allocation, offspring provisioning and the evolution of long postmenopausal life spans. *Current Anthropol.* 38(4):551–577, 1997.

352. Evans, W. J. Exercise training guidelines for the elderly. *Med. Sci. Sports Exerc.* 31(1):12–17, 1999.

353. Haddock, B. L., Marshak, H. P., Mason, J. J., and Blix, G. The effect of hormone replacement therapy and exercise on cardiovascular disease risk factors in postmenopausal women. *Sports Med.* 29(1):39–49, 2000.

354. Navarro, A., Lopez-Cepero, J. M., and Sanchez del Pino, M. J. Skeletal muscle and aging. *Frontiers Biosci.* 6:D26–44, 2001.

355. Short, K. R., and Nair, K. S. The effect of age on protein metabolism. *Curr. Op. Clin. Nutr. Metab. Care* 3(1):39–44, 2000.

356. Moulias, R., Meaume, S., and Raynaud-Simon, A. Sarcopenia, hypermetabolism, and aging. *Zeitschrift Gerontol. Geriat.* 32(6):25–32, 1999.

357. Neder, J. A., Jones, P. W., Nery, L. E., and Whipp, B. J. The effect of age on the power/duration relationship and the intensity-domain limits in sedentary men. *Eur. J. Appl. Physiol.* 82(4):326–332, 2000.

358. Trappe, S., Williamson, D., Godard, M., Porter, D., Rowden, G., and Costill, D. Effect of resistance training on single muscle fiber contractile function in older men. *J. Appl. Physiol.* 89(1):143–152, 2000.

359. Waylonis, G. W., Ronan, P. G., and Gordon, C. A profile of fibromyalgia in occupational environments. *Am. J. Phys. Med. Rehabil.* 73:112–115, 1994.

360. Perlmutter, C., and Goldstein, L. The truth about fibromyalgia. *Prevention* 49:86–91, 1997.

361. Roozen, M. M. Training individuals with fibromyalgia. *Strength Cond.* 20(2):64–66, 1998.

362. Wyatt, F. B., Milam, S., Manske, R. C., and Deere, R. The effects of aquatic and traditional exercise programs on persons with knee osteoarthritis. *J. Strength Cond. Res.* 15(3):337–340, 2001.

363. Strinic, T. Disorders of pulmonary ventilation function in patients with genital prolapse postmenopause. *Lijecnicki Vjesnik* 121(3):78–81, 1999.

364. Gosselin, L. E., Adams, C., Cotter, T. A., McCormick, R. J., and Thomas, D. P. Effect of exercise training on passive stiffness in locomotor skeletal muscle: role of extracellular matrix. *J. Appl. Physiol.* 85(3):1011–1016, 1998.

365. Legato, M. J. *Gender-Specific Aspects of Human Biology for the Practicing Physician.* Armonk, NY: Futura, 1997.

366. Henderson, V. W., Paganini-Hill, A., Emanuel, C. K., Dunn, M. E., and Buckwalter, J. G. Estrogen replacement therapy in older women: comparisons between Alzheimer's disease cases and nondemented control subjects. *Arch. Neurol.* 51:896–900, 1994.

367. Kawas, C., Resnick, S., Morrison, A., et al. A prospective study of estrogen replacement therapy and the risk of developing Alzheimer's disease: the Baltimore Longitudinal Study of Aging. *Neurology* 48:1517–1521, 1997.

368. Paganini-Hill, A., and Henderson, V. W. Estrogen replacement therapy and the risk of Alzheimer's disease. *Arch. Int. Med.* 156:2214–2217, 1996.

369. Vane, J. R., and Botting, R. M. Mechanisms of action in anti-inflammatory drugs. *Int. J. Tissue React.* 20(1):3–15, 1998.

370. Stewart, W. F., Kawas, C., Corraa, M., and Metter, E. J. Risk of Alzheimer's disease and duration of NSAID use. *Neurology* 48(3):626–632, 1997.

371. de la Torre, J. C. Cerebromicrovascular pathology in Alzheimer's disease compared to normal aging. *Gerontology* 43(1–2):26–43, 1997.

372. Rich, J. B., Rasmusson, D. X., Folstein, M. F., Carson, K. A., Kawas, C., and Brandt, J. Nonsteroidal anti-inflammatory drugs in Alzheimer's disease. *Neurology* 45(1):51–55, 1995.

373. Reiter, R. J., Carneiro, R. C., and Oh, C. S. Melatonin in relation to cellular antioxidative defense mechanisms. *Horm. Metab. Res.* 29(8):363–372, 1997.

374. Crawford, J. G. Alzheimer's disease risk factors as related to cerebral blood flow. *Med. Hypotheses* 46(4):367–377, 1996.

375. DiPietro, L., Williamson, D. F., Caspersen, C. J., and Eaker, E. A survey for assessing physical activity among older adults. *Med. Sci. Sports Exerc.* 84:14–19, 1993.

376. William, P., and Lord, S. R. Predictors of adherence to a structured exercise program for older women. *Psychol. Aging* 10(4):617–624, 1995.

377. Birer, R. D. Exercise stress testing. *J. Fam. Prac.* 26:425–435, 1998.

378. Haskell, W. L. Design and implementation of cardiac conditioning. In Winger, N. K., and Hellerstein, H. K. (Eds.), *Rehabilitation of the Coronary Patient*. New York: Wiley, 1978.

Additional References

Bar-Or, P., Lamb, D. L., and Clarkson, P. M. (Eds.) Exercise and the female: a life span approach. *Persp. Exerc. Sci. Sports Med.* Vol. 9, Carmel, IN: Cooper Publishing Group, 1996.

Cowlin, A. F. *Women's Fitness Program Development*. Champaign, IL: Human Kinetics Publishers, 2002.

Rowland, T. W. *Developmental Exercise Physiology*. Champaign, IL: Human Kinetics Publishers, 1996.

Tarnopolsky, M. (Ed.) *Gender Differences in Metabolism*. Boca Raton, FL: CRC Press, 1999.

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CHAPTER

10

Pharmacology and Midwifery

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Introduction

Throughout history, midwifery, like pregnancy, has been intertwined with myths. Among the modern myths is the one that midwives eschew the use of drugs and only use, at most, herbal remedies. In reality, knowledge of pharmacology is necessary for the practice of midwifery in the twenty-first century so that midwives can use agents appropriately. Moreover, herbal agents are pharmaceutical agents themselves and should be subject to the same scrutiny as any drug. As an increasing number of midwives attain prescriptive privileges, knowledge of pharmacology becomes even more important. Although midwives may use a wide repertoire of nonpharmaceutical approaches, there are conditions and situations in which no effective substitutes exist for pharmacological treatments.

Throughout this book, specific therapeutic agents are discussed as treatments for various conditions. However, the field of pharmacology is so expansive that midwives can benefit from a pharmacological overview. This chapter focuses on such an overview, and it includes discussion of specific situations such as the use of common drugs in the primary care of women when the woman is either pregnant or breastfeeding. Moreover, although many examples are included in the chapter as illustrations, it should not be assumed that they are exhaustive. Additionally, certain terms—including drugs, agents, medications, and pharmaceuticals—are terms used interchangeably throughout the chapter. The word *drug* should not connote an illicit substance or a licit substance being abused. Drugs with abuse potential will be designated as such. In this chapter, drugs will be listed by generic name, accompanied by the most common brand name(s). Readers who desire additional information about the basics of pharmacology are directed to any of the standard pharmacology textbooks.

The Lexicon of Pharmacology

As knowledge in pharmacology has expanded, so has the lexicon. Knowledge of the terms is helpful as midwives are faced with an increasing amount of information in the field. A prerequisite to understanding drug actions and effects is the midwife's ability to define the various terms used in pharmacology. Some of the terms are old and established. *Pharmacology* itself means the study of drugs in all their aspects. However, there are several more specific terms employed in the field. Pharmacokinetics describes the absorption, distribution, metabolism (biotransformation), and excretion (clearance) of drugs. These factors then determine the amount of the agent available at the target sites for action. Pharmacodynamics refers to the receptor-mediated action of drugs, rather than drug effects that occur when agents are free, unbound, and not ionized. The pharmacodynamic action of a drug results from the drug's binding relationship at the receptor site as either an *agonist* or an *antagonist*. Pharmacotherapeutics is the field focusing on treatment effects of drugs. Additional terms can be found in the pharmacology glossary presented in Table 10-1.

TABLE 10-1	A Brief Glossary of Pharmacology
Agonist	A drug that binds to a receptor and activates it, producing a pharmacological response.
Antagonist	A drug that attenuates the effects of an agonist. Antagonism can be competitive and reversible (i.e., it binds reversibly to a region of the receptor in common with the agonist) or competitive and irreversible (i.e., the antagonist binds covalently to the agonist binding site, and no amount of agonist can overcome the inhibition).
Cardiovascular pharmacology	Pharmacotherapeutic uses of agents on specific areas of the cardiovascular system.
Chemotherapeutics	Agents used to kill microorganisms such as bacteria, viruses, and parasites; includes antimicrobial agents.
Cosmeceutical	Cosmetic products that have medicinal or druglike benefits.
Ecopharmacology	Drugs derived from plants, especially those found in the rain forest, as well as exploration of pharmacological implications of pollutants in water that exert pharmaceutical-like effects, most often estrogenic in nature. The latter also have been called ecoestrogens or xenoestrogens.
Half-life	The period of time required for the concentration or amount of drug in the body to be reduced to exactly one-half of a given concentration or amount.
Immunotherapy	Treatment of disease by inducing, enhancing, or suppressing an immune response.
Loading dose	A larger than normal dose administered as the first in a series of doses, the others equal to each other, but smaller than the first. A loading dose is administered in order to achieve a therapeutic amount in the body more rapidly.
Molecular pharmacology	Study of the molecular mechanisms that define drug action.
Neuropharmacology	Pharmacotherapeutic uses of agents on specific areas of the nervous system.
Nutriceuticals, or functional foods	Food or supplements like folic acid that have specific health benefits.
Pharmacodynamics	How drugs produce their effects, such as interactions at a receptor site.
Pharmacoeconomics	A blending of pharmacology and economics that applies cost-benefit, cost-effectiveness, cost-minimization, and cost-utility analyses to compare the economics of different pharmaceutical products or to compare drug therapy to other treatments. Several sources include in this definition factors such as quality of life and impact of the drug on the recipient, caregivers, and society in general.
Pharmacoepidemiology	The study of the utilization and effects of drugs in large numbers of people. To accomplish this study, pharmacoepidemiology borrows from both pharmacology and epidemiology.
Pharmacogenetics	The study of how drugs interact with genetic makeup of an individual or the genetic response to a drug; this may be one of the first clinical applications derived from the Human Genome Project.
Pharmacogenomics	Studies that illustrate similarities and differences in pharmacodynamic and pharmacokinetic mechanisms among various individuals and people of different ethnic backgrounds.
Pharmacokinetics	The movement of drugs in the body, specifically encompassing the study of factors that determine the amount of chemical agents at their sites of biological effect at various times after the agent is administered. Pharmacokinetics is composed of four specific factors of absorption, distribution, metabolism (biotransformation), and excretion (clearance).
Pharmacotherapeutics	The field concentrating on the treatment effects of drugs. There are several subsections within pharmacotherapeutics.
Pharmacovigilance	The monitoring of untoward pharmacologically induced effects.
Psychopharmacology	The study of agents used for mental conditions such as depression.
Steady state	On a fixed dosage schedule, steady state or a steady concentration of the drug is reached after about 4 half-lives. In case of a long half-life, it may therefore take some time for the drug to reach a therapeutic concentration. To reach the window more rapidly, one would use a loading dose.
Toxicology	The branch of pharmacology that deals with the nature, effects, and treatments of poisons.

Newer terms in the field of pharmacology have emerged and more are likely to follow. *Nutriceuticals*, or functional foods, is a term coined by the De Felice of the New York Foundation for Innovative Medicine, a group founded in 1976 and dedicated to accelerate medical discovery by establishing a more productive clinical research community. Nutriceuticals (alternatively spelled Nutraceuticals) refer to foods or supplements like folic acid that have specific health benefits [1, 2]. While the Food, Drug, and Cosmetic Act does not recognize the term *cosmeceutical*, the cosmetic industry uses this word to refer to cosmetic products that have medicinal or druglike benefits [3]. *Ecopharmacology* is a term that recognizes drugs derived from plants, especially those found in the rain forest, as well as exploration of pharmacological implications of pollutants in water that exert pharmaceutical-like effects, most often estrogenic in nature. The latter have also been termed *ecoestrogens* or *xenoestrogens* [4].

Pharmacogenetics—the study of the genetic response to a drug, or how drugs interact with the genetic makeup of an individual—may be one of the first clinical applications derived from the Human Genome Project [5, 6]. Pharmacogenetic studies illustrate similarities and differences in drug effects among various individuals and people of different ethnic and racial backgrounds. *Pharmacogenomics* is the study of DNA sequencing and is theorized as one basis of the creation of designer drugs, or agents specifically made to decrease various adverse effects [7–9]. *Pharmacoeconomics* is a blending of pharmacology and economics that applies cost-benefit, cost-effectiveness, cost-minimization, and cost-utility analyses to compare the economics of different pharmaceutical products or to compare drug therapy to other treatments. Several sources include in this definition such factors as quality of life and impact of the drug on the recipient, caregivers, and society in general [10]. *Pharmacoepidemiology* has been defined as the study of the utilization and effects of drugs in large numbers of people. To accomplish this study, pharmacoepidemiology borrows from both pharmacology and epidemiology. Pharmacoepidemiological studies explore probability of beneficial effects in populations, or the probability of adverse effects in populations and other parameters relating to drug use using epidemiological methodology. A term even exists for the monitoring of untoward pharmacologically induced effects—namely, pharmacovigilance [11].

Drugs in Modern Society

More than 1.3 billion prescriptions are written each year in the United States, according to the National Association of Chain Drug Stores. Appendix A at the end of this chapter lists the 200 most commonly prescribed drugs in 2001 [12]. Each prescription filled can result in a 20 percent profit to the manufacturer, making the area highly profitable. In addition to prescription drugs, over-the-counter drugs are popular purchases.

In 2002, the National Slone Survey found that most American adults take at least one medication, and many take multiple pharmaceuticals daily [13]. Rates of use increased according to age group, and women used more agents than men in every age group, except for people aged 65 or older, where there was no gender difference for those using 10 agents or more. Some ethnic variations were also discovered, with Whites and Native Americans using the most pharmaceutical agents. Four of the five most popular agents were over-the-counter drugs; in order, they were acetaminophen (Tylenol), ibuprofen (Motrin or Advil), aspirin, and pseudoephedrine hydrochloride (Sudafed). The prescription drug, conjugated estrogens (Premarin) were ranked fifth. Approximately 40 percent of study participants had taken a vitamin and/or mineral supplement in the week before the survey; most commonly a multivitamin, vitamins E and C, calcium, or magnesium. Folic acid was ranked seventh among these agents. Fourteen percent of the population had taken at least one herbal agent or supplement in the preceding week, such as ginseng, ginkgo biloba extract, allum sativum, glucosamine, and St. John's wort.

The use of pharmaceuticals is thus seen to be prevalent in American society today. The increase in the use of drugs is related to several factors: the increase in their availability; the comfort of the public in safety of drugs, especially over-the-counter products; and the plethora of health care providers, pharmacies, and other outlets. These multiple options mean that an individual may receive drug prescriptions and/or recommendations from providers at various sites who may be unaware of other prescribers. Advertising directed to consumers exposes many more individuals to prescription drugs and proposed therapeutic options of which they might have been previously unaware [14]. Medications are widely marketed and there appears to be a shift among the generations in the country, from an older approach to avoid pharmaceuticals unless ab-

solutely necessary, to a newer, relatively liberal use of drugs. In addition to public acceptance of drugs to treat illnesses, there is a growing appreciation of agents for prophylaxis against various diseases or for general health maintenance.

Even individuals living in developed countries who avoid taking specific drugs or agents may constantly be exposed to pharmaceuticals through the food chain or in their daily environment [15]. Such exposure and other issues in reproductive toxicology are beyond the scope of this chapter, although the area is likely to grow, and studies should provide findings of clinical importance, perhaps even in the near future [16–20].

Practicalities and Issues Involving Drugs

Drugs are often listed in various ways. Agents can be described by a physiochemical property of the drug (e.g., an acid) or by phamacotherapeutic indication (e.g., sedative). Sometimes they are described by regulation. Pharmaceuticals are regulated in the United States by the Food and Drug Administration (FDA), one of 12 agencies within the U.S. Department of Health and Human Services. The FDA also regulates medical devices like intrauterine contraceptive systems (ParaGuard, Mirena) and biologic agents such as vaccines. The FDA has some post-marketing responsibility regarding safety of dietary supplements such as St. John's wort but does not regulate them by law in the same manner as pharmaceuticals. Similarly, the FDA may require labeling to designate that safety has not been established for cosmetics, but recall of cosmetics is voluntary by the manufacturer [21].

The pharmaceuticals for which the FDA does have authority may be obtained by prescription or over the counter. The regulation of drugs is administered by the Center for Drug Evaluation and Research (CDER), a subgroup within the FDA that oversees the research, development, manufacture, and marketing of drugs, both prescription and over the counter. If unexpected risks are detected after approval, CDER takes action to inform the public, change a drug's label, or, when necessary, remove a product from the market. The FDA does not develop, manufacture, or test drugs. Drug manufacturers submit full reports of a drug's studies, which are called *clinical trials*, so that the Center can evaluate its data and determine if the drug should be approved for a specific indication. This approval commonly is termed FDA labeling. The clinical trials are intended to be appropriately large to determine safety and effectiveness. However, sometimes the FDA approves a drug, only to remove it from the marketplace later due to issues that emerge in larger groups, when individuals use the drug for longer periods of time, or when used in conjunction with other agents. Midwives should be aware of the FDA MedWatch hotline (800-FDA-1088) where adverse reactions can be reported, although such reporting is not legally mandated at this time. Table 10-2 lists the sequencing of FDA phases or trials and Figure 10-1 illustrates the process [22].

The FDA has been regulating drugs for decades. However, women have not been participants in most drug development studies due to ethical, practical, and liability concerns [23]. Even when women have participated, it has been rare that an analysis of gender differences has been published. Moreover, clinical trials for contraceptives generally do not include many adolescents, as women under the age of 18 are considered pediatric patients. Pediatrics itself is a difficult area in which to conduct clinical trials because of the inherent issues with informed consent.

In relation to everyday usage, problems are emerging with the current mobile society. According to federal and most state regulations, drugs bought legally by a person in other countries,

TABLE 10-2 Phases or Trials of the Food and Drug Administration

FDA Phase	Description
1	Designed to determine drug dynamics and identify drug metabolites. This phase is usually small, and may be omitted if extensive international study has been conducted.
2	Controlled clinical trials to verify effectiveness and basic safety.
3	Randomized clinical trials, usually placebo controlled.
4	Post-marketing clinical trials, usually to gather information about adverse reactions, morbidity, and mortality that can be obtained only in larger groups.

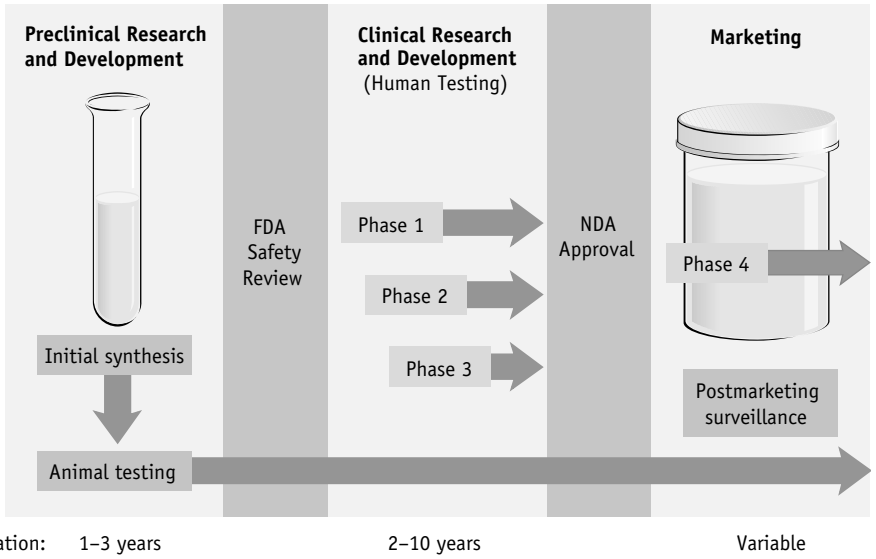

FIGURE 10-1 Steps required by the FDA for reviewing a new drug.

Source: Hanson, G.R., Venturelli, P.J., and Fleckenstein, A.E. *Drugs and Society*, 7th ed. Sudbury, MA: Jones and Bartlett Publishers, Inc., 2002.

such as Canada and Mexico, generally are considered illegally imported when the same individual uses them in the United States [24].

Perhaps most importantly, FDA labeling does not mean that off-label use is ineffective. Such use describes clinical practice for indications for which a drug is not labeled [25]. Examples abound regarding off-label use. The most commonly used tocolytic in the United States is magnesium sulfate, yet only ritodrine (Yutopar) is FDA labeled for the indication. Methotrexate (Rheumatrex), a folic acid antagonist used as a chemotherapeutic, has a marked predilection for destruction of trophoblastic tissue and is used off label for medical treatment of an unruptured ectopic. Midwives should recognize that off-label use, albeit common, should not be undertaken capriciously. Both medical and legal implications are involved, especially if the drug is not yet widely accepted in practice.

Some prescription drugs have a higher risk of abuse than others. The U.S. Drug Enforcement Administration (DEA) was established in 1973 within the Department of Justice. This agency has a special role in the regulation of prescription drugs under the 1970 Controlled Substance Act (CSA). The CSA has categorized potentially abused pharmaceuticals regulated under existing federal law into one of five schedules based upon the substance's medicinal value, harmfulness, and potential for abuse or addiction. Schedule I is reserved for the most dangerous drugs that have no recognized medical use, such as LSD or heroin. Schedule V is the classification used for the least dangerous drugs, such as brand name antitussives containing small amounts of codeine. Meperidine (Demerol) is a Schedule II agent. Knowledge of these schedules is important for midwives seeking prescriptive authority. Table 10-3 lists the five schedules for controlled substances.

Approximately 48 states grant some type of prescriptive authority to Certified Nurse-Midwives [26]. Prescriptive authority remains less common for Certified Midwives, as their credential is newer and their numbers fewer. Prescriptive authority is controlled on the state level and ranges from very limited to relatively broad. Many states limit prescriptive authority according to the aforementioned schedule of drugs, often making it difficult for midwives to offer opiate analgesics to laboring women. Some laws are based on delegation or practice site, which also can be barriers for midwives to provide appropriate care to women.

A registration number issued by the DEA is needed in order to prescribe a controlled substance. In 1993, the DEA published a regulation that established a new category under which health care providers other than physicians, dentists, veterinarians, or podiatrists would receive individual DEA registration numbers granting controlled substance privileges consistent with the authority granted them under state law (including authorization through joint practice agreements, protocols, and guidelines)

TABLE 10-3	FDA Classification of Controlled Substances
Schedule	**Interpretation**
I	High potential for abuse and no current accepted medical use. Examples are heroin and LSD.
II	High potential for abuse. Use may lead to severe physical or psychological dependence. Examples are opioids, amphetamines, short-acting barbiturates, and preparations containing codeine. Prescriptions must be written in ink or typewritten and signed by the practitioner. Verbal prescriptions must be confirmed in writing within 72 hours and may be given only in a genuine emergency. No renewals are permitted.
III	Some potential for abuse. Use may lead to low-to-moderate physical dependence or high psychological dependence. Examples are barbiturates and preparations containing small quantities of codeine. Prescriptions may be oral or written. Up to five renewals are permitted within six months.
IV	Low potential for abuse. Examples include chloral hydrate, phenobarbital, and benzodiazepines. Use may lead to limited physical or psychological dependence. Prescriptions may be oral or written. Up to five renewals are permitted within six months.
V	Subject to state and local regulations. Abuse potential is low; a prescription may not be required. Examples are antitussive and antidiarrheal medications containing limited quantities of opioids.

[27]. According to this regulation, midlevel practitioners such as Certified Nurse-Midwives were given authority for controlled substances by the state or jurisdiction in which they practice. However, because of state and local barriers, the majority of midwives do not have separate DEA numbers.

Midwives with prescriptive authority have the legal ability to write prescriptions. Although many prescriptions are phoned to a pharmacy or, increasingly, transmitted by electronic means, a midwife needs to know the components of a prescription. All handwritten prescriptions must be legibly written in indelible ink. Every prescription includes the midwife's name, address, and contact information for the pharmacist should questions arise. It is optimal to have the midwife's prescriptive authority number or other identifying information either on the top of the prescription or adjacent to the midwife's signature. All prescriptions are dated, and information about the prescription is placed in the woman's record so that if she loses the prescription, changes pharmacies, or moves, it can be easily retrieved. Only one drug is written on each prescription blank. Refills, if any, are noted, especially since certain health plans limit coverage of monthly drugs. Some authorities have lists of abbreviations, such as TID for "three times a day," although many sources recommend actively avoiding any abbreviations.

The section of the prescription specific to the medication consists of four parts: (1) superscription, (2) inscription, (3) subscription, and (4) signature. The superscription includes the symbol "Rx," although according to WHO guidelines, it is more proper to use the Latin "R/" [28]. In any case, the symbol is derived from the Latin for "recipe" or "take." The inscription specifies the ingredients and their quantities (e.g., nitrofurantoin 100 milligram capsules). The subscription informs the pharmacist how to compound or dispense the medication (e.g., dispense 10 capsules). The midwife should avoid decimals and, where necessary, write words in full to avoid misunderstanding. For example, the midwife should write "levothyroxine 50 micrograms," not "0.050 milligrams" or "50 μg." The signature, or "sig," is not that of the prescriber, but represents the Latin "signa" or "mark" that are the instructions that enable the woman to understand dosages and when to take a drug. The sig should include route, frequency, duration, and any other specific information—for example, "Take 1 capsule by mouth at bedtime for 10 days."

Generally it is recommended that the generic or nonproprietary name be used when a prescription is written. Use of generic names enables the pharmacist to maintain a more limited stock of drugs, and/or dispense the least expensive drug. However, if there is a particular reason to prescribe a special brand, the trade name can be added. Some areas allow generic substitution by the pharmacist and require the addition "Do not substitute," "Dispense as written," or "Brand medically necessary" if that brand, and no other, is to be dispensed. When a specific brand is required, the midwife should document such in the woman's chart with rationale. The documentation is not only for completeness, but also may be necessary for the prescription to be covered by a public program like Medicaid, various managed care groups, or other types of health insurance. Figure 10-2 illustrates a sample prescription written by a midwife.

Midwifery Care, PC
124 Main Street
Elsewhere, USA
Office (800) 555-1212
Fax (800) 555-1411

Patient: *Sally Smith*
Address: *4321 Main Street, Elsewhere, USA*

Rx	*Conjugated Equine Estrogens 0.625 milligrams*
Sig	*One tablet daily by mouth*
Dispense	*30 tablets*

Generic: Yes / (No)
Refill *12 times*

Mary Midwife, CNM

State Prescriptive Authority No. 0005

FIGURE 10-2 A sample prescription.

Adverse Drug Reactions/Adverse Drug Events

Although the federal government has attempted to address the issue of drug abuse through the CSA and DEA activities, society can be harmed in different ways by drugs. In 1998, a meta-analysis by Lazarou et al. of adverse drug reaction (ADR) in hospitals culminated in major concerns about drugs [29]. Based on the research, it was estimated that in 1994 more than two million hospitalized patients had serious ADRs and more than 100,000 had fatal ADRs. These statistics indicated that ADRs ranked in the top six causes of death. Since that time, professional organizations such as the American Medical Association and various nursing and medical state boards have been in dialogue to develop strategies to avoid ADRs, recognize the reactions promptly, and promote methods to develop drugs with fewer risks.

Adverse drug reactions do not include drug calculation errors, overdoses, or problems with compliance. Some authors categorize these as adverse drug events (ADEs), a more inclusive phrase connoting any injury resulting from the administration of a drug. This broader terminology means that the overall effect of drug injuries would be higher than those estimated by Lazarou and colleagues. Midwives need to be aware of the increased scrutiny about drugs and to be prepared to expect additional outside regulations or controls as institutions and organizations attempt to address issues of drug safety. Part of the move toward electronic transmittal of prescriptions and computer charting is an attempt to decrease medication errors [30].

Drug Resistance

Within four years after drug manufacturers began mass production of penicillin in the 1940s, resistant *Staphylococcus aureus* began to appear. By the late 1960s, additional resistant bacteria were found in the Pacific. The spread of resistance was rapid [31]. Between 1979 and 1987, only 0.02 percent of strains of pneumococcus were reported as resistant by the CDC; by 1994, 6.6 percent were reported to be resistant. Several factors account for the development and rapid rise of drug-resistant strains. One factor is the human complacency that developed in the 1980s when many scientists and clinicians began to view a bacterial infection as an easily curable condition. Antimicrobial use was liberal, even for conditions for which they were not indicated, such as the common cold.

When susceptible bacteria were eradicated, the few left were the resistant ones. With natural selection, these microbes often became the predominant microorganism. Resistant microbes have several mechanisms of action. For example, penicillin resistance is the result of gene action. Since penicillin destroys cell walls, some of the organisms can alter cell walls so that the antibiotic cannot bind to it, or they can produce enzymes to destroy the penicillin. Alternatively, resistance to quinolones involves altering the ability of the drug to penetrate its target [32].

There are three ways in which bacteria can acquire genes that provide resistance: (1) spontaneous DNA mutation—e.g., drug resistant tuberculosis; (2) transformation in which one bacterium assumes DNA from another bacterium—e.g., penicillin resistant gonorrhea; and (3) resistance acquired from a small circle of DNA called a plasmid that can fit from one type of bacterium to another—e.g., shigella. The latter is the most troublesome, since with plasmid acquisition, the bacteria may simultaneously become resistant to several types of drugs. The rise in drug resistance directly correlates with the rise in use of antimicrobials. Therefore, midwives are advised to use good hand-washing techniques with regular soap to avoid spread of disease, to use antimicrobials only when they are clearly indicated, and to attempt to use narrow-spectrum agents when the microorganism is known. Midwives should also educate women about the appropriate use of antimicrobials, including avoidance of antibacterial soaps and cleansers that may contribute to the problem. Adding antibacterial agents to a variety of substances, such as soaps, lotions, and cleaning supplies, can act like antibiotics in the selection of resistant strains of microbes and are no more effective than similar agents without the antibacterial additives [33].

Drug-to-Drug Reactions

Although certain drugs are therapeutic when used alone, when they are used concomitantly with other agents, untoward effects may result. Recent research has been conducted in the area of drug to drug and even drug to herb interactions.

Many agents are metabolized through the cytochrome P-450 pathway. This pathway tends to affect the metabolism of drugs by slowing or accelerating drug clearance. It has been found that some individuals have mutations called polymorphisms in the cytochrome P-450 pathway in the liver. Approximately 10 percent of Caucasians have the polymorphism that inhibits metabolism of some agents, and facilitates others. It is probable that more mutations may be discovered in the future. An example of a drug-to-drug reaction is cardiac arrhythmias that may occur when the macrolide erythromycin (e.g., e-base or Eryc, azithromycin or Zithromax, clarithromycin or Biaxin) and the antifungal ketoconazole (Nizoral) are taken simultaneously. Gene testing for the cytochrome P-450 mutation is on the horizon. Until then, since no one can identify which women specifically are at risk, all women should be advised about potential interactions. Thus, it is important that midwives know all the medications, including herbs [34], that a woman is taking before prescribing or recommending others.

One of the greatest challenges to the midwife in clinical practice is maintaining current information about drug indications, doses, side effects, and contraindications. Now providers additionally need to be aware of drug-to-drug/herb interactions. Various publications, both in print and electronic media, have emerged to help with maintaining the information, and also updating it as new discoveries emerge. Prominent among these innovations are applications for personal digital assistants (PDAs), which can download programs containing information about all FDA approved medications, including doses, contraindications, cautions, interactions, adverse reactions, cost, and pregnancy categorization [35]. This information can be accessed rapidly regardless of location [36, 37].

Drug Costs

Health care costs are a major component of the gross national index, and pharmaceuticals remain a large part of the costs. Today, the high cost of many drugs exceeds the personal savings of individuals, if they are not able to obtain assistance through public programs such as Medicare or Medicaid. Midwives should be aware that many pharmaceutical companies have patient assistance programs for women with an annual income less than $12,000, or a family income less $15,000 and nonavailability of prescription drug payment from public or private third-party sources. Most of these programs require a prescription and a letter of verification, and usually they will provide a three-month supply subject

to re-review at that time [38]. Midwives may contact the pharmaceutical manufacturers directly, access information via the Internet, or contact social services at local institutions.

Drugs and Herbs

Hippocrates documented the use of more than 200 herbal remedies. Today, more than three-quarters have been refined, synthesized, or packaged as modern pharmaceuticals. However, many other herbs and botanicals are sold today, although their actions and safety may remain unknown. Herbal preparations can be found in a variety of forms and are listed as dietary supplements by the FDA. The FDA regulates dietary supplements differently than it does prescription and over-the-counter agents. Under the Dietary Supplement Health and Education Act of 1994 (DSHEA), the manufacturer must ensure that a dietary supplement is safe before it is marketed [39]. The FDA is responsible for taking action against any unsafe dietary supplement product after it reaches the market. Generally, manufacturers do not register with the FDA nor do they get FDA approval before producing or selling dietary supplements. The FDA's postmarketing responsibilities include monitoring safety, such as voluntary dietary supplement adverse event reporting. The FDA must also monitor product information, such as labeling, claims, package inserts, and accompanying literature. The Federal Trade Commission regulates dietary supplement advertising.

For years herbal therapy has been outside the mainstream of American life. However, it is apparent that today many individuals take nutritional supplements and herbs, often as a complementary therapy to pharmaceutical therapies. The National Center for Complementary and Alternative Medicine (NCCAM), founded in 1998, is one of the 27 institutes and centers that compose the National Institutes of Health (NIH) within the U.S. Department of Health and Human Services (DHHS).

Because herbal therapy has been outside the mainstream, it has not been subjected to the same rigorous investigation as pharmaceuticals—but such lack of research has in turn kept it from being in the mainstream. This paradox is unfortunate because many of the agents are inexpensive and easily available but financial backing has been unavailable to conduct studies. However, with the advent of the research under the auspices of NCCAM and evidence-based research emerging from abroad, it is becoming apparent that herbs can be effective therapies.

The use of herbs is challenging for modern midwives, as much of the information available on the Internet or in journals remains anecdotal or strictly opinionated. Some evidence-based information can be obtained, and it should be sought by any midwife planning to recommend herbal therapy. In 1978, a regulatory agency was established in Germany to evaluate the effectiveness of herbal remedies. Called the German Commission E, the group of 24 scientists evaluated studies (clinical, case, field), and prepared scientific monographs. The current plans are that by 2004 only herbs that the German Commission E have found to be effective, and of low risk of adverse effects, will be available in Germany. The American Botanical Council, based in Texas, has published an English translation of the German monographs [40]. Although the work generally has been lauded, many common North American herbs are not included [41]. Currently, the NCCAM has approximately two dozen studies in process that compare herbal remedies to conventional pharmaceutical treatments for specific conditions, such as endometriosis. Data from these U.S. studies should expand knowledge in the area. At the present time, however, midwives must be cautious about claims involving therapeutic uses of herbs. Many sources simply are lists of possible indications without accompanying data.

Pregnancy and Drug Use

Pharmacokinetics in Pregnancy

As previously mentioned, pharmacokinetics describes the absorption, distribution, metabolism, and excretion of an agent. The basics of pharmacokinetics can be found in various pharmacology texts. However, during pregnancy, the myriad physiological changes in a woman's body also affect the pharmacokinetics of any drugs and herbs she uses [42].

Absorption

Gestational nausea and vomiting are common and impair absorption of drugs from the gastrointestinal system. Decreased gastric emptying, probably associated with increased levels of progesterone, results in drugs remaining in the stomach for approx-

imately twice as long as in a nonpregnant woman. Decreased gastric motility also results in a possible increase in absorption of drugs in the small intestine and may increase absorption of hydrophilic drugs that tend to cross the gastrointestinal epithelia slowly. In addition, the pH of the stomach increases during pregnancy, becoming more alkaline. Drugs that are weak bases have increased absorption because less of the drug is ionized and more of the agent passively diffuses out of the stomach. The opposite effect occurs with weak acids; more drug is ionized in the stomach and less is passively diffused. However, even with these changes affecting oral bioavailability, the therapeutic windows of most agents are wide enough that modifications in drug dosing are not needed.

Modifications in drug absorption in pregnancy also occur with other routes of administration, including inhalation through the respiratory tract. By the twentieth week of pregnancy, tidal volume is increased, residual volume decreased, and respiratory rate is either unchanged or slightly increased. By term, alveolar ventilation is increased by approximately 70 percent. These changes, especially the alveolar ventilation, lead to increased particle uptake and diffusion of aerosols and bronchodilators. Thus, less drug may be needed to obtain the same therapeutic effect found in a nonpregnant woman.

During pregnancy, the increase in cardiac output significantly increases skin perfusion. Thus, there is enhanced absorption of most transdermal and subcutaneous drugs, especially water-soluble ones. Theoretically, some local anesthetics, such as lidocaine, can have enhanced absorption when administered during pregnancy, although it is likely that such a reaction would be mediated by differences in the distribution and rate of elimination. Intramuscular injections may result in more rapid reactions because of increased cardiac output and enhanced blood flow; conversely, if the injection site is in an area of major edema, decreased absorption may occur.

Bioavailability/Drug Distribution

Distribution of a drug is related to a variety of factors including protein binding, lipid solubility, ionization, and affinity with tissue. Protein binding initially buffers the action of a drug but also has the effect of prolonging its half-life. Drugs bound to protein are not free and active in solution until the concentration gradient diminishes, causing the release of the drug from the protein. By the last few weeks of pregnancy, the intravascular volume expansion results in a lower serum albumin concentration. Therefore, more free drug is available at lower plasma concentrations since less albumin binding of the drug exists. Binding varies inversely with pregnancy—i.e., the more advanced the pregnancy, the lower the serum concentration of protein. Drugs that generally are highly bound to albumin, such as antiepileptic drugs and selective serotonin reuptake inhibitors, tend to demonstrate an increased effect because of this physiological phenomenon.

Drug distribution is complex during pregnancy because of four separate compartments that exist: (1) the fetus, (2) the amniotic fluid, (3) the placenta, and (4) the mother. Each of the compartments impacts movement of drugs, and occasionally certain drugs can have higher concentration in a specific compartment. For example, although studies of placental transfer are less than optimal, it appears that most transplacental movement of drugs from the mother to the fetus occurs by simple diffusion [43]. In general, increased drug distribution is associated with the 50 percent increase in blood volume during pregnancy. Drug transfer is facilitated by lipid solubility, since the placenta is lipoid in character. A nonionized state also facilitates transfer. Transfer can occur both ways, although sometimes ion trapping can result. When ionized modules cross the placenta via active transport, they can accumulate in the fetal liver and adrenal glands and become ion trapped in the fetus because of the more acidic fetal circulation.

Drugs are more easily transferred in the third trimester. Table 10-4 lists the major factors that influence the enhanced drug transfer of late pregnancy.

Placental transfer of drugs can be accomplished by any of the traditional drug transfer methods, whether passive or active. Passive transfer includes simple diffusion and facilitated diffusion. Neither of these two methods requires energy, or allows an agent to be transferred across the membrane to an

TABLE 10-4 Factors Influencing Increased Drug Transfer in Late Pregnancy

- Increased unbound drug available for transport
- Increased uteroplacental blood flow
- Increased placental surface area
- Decreased thickness of semipermeable lipid membranes between placental capillaries
- Greater physical disruption of placental membranes
- More acidic fetal circulation to trap basic drugs

area of higher drug concentration. Most drugs transfer across the placenta by simple diffusion, although some are carrier mediated, or use facilitated diffusion. Active transport requires energy; the most common method is pinocytosis, a process during which a portion of the plasma membrane engulfs the drug molecule, creating a type of intracellular vesicle. Because of the energy and time required for pinocytosis, few drugs cross the placenta using that method in any appreciable amount.

Certain factors dictate the method available for transport. Most drugs have a small molecular weight, usually less than 500 MW, so they are more likely to be transferred easily across the placenta, especially when compared with drugs like heparin or insulin, with a greater than 1000 MW. However, even large molecules can be transported, although it is a more difficult process.

Once a drug passes the placenta, it is free to bind with proteins in the fetal plasma, especially since albumin concentrations in the fetal compartment are higher than in the maternal compartment. Thus, some drugs like diazepam (Valium) may have an increased fetal effect when compared with maternal effects. Other factors associated with maternal fetal drug transfer include conditions that influence drug distribution and metabolism, such as preeclampsia and hepatitis.

Metabolism

Most drug metabolism occurs in the liver. Lipid-soluble drugs are converted into water-soluble ones to enhance elimination, especially by the urinary system. Pharmaceutical agents may be categorized as high extraction or low extraction. High extraction agents like lidocaine (Xylocaine) and meperidine (Demerol) depend on liver blood flow for metabolism. In spite of general increases in blood flow, there is no evidence that hepatic blood flow is increased significantly during pregnancy. Therefore, metabolism of high extraction drugs is similar to that in the nonpregnant state.

Low extraction drugs are dependent upon liver enzymes. Examples include phenytoin (Dilantin), theophylline (Theolair), and fluoxetine (Prozac, Sarafem). The most important metabolic pathway is the one that enables drugs to be oxidized in order to facilitate clearance. The liver enzyme most prominently involved is cytochrome P-450, discussed earlier in this chapter in relation to drug-to-drug interactions.

All hepatic enzymes fluctuate in pregnancy, probably due to increased production of steroidal hormones. In particular, estrogen and progesterone have been found to inhibit some enzyme activity in the liver, resulting in increased drug accumulation or decreased elimination of agents like caffeine. Additional studies are ongoing regarding other hormonal influences.

The placenta can also accomplish metabolism of drugs. The organ has cytochrome P-450 pathways. It has been found that the placenta contains approximately half the amount of liver enzymes as the maternal liver, although the effect of these enzymes remains poorly understood.

Elimination/Clearance

Major changes can occur with drugs that use the urinary system for clearance of the agent itself or its metabolites. In general, excretion includes glomerular filtration, especially for water-soluble drugs, active tubular secretion, and passive absorption. In the urinary tract, protein bound drugs are not easily absorbed while lipophilic drugs usually are reabsorbed.

Renal clearance is influenced by some of the changes in pregnancy. Renal blood flow increases by 80 percent in early pregnancy, then decreases until it approximates the nonpregnant state at term. The glomerular filtration rate increases by 50 percent during pregnancy, allowing water-soluble drugs to be cleared more rapidly. Creatinine clearance tends to mimic changes in the glomerular filtration rate and reaches a maximum at 34 weeks. Thus, renally excreted drugs like beta-lactam penicillins and aminoglycosides like gentamicin (Garamycin) are cleared more rapidly during pregnancy.

In conclusion, pharmacokinetics are impacted directly by physiological changes in pregnancy. However, most commonly used agents possess wide therapeutic windows and need little, if any, change in administration. Thus, even if these pharmacokinetic changes are known, they often do not impact clinical practice today. However, as pharmaceutical designs and delivery systems become more sophisticated, additional knowledge may be needed in the area to compensate for changes in pregnancy.

At this time, there are a few agents that midwives should be aware could theoretically need

dosage adjustments. Midwives should monitor women carefully for therapeutic effects particularly with the use of aminoglycosides like gentamicin (Garamycin) or other agents such as ampicillin (Omnipen, Polycillin, Principen), and cefazolin (Rochephin), since serum concentrations appear to be decreased in pregnancy. The clinician may also need to decrease theophylline (Theolair) doses for the asthmatic woman as its serum concentrations rise in pregnancy.

Teratology and Drugs During Pregnancy

Although women are aware that they should not take drugs during pregnancy—be they licit or illicit—the majority of women report taking several drugs during pregnancy. One of the major issues specific to pregnancy is whether or not the agents ingested are teratogenic.

In today's common use, teratology essentially is the study of congenital anomalies. Contrary to popular belief, the vast majority of birth defects either are idiopathic or due to genetic/chromosomal influences. It is estimated that approximately 2 to 5 percent of all births result in a baby with a birth defect [44, 45]. This percentage is often called the "background risk" upon which additional risks are calculated based on family history, past history, and environmental exposure. Only 10 percent of birth defects can be associated with environmental factors, and even then the majority of environmental factors are not pharmaceuticals. The etiology of congenital anomalies includes maternal infections and illnesses such as rubella, pregestational diabetes, and exposure to radiation. Drug agents, including agents such as mercury and pesticides, account for approximately 45 percent of the environmental factors involved in congenital anomalies, or an estimated 4 to 5 percent of all birth defects.

The unique fact about teratogenic medications is that avoiding the teratogen can prevent the associated congenital anomaly. Thus, knowledge about teratogenic drugs is essential for the practicing midwife. Fortunately, the number of these agents is relatively low, and even fewer are in common use. The period of organogenesis—between 3 to 8 weeks postfertilization or 5 to 10 gestational weeks—is the most critical period for exposure to teratogens.

Using a strict definition, a teratogenic agent is one that, when administered during the first trimester, causes permanent structural or behavioral changes to the fetus. Some sources advocate using the term fetotoxic for agents, like tobacco, that cause changes when administered in the second or third trimester. Others might term it a trophogen, as an agent that alters growth. Yet most clinicians apply the term teratogenic to agents culminating in intrauterine insults, regardless of gestational timing [46].

In 1980, the FDA published a list of pregnancy risk categories for prescription and nonprescription drugs, including those with known teratogenic effects. These categories can be found in Table 10-5 [47]. The FDA does not directly categorize drugs it-

TABLE 10-5 FDA Pregnancy Risk Categories for Prescription and Nonprescription Drugs

A	Controlled studies in women fail to demonstrate a risk to the fetus in the first trimester (and there is no evidence of a risk in later trimesters), and the possibility of fetal harm appears remote.
B	Either animal reproduction studies have not demonstrated a fetal risk but there are no controlled studies in pregnant women or animal reproduction studies have shown an adverse effect (other than a decrease in fertility) that was not confirmed in controlled studies in women in the first trimester (and there is no evidence of a risk in later trimesters).
C	Either studies in animals have revealed adverse effects on the fetus (teratogenic or embryocidal or other) or there are no controlled studies in women and animals are not available. Drugs should be given only if the potential benefit justifies the potential risk to the fetus.
D	There is positive evidence of human fetal risk, but the benefits from use in pregnant women may be acceptable despite the risk (e.g., if the drug is needed in a life-threatening situation or for a serious disease for which safer drugs cannot be used or are ineffective).
X	Studies in animals or human beings have demonstrated fetal abnormalities or there is evidence of fetal risk based on human experience or both, and the risk of the use of the drug in pregnant women clearly outweighs any possible benefit. The drug is contraindicated in women who are or may become pregnant.

Source: From the *Federal Register*, 44:37434–37467, 1980.

self and in most cases the drug manufacturer performs that action [48]. Few drugs can be placed in Category A since the conduct of controlled studies in pregnancy not only is difficult but also is probably unethical. Category B contains agents such as acetaminophen and penicillin where both animal and noncontrolled human studies have failed to demonstrate any teratogenic effects. Category C encompasses two distinct concepts: either data are lacking about safety of the drug, most likely because it is new to the marketplace, or there is some evidence of animal teratogenic effects, although no similar human effects have been found. More than two-thirds of current drugs fall into Category C [49]. Categories D and X are both teratogens but differ according to risks and benefits. For example, some Category D drugs are antiepileptic drugs (AEDs) with known teratogenic effects. However, these AEDs may be prescribed during pregnancy if they are the only agents effective in controlling seizure activity. Isotretinoin (Accutane) is a Class X drug since it is used to treat acne, a non-life-threatening event. At the time of this writing, the FDA is considering updating the categorization [50].

Occasionally the term *litogen* is used in the literature. Although litogens are not classified as teratogens, they are agents that have been found to be of risk in court—i.e., in litigation [51]. For example, a combination of doxylamine succinate and vitamin B_6 was marketed for years under the brand name Bendectin, a remedy for gestational nausea [52]. Parents of infants born with limb defects argued that there was an association with the drug. In spite of a large volume of expert testimony to the contrary, the court awarded a major finding in at least one case, causing the manufacturer to remove the drug from the marketplace not as a teratogen but as a litogen.

Additionally, the FDA has created a Web site to provide information directly to women and to encourage pregnant women using selected drugs to participate in surveillance registries. The women are actively enrolled and asked to periodically participate in surveys and other data-collecting methods. Prominent among the drugs are antiepileptic agents (AEDs). General information about teratogens is included and a link to the Organization of Teratology Information Services (OTIS) is part of the Web site. OTIS is of value not only to pregnant women but particularly to midwives who are seeking information about the safety of an agent for a woman. The Pregnancy Registry is a separate page that can be accessed through the FDA Web site at www.fda.gov/womens/registries.html. Other drug registries, such as the antiretroviral registry, are maintained by manufacturers. Appendix B at the end of this chapter lists teratology information systems by location.

Most human teratogens are identified *ex post facto*—after the results are apparent in clinical practice. Sometimes the information proves to be circumstantial, and, ultimately, no association is found. Generalizability is an issue for data from animal studies. Different species have various responses to the same drug. Moreover, there exists the issue of animal rights, the cost of primate studies, which provide the most similar response to humans, and problems with inconsistency among species. In general, animal studies demonstrating teratogenicity can be helpful, although rarely definitive. The absence of reports of birth defects does not imply safety, nor is the converse true. A drug may consistently cause defects in animal species but not in humans. Some basic criteria for identifying a teratogen includes exposure to the agent; epidemiological studies that establish linkage; biological plausibility; and consistent manifestation of a specific defect, especially if it is a rare anomaly [53]. Epidemiological studies are particularly challenging as studies often are of small size, nonrandomized, and conducted by recall from mothers with affected children [54, 55]. Table 10-6 lists drugs and chemicals that are known to be teratogens.

Another problem emerges once a teratogen is identified. In the United States, one of two approaches is followed: The agent may be removed from the marketplace, as thalidomide (Thalomid) was initially withdrawn; or it may be retained with various public safeguards [56]. For example, isotretinoin (Accutane) uses explicit and detailed printed warnings, includes drawings of malformed children, and has a detailed informed consent form for women. Still a substantial number of fetuses have been exposed, and as many as one-third of the women did not use any method of contraception, believing they were not fertile [57, 58].

Embryologists and other scientists specializing in this area have published much of the information about teratology, and these professionals tend to use postconceptional dating. Since midwives are more familiar with gestational weeks, rather than postconceptional or postfertilization weeks, they should read the literature about teratology and embryology carefully.

Teratogenic effects such as a cleft palate may be obvious. However, some may be subtle and sub-

TABLE 10-6 Drugs and Chemicals That Are Known Teratogens

Agent	Teratogenic Associations	Comments
Alcohol	Growth restriction Mental retardation Atypical facial appearance Renal and cardiac defects Spontaneous abortion Microcephaly	Women who ingest six drinks per day are at a 40% risk of developing some features of fetal alcohol syndrome (FAS), but the threshold remains unclear. Nutritional deficiencies, smoking, and polypharmacy activities confound the data.
Androgens and testosterone derivatives (including Danocrine)	Virilization of females Advanced genital development of males	Dose dependent and based on critical period. Brief exposure rarely is significant. Before 9 weeks' gestation, labioscrotal fusion is common. Incidental, brief exposure usually has minimal risk.
Angiotensin converting enzyme (ACE) inhibitors	Growth restriction Oligohydramnios Renal failure Decreased skull ossification Renal tubular dysgenesis	Risk of growth restriction is approximately 25% with fetal morbidity approximately 30%. Risk of effects increase in second and third trimester (probably due to decreased utero placental flow).
Antithyroid drugs	Fetal and neonatal goiter Hypothyroidism Aplasia cutis (with methimazole)	Methimazole should be avoided. Propylthiouracil is agent of choice, subject to close monitoring since high doses can effect fetal thyroid.
Coumarin	Bone defects Growth restriction CNS defects Developmental delays	15–25% risk when anticoagulants that impair vitamin K are used, especially between 6–9 weeks of gestation. Later use in pregnancy associated with abruption, CNS defects, stillbirth, and hemorrhage of the fetus/newborn.
Carbamazepine	Neural tube defects Minor craniofacial defects Developmental delays Growth restriction	Risk of neural tube defect is increased, especially when used with other antiepileptic drugs.
Folic acid antagonists	Spontaneous abortion Various anomalies	Includes cytotoxic drugs like aminopterin (not currently in clinical use) and methotrexate. Malformation in first trimester is 30%, among those that survive. Some authors include trimethoprim, trimterene, carbamazepine, phenytoin, phenobarbital, and primidone. Some suggest that risk can be decreased with FA in multivitamins.
Cyclophosphamide	CNS malformations Secondary cancers	Chemotherapeutic and antirheumatic drug that is not in common usage.
Diethylstilbestrol (not currently in clinical use)	Clear cell adenocarcinoma of vagina and cervix Vaginal adenosis Possible infertility or subfertility in females and males	Vaginal adenosis found in 50% of females whose mothers took these drugs before 9 weeks' gestation. Data suggest that males exposed in utero may have up to 25% incidence of epididymal cysts and abnormal tests and spermatozoa.
Finasteride	Male genital abnormalities	Marketed most commonly as Propecia, a hair loss treatment for men. Can be absorbed through broken tablets.
Hypoglycemic drugs	Neonatal hypoglycemia	Insulin is a macromolecule and little if any passes the placenta and is the hypoglycemic agent of choice to avoid fetal effects associated with oral hypoglycemic agents.
Lead	Spontaneous abortion Stillbirths	Theorized that CNS development is adversely affected.
Lithium	Congenital heart disease (Ebstein)	Low risk, but Ebstein's has been found and not found with SSRIs and TCAs. Exposure in last month of pregnancy linked to toxic effects on thyroid, renal, and musculoskeletal systems.

TABLE 10-6 Drugs and Chemicals That Are Known Teratogens (continued)

Agent	Teratogenic Associations	Comments
Misoprostol, mifepristone (RU-486)	Abortion Moebius sequence (brain stem ischemia, vascular disruption) for misoprostol	Primarily used for abortion. When used alone for abortion, each is less effective.
Nonsteroidal anti-inflammatory drugs (NSAIDs)	Theorized premature closure of the ductus arteriosus Necrotizing enterocolitis	Sulindac probably does not have the effect on the ductal constriction. Also associated with post-term pregnancy.
Organic mercury	Cerebral atrophy Microcephaly Mental retardation and blindness	Exposure is usually due to fish and/or grain contaminated with methylmercury. Note that mercury thermometers are being withdrawn from the marketplace.
Phenytoin	Growth restriction Mental retardation Craniofacial dysmorphia	Full syndrome less than 10% of fetuses exposed. Degree of expression may be associated with a mutant gene that decreases production of epoxide hydrolase, an enzyme necessary to decrease the teratogen phenytoin epoxide.
Streptomycin and kanamycin	Hearing loss Eighth nerve damage	No ototoxicity has been found with gentamicin or vancomycin.
Tetracycline	Abnormalities of teeth	No known effect unless exposure occurs in second or third trimester.
Thalidomide	Limb deficiencies Cardiac and GI abnormalities	20–30% risk during critical period (very potent). Used for years before teratogenic effects became obvious. Has caused the belief that all drugs have the potential to be a new thalidomide. Back on market for oral lesions in HIV, Hansen's disease, TB, and multiple myeloma. STEPS (System for Thalidomide Education and Prescribing Safety) available on-line from manufacturer, Celgene Corporation.
Trimethadione and paramethadione	Growth restriction Cleft lip/palate Mental retardation Facial dysmorphia Ophthalmic, limb, and GU problems	In first trimester, risk of spontaneous abortion is 60–80%. Characteristic facies associated with use. These antiseizure drugs rarely used today, especially during pregnancy since other agents are available.
Valproic acid	Neural tube defects Minor facial defects	Incidence is approximately 1%. Exposure must be in first trimester, before closure of neural tube.
Vitamin A and derivatives	Spontanous abortion CNS defects Cardiovascular, facial dysmorphia Mental retardation Cleft lip/palate	Use before pregnancy of isotretinoin is not a risk since it is not stored in tissue. However, etritinate has a long half-life and may present a problem. Note that 30% of affected infants according to Retinoid Pregnancy Prevention Program are conceived by women who did not use a contraceptive method, assuming they were not fertile since they had not conceived during periods of months or years when they had not used contraceptive methods. In addition to no contraception, issues of using leftover medications, and even a physician obtaining drug from friend so she could treat her oily skin, etc., have been found.

lethal. For example, decreased intelligence, but not necessarily mental retardation, has been implicated with the use of certain agents such as phenobarbital or cocaine [59].

Fetal age, drug potency, and drug dose all matter in teratology. For women who are exposed to agents prior to tissue differentiation (usually less than 20 days postfertilization or up to approximately four to five gestational weeks), the teratogenic agents tend to result in either a spontaneous abortion, or no effect at all. This phenomenon is termed the all-or-none effect [60]. The susceptibility to teratogenesis depends upon the host susceptibility, involving the mother, embryo, or fetus and the environment (including concomitant use with other drugs), so that prediction of degree of effect becomes an inexact science.

After tissue differentiation occurs, organ systems develop with different timing. (See the section on intrauterine growth and development in Chapter 21.) Exposure to teratogens may result in different manifestations based on timing. When thalidomide (Thalomid) was ingested during the critical period for limb development, phocomelia, or flipper-like limbs, resulted. With some agents, as the dosage increases so does the resulting manifestation. With the dose effect, the result may range from no effect to a totally lethal level. If there is a level known below which there is no effect, and at or above which there is effect, it is called a threshold. For example, the threshold is unknown for alcohol. In some parts of the world alcohol is not proscribed for pregnant women, but suggested in moderation. In the United States, since the threshold is not known, all pregnant women are admonished to abstain from drinking.

Once organogenesis has been completed, drugs still remain a potential problem. Agents such as ACE inhibitors have been linked to low birth weight infants. As mentioned earlier, these agents are fetotoxic, as opposed to true teratogens, although the distinction usually is not emphasized in clinical practice.

Commonly Used Pharmaceuticals

The typical woman in today's society may take medications for a variety of conditions, and a single chapter cannot address all the potential agents she may be confronted with. However, certain drug classifications are commonly used among women, such as antimicrobials, analgesics, and hormones. Midwives need to be aware of these drugs, particularly if the woman is pregnant or could become pregnant. Fortunately, most agents that midwives prescribe are not teratogenic. Lists of teratogenic agents include pharmaceuticals as well as environmental agents. For example, organic mercury can have profound untoward effects but certainly no one prescribes or recommends it. However, some common pharmaceutical agents can be teratogenic and should be viewed cautiously for the pregnant or preconceptional woman. The sections that follow discuss categories of pharmaceuticals from which midwives often prescribe or recommend treatments for nonpregnant women. Agents that should be avoided because of risk in pregnancy are indicated as such. Some common agents that are preferred for use during pregnancy are also included.

Antimicrobials

It is well known that antimicrobials should not be used without indication. Drug resistance has become a major threat to well-being because of the inappropriate and liberal use of these agents in the past [61]. However, there are specific instances in which an antimicrobial agent is necessary. Many agents, like penicillins, are reasonable options for the pregnant woman. However, tetracyclines, (tetracylcine or Acromycin, doxycycline or Vibramycin, minocycline or Minocin) should be avoided as, after crossing the placenta, they concentrate in bones and teeth. Children exposed in utero to tetracyclines may have yellowed teeth with poor enamel and vulnerability to caries as well as problems with bone growth. Other agents should be chosen for the pregnant woman.

The aminoglycosides, streptomycin, and kanamycin (Kantrex) are ototoxic drugs, causing permanent eighth cranial nerve damage. These agents are reserved for grave situations in which the benefits may outweigh the risk, and peak and trough levels should be drawn with administration of multiple doses to ensure the drug plasma level is within the therapeutic window.

Cephalosporins (e.g., cefaclor or Ceclor, cefixime or Suprax, ceftriaxone or Rocephine) are among the most common antimicrobials in treatment of various female reproductive infections. Few studies of cephalosporins have been conducted in the first trimester, but no adverse effects have been reported and cephalosporins, like penicillin, belong to the beta-lactam classification of antimicrobial agents. However, since the penicillins and erythromycin (e.g., e-base or Eryc, azithromycin or

Zithromax, clarithromycin or Biaxin) have been studied extensively and not found to be associated with teratogenic effects, many scientists advocate using them as first-line therapies whenever possible.

Sulfonamides are not teratogenic but require attention to timing. These agents are highly protein bound and can displace bilirubin from binding sites. The most commonly used agents in this category are a combination of sulfamethoxazole and trimethoprim (Bactrim, Septa). Since the placenta clears bilirubin, administration of sulfonamides becomes problematic when it is administered near delivery and the free bilirubin is in the newborn's system where the immature liver is unable to compensate. Kernicterus may result from these high levels. Thus, sulfonamides should be avoided in the third trimester. One sulfonamide, sulfasalazine (Azulfidine), appears to be an exception. This drug is used primarily for the treatment of ulcerative colitis and Crohn's disease and has a weak, if any, effect on bilirubin.

Quinolones are an FDA Category C but are usually considered contraindicated in pregnancy and for young children. Animal studies have demonstrated drug accumulation in the joints with subsequent damage [62].

Metronidazole (Flagyl) is a well-established antiprotozoal agent and is the treatment of choice for *Trichomonas vaginalis* and bacterial vaginosis. No teratogenic effect has been found with metronidazole, even though its mechanism of action involves bacterial mutation [63]. The drug is assigned to FDA Category B. Yet many providers are hesitant to administer it during the first trimester. Although evidence does not support withholding the drug, the conditions for which it is used generally are not life threatening and many providers fear that should a malformed infant be born the drug could be implicated as a litogen. Once labeled as a litogen, it would likely be withdrawn from the marketplace. Since metronidazole is the most effective drug for the treatment of trichomoniasis, these providers avoid its prescription in early pregnancy in order to avoid the risk of litogen labeling.

Sex Hormones

Diethylstilbestrol (DES) is a synthetic nonsteroidal estrogen that was used during the mid-twentieth century to prevent spontaneous abortion, preterm labor, and preeclampsia. Although found not to be efficacious for the above indications, DES nonetheless had a profound effect on many women and their families. The drug became the first one recognized as being capable of transplacental carcinogenesis in humans. Daughters exposed in utero to DES not only were vulnerable to reproductive cancers but often had abnormal uteri, unexplained spontaneous abortions, and preterm labor. Even sons exposed to in utero DES were more likely to have abnormalities of male genitalia. Today, the individuals exposed to DES are perimenopausal or beyond reproductive age. However, women exposed to DES continue to require close health care attention, especially regarding vaginal and cervical cancers and abnormalities [64].

Approximately three million women conceive while actively using contraception, including those using combination oral contraceptives [65]. In most cases of failure with oral contraceptives, it is due to a pill-taking error. Nevertheless, women are concerned that they have exposed their children to estrogen and progesterone. No evidence exists linking any hormonal contraceptives to teratogenic effects.

Vitamins

Vitamin A Vitamins are not always positive supplements. Vitamin A in large doses can be a teratogen. Initially, the threshold was thought to be above 25,000 IU daily. However, a more recent study has found cranial neural crest anomalies occurring with as little as 10,000 IU daily [66]. Midwives should know that routine supplementation of vitamin A is unnecessary, and, if supplementation is used, it should not exceed 5000 IU daily. Typical prenatal multivitamins contain at least 800 IU of vitamin A. Women should be cautioned not to double or triple multivitamins in an attempt to get additional folic acid or calcium. Increasing a multiple vitamin increases all constituents, including vitamin A.

Isotretinoin (Accutane), a vitamin A analog, is a popular agent to minimize acne. Its metabolite, etretinate (Tegison), is used for psoriasis, yet both are known to carry a risk of anomalies of approximately 25 percent.

Folic Acid Through a variety of studies, it has been proved that preconceptional folic acid has positive effects for both primary and secondary prevention of neural tube defects [67]. Numerous cohort studies have suggested that folate, also known as vitamin B_9, may have other prophylactic effects in regard to cardiac disease and colon cancer as well as other diseases [68, 69].

Vaccinations Immunizations are an excellent example of primary care prevention. However, pregnant

women, or those at risk of pregnancy, should not be given live virus vaccines such as the rubella vaccine. Other vaccinations, such as hepatitis A and B, influenza, polio, and rabies may be given during pregnancy if necessary [70].

Analgesics Nonsteroidal anti-inflammatory drugs include a variety of over-the-counter agents and, strictly speaking, include acetylsalicylic acid or aspirin. All these agents have been implicated in disruption of the prostaglandin cascade involved in initiation of labor and are thus linked to post-term pregnancy. Theoretically, they also may be linked with premature closure of the ductus arteriosus as they are employed neonatally for that specific therapeutic effect. Aspirin has been associated with some bleeding issues throughout pregnancy as well as competition with bilirubin for albumin binding sites. All of these agents should be avoided in pregnancy. An alternative agent without anti-inflammatory action is acetaminophen (Tylenol) [71]. Acetaminophen is an FDA Category B and is the analgesic of choice for minor pain during pregnancy.

Opiate analgesics have not been implicated as having teratogenic effects. Caution for use in pregnancy is based upon fear of addiction, not teratogenicity.

Lifestyle Agents Although increasingly unpopular from a social standpoint, smoking remains a relatively common activity during pregnancy, estimated at slightly less than 15 percent nationwide [72]. Although nicotine is not a known teratogen, both nicotine and its metabolite cotinine are fetotoxic, and linked to low birth weight infants, reduced uteroplacental blood flow, placental abruption, and possibly preterm birth. Postnatally, the child of a smoker is more likely than a child of a nonsmoker to die of sudden infant death syndrome (SIDS) [73].

Caffeine is an agent that remains controversial in spite of years of study. It has been established that the half-life of caffeine is tripled during pregnancy. However, linkage with teratogenic effects is more elusive. Early studies failed to account for the confounding bias with smoking. Research studies involving high levels of caffeine have been associated with spontaneous abortion and skeletal anomalies. Studies of women drinking approximately one cup of coffee daily failed to demonstrate any association. Thus, the exact amount that should be recommended to women remains unclear [74, 75]. Theoretically, decaffeinated drinks pose little if any effects on the embryo or fetus.

Many women query their midwives on the advisability of adding a nonnutritive sweetener to their coffee, or ask if they should drink diet soft drinks. Aspartame (Equal, Nutrasweet) is a sugar substitute whose major metabolite is phenylalanine. Although extremely high levels of phenylalanine theoretically can result in toxic fetal levels, as commonly used, aspartame results in fetal phenylalanine levels that are far below toxicity [76]. Obviously, if the mother has phenylketonuria, aspartame is contraindicated.

Almost half of all women between the ages of 15 and 44 years of age have used illicit drugs at least once in their lives. Illicit drug use most commonly has been reported in 7.5 to 15 percent of pregnant women [77]. Although some studies have implicated cocaine with prune-belly syndrome, the evidence is not clear regarding congenital anomalies. Cocaine is associated with abruptio placentae and preterm labor as well as long-term deficits in mental skills [78]. Most illicit drugs are difficult to link with teratogenic effects because of polypharmacy effects, hesitancy regarding disclosure, and variations in potency of the agent. Chapter 12 discusses drug abuse in more detail.

Drugs for the Treatment of Various Medical Conditions

Approximately 25 years ago, midwifery care of high-risk women was a controversial area [79]. Today, the definitions of low and high risk have become less distinct. Many midwives collaboratively care for women who have various medical conditions. Therefore, the midwife needs to appreciate the potential teratogenic issues that accompany some treatments. The following are examples of some conditions that usually require pharmaceutical interventions.

Pregnant women with seizure disorders pose a distinct challenge to the health care provider [80]. Some speculation exists that the disease itself contributes to teratogenic outcomes. Several antiepileptic drugs (AEDs) carry a major risk of teratogenesis, although the absolute risk of congenital malformations following prenatal exposure to most psychotropics is low.

For example, trimethadione is a potent teratogen involving cardiac anomalies, intrauterine growth restriction, and microcephaly. Trimethadione (TMO; Trimethadionum, Trimethinum, Troxidone) is not

commonly used in general and should not be used during pregnancy. Phenytoin (Dilantin) appears to have some teratogenic effect, although perhaps overestimated in years past. Carbamazepine (Tegretol) can result in a dysmorphic pattern of minor anomalies. Phenobarbital (Solfoton) has been associated with potential teratogenic effects. Newborns exposed in utero to phenytoin, carbamazepine, or phenobarbital are at risk of coagulation problems secondary to drug induced vitamin K deficiency, and need prompt supplemental vitamin K.

Many mechanisms have been proposed to explain teratogenicity of anticonvulsant agents. Several of the drugs appear to have antifolate characteristics, and some authorities recommend that women on AEDs should be treated with 4 mg of folic acid preconceptionally and in early pregnancy [81]. The midwife should work closely with maternal fetal specialists when caring for a woman with a seizure disorder as treatment requires the choice of the least risky drug, at the lowest dose that controls seizures.

Depression and other psychiatric conditions are not uncommon in pregnancy. Diazepam (Valium) remains the most common anxiolytic or antianxiety drug and current evidence about benzodiazepines has presented a controversy about whether or not they are associated with cleft palate. Based on the data, if an association does exist, it is very small [82]. However, when administered late in pregnancy or during labor, significant doses of diazepam may result in neonatal irritability, tremors, and hyperreflexia.

Tricyclic antidepressants (TCAs) such as amitriptyline (Elavil), imipramine (Tofranil), and protriptyline (Vivactil) as well as selective serotonin reuptake inhibitors (SSRIs) such as fluoxetine (Prozac), paroxetine (Paxil), and sertraline (Zoloft) have not been found to be teratogens [83]. Although the FDA classifies TCAs as Category D, they are commonly prescribed, and almost two decades of experience suggests these drugs are not potent teratogens. Cases of first-trimester exposure have failed to indicate a significant association with high rates of congenital malformations [84]. The SSRI most studied is fluoxetine and in 450 exposed pregnancies, no fetal anomalies or neurobehavioral effects were demonstrated [85]. Data are sparse or lacking regarding various other antidepressant agents, and monoamine oxidase inhibitors (MAOIs) like phenelzine (Nardil) or tranylcypromide (Parnate) as well as St. John's wort are not recommended for use in pregnancy.

Mood stablizers, such as lithium (Eskalith, Lithobid, Lithonate), usually are used for the treatment of bipolar disease. Lithium appears to be linked with cardiovascular anomalies, including Ebstein's anomaly, a malattachment of tricuspid valve leaves. However, the birth defect is relatively rare, with an estimated incidence of 1 in 20,000 births in the general population. The risk of Ebstein's anomaly is approximately eight times more common among pregnant women taking lithium [86]. Polyhydramnios also has been associated with the use of lithium in pregnancy. Alternatives to lithium generally include anticonvulsant agents like carbamazepine (Tegretol), although these drugs are also problematic.

Untreated hyperthyroidism itself has been linked to spontaneous abortion. However, treatment with radioactive iodine, although useful for the nonpregnant woman, is contraindicated in pregnancy. The agent not only can destroy the maternal thyroid, but it can cross the placenta and destroy the fetal thyroid. Traditionally, propylthiouracil (PTU) has been the drug of choice for hyperthyroidism in pregnancy as methimazole (Tapazole) has been linked to aplasia cutis in the newborn. However, the neonatal association has been called into question [87]. Moreover, propylthiouracil may result in fetal hypothyroidism when the drug is used in high doses, so close monitoring is warranted. The common treatments for hypothyroidism are supplementation with thyroid and, thus, not associated with any known teratogenic effects.

For the woman with chronic hypertension, ACE inhibitors such as captopril (Capoten) and enalapril (Vasotec) should be avoided [88]. Use in second and third trimesters is associated with low birth weight, oligohydramnios, and hypoplastic fetal lung development. In studies on the long-term effect of beta-adrenergic antagonists in pregnancy, atenolol (Tenormin) has been associated with intrauterine growth restriction (IUGR). Propanolol (Inderal) has been associated with neonatal hypoglycemia, IUGR, fetal and neonatal bradycardia, although it is unknown whether the fetal effects are due to the disease process, the drug, or an interaction between the two. The alpha-adrenergic antagonists (e.g., prazosin or Minipress) are commonly used in pregnancy since they effectively can control hypertension and have not been linked with fetal growth restriction. The use of calcium channel blockers has not demonstrated harmful fetal effects. Current studies are being conducted for nifedipine (Adalat, Procardia) both as a tocolytic and as an

agent for treatment of preeclampsia and chronic hypertension in pregnancy. Nicardipine is more effective and has fewer side effects for treating hypertension in pregnancy than metoprolol (Lopressor) [89].

If a woman needs an anticoagulant during pregnancy, heparin, either regular or low molecular weight, remains the drug of choice [90]. Coumarins, including warfarin (Coumadin), easily cross the placenta and approximately one-fourth of the embryos are born with fetal warfarin syndrome (nasal hypoplasia, optic atrophy, and mental retardation). When the fetus is exposed, the results may include cataracts, microcephaly, and microphthalmia, as well as fetal and maternal hemorrhage.

Tocolytics are reserved for treatment in the late second or third trimester, avoiding the classic teratogenic period. However, magnesium sulfate, as a tocolytic or treatment for preeclampsia, may result in an infant who is lethargic and hypotonic at birth. Tachycardia, both maternal and fetal, is a common side effect of beta-adrenergic tocolytics (e.g., terbutaline or Brethine and ritodrine or Yutopar). None of these agents have been identified as teratogenic [91].

The pregestational diabetic woman often controls her disease by the use of oral hypoglycemic agents. Oral hypoglycemics have been implicated with profound neonatal hypoglycemia since placental transfer is relatively easy. Intrauterine fetal death has also been reported. In contrast to oral hypoglycemic agents, insulin is a large molecule and has difficulty crossing the placenta. Therefore, it has been the drug of choice for management of diabetes mellitus during pregnancy [92]. Ongoing current studies are investigating glyburide (DiaBeta, Micronase), a second generation hypoglycemic. When administered during pregnancy, glyburide has neither been found in cord blood nor associated with neonatal effects. If further trials are consistent with these findings, this drug may change management of diabetes in the future [93, 94].

Fortunately, cancer is relatively rare for a reproductive-aged woman. However, when it does occur, chemotherapeutic agents generally pose great risk to the fetus [95]. Trophoblastic and embryonic tissue grows rapidly and anticancer drugs may target them as they do cancerous cells. Methotrexate, for example, interferes with folic acid metabolism. Depending upon when they are administered, chemotherapeutic agents can cause spontaneous abortions or major teratogenic manifestations. Because of its predilection for trophoblastic tissue, methotrexate is often used for the medical treatment of unruptured ectopic pregnancy.

Fetal Drug Therapy

Perhaps the opposite of the study of teratology, or the study of drugs with adverse effects, is the study of fetal drug therapy, or the use of drugs specifically for fetal therapeutics [96]. Fetal drug therapy is the administration of an agent for the purpose of treating a fetal disorder in order to improve capacity for later intrauterine or neonatal adaptation. It is based on knowledge of fetal pharmacokinetics and placental transfer. This area of study is in its infancy, yet several examples already exist, including steroidal treatment of the preterm fetus in order to mature the lungs, folic acid to reduce neural tube defects, antiviral treatment of HIV positive women to decrease mother to child transfer, and even antiarrhythmic drugs for fetal arrhythmia. More study can be anticipated in this area in the future.

Pharmaceuticals and Breastfeeding

No doubt exists that breastfeeding is the best method of feeding newborns and young infants. For many women, the need to take a medication during this time presents a dilemma [97]. Often they fear that there are untoward effects for their child, and their provider may or may not be able to address those fears. Sometimes they discontinue breastfeeding without discussing it with a provider because of fear. A midwife needs to know how drugs transfer into breast milk, reliable resources specific to breastfeeding and drug compatibility, and several key questions [98, 99]. The first question is whether the breastfeeding mother really needs to be medicated. How much of the drug is excreted in breast milk, and does it present a risk to the baby?

The difficulty in answering these questions lies in the fact that there is a meager knowledge base in the area, and data are often conflicting. Essentially all milk secretion and synthesis studies have been conducted on animals. Much of the general knowledge is extrapolated from those studies, adding anecdotal findings and plausibility based on known maternal and neonatal pharmacokinetics. For the majority of drugs, less than 1 percent of the maternal plasma level of the drug crosses into the breast milk. In addition, binding to the milk proteins or onto the surface of the milk fat globule deters neonatal exposure further, since

bound drugs do not passively diffuse out of the newborn's stomach [100].

In order for drugs to come into contact with breast milk, they must pass the mammary membrane. The mammary membrane is semipermeable, and transfer is more difficult than transfer across the placenta. However, just as placental drug transfer is dependent upon a variety of factors, so is the amount of an agent transferred through breast milk. Factors that increase the likelihood of drug transfer into breast milk include lipid solubility, low molecular weight, long half-life, and the capacity to remain unbound and nonionized in the maternal plasma.

Timing also influences drug transfer into breast milk. The excretion of drugs into breast milk primarily involves passive diffusion. However, in addition to diffusion, drugs may pass by secretory methods though the capillary walls into the alveolar cell lining of the milk buds and through both walls to the alveolar cells to penetrate milk. During the first one to two weeks postpartum, large gaps exist between alveolar cells, facilitating easy transfer of various agents including immunoglobulins. As milk production is established and the alveolar cells expand, the intracellular gaps tend to close, making drug transfer more difficult [101]. Also, since the majority of milk is produced at the time of feeding and blood flow to the breast is maximized at this time, women should be educated about time for peak plasma levels of the drug and counseled to avoid breastfeeding during these times.

One of the most popular approaches used in clinical practice to evaluate drug concentration in breast milk is the milk plasma ratio (MPR). This ratio varies over time as both drug amount and type of milk varies over time, so most drug kinetics are based on a time-averaged ratio or range [102]. The MPR has been calculated for many agents. The majority of drugs have an MPR of 1 or less, indicating that the level of drug in the breast milk is the same or less as in maternal plasma. For example, an MPR of 0.10 indicates that the breast milk contains 10 percent of the amount of the drug in maternal plasma. Although the MPR can be helpful, it is not clinically relevant unless other factors are considered. For example, a drug with a high MPR, may not indicate a problem if the drug poses no harm to the infant. Conversely, a low MPR may be problematic if drug clearance is slow in the neonate or the half-life of the drug is unusually long, exposing the baby to the pharmaceutical over a longer period of time.

In 2001, the American Academy of Pediatrics Committee on Drugs published an evidence-based listing of drug information for breastfeeding that included approximately 400 primary research references [103]. This group currently uses a list of seven categories for licit and illicit drugs. Six of the categories include those licit and illicit drugs that are contraindicated, requiring temporary cessation, of possible concern, to be used with caution, and compatible. The additional category includes food and environmental agents. (See the AAP tables in Appendix C at the end of this chapter.)

The Breastfeeding and Human Lactation Study Center at the University of Rochester is a repository of breastfeeding information. Midwives with specific questions can contact the center during the week at (716) 275-0088.

Midwives should note that most of the drugs felt to be harmful to the breastfeeding couplet are uncommon ones. Fortunately, many other common drugs are compatible with breastfeeding. Although more research is needed regarding many agents, drug transfer is rarely a reason to discontinue breastfeeding, and the midwife should be encouraged to seek out the most current and reliable information when counseling a woman about safety. The following section describes agents or groups of drugs that midwives may find themselves considering for management of conditions that a breastfeeding woman may experience. Agents that should be avoided because of risk are indicated as such. Some common agents that are preferred for the breastfeeding woman also are included in the discussion.

Selected Drugs and the Breastfeeding Woman

Antimicrobials

Penicillins (e.g., ampicillin or Omnipen and amoxicillin or Amoxil) and related cephalosporins (e.g., cefaclor or Ceclor, cefixime or Suprax, ceftriaxone or Rocephine) are considered compatible for the breastfeeding dyad [104]. Concern about sensitivity is more theoretical than actual. Sulfa drugs such as the combination of sulfamethoxazole with trimethoprim (Bactrim, Septa) should be avoided during the first month of life because of the issue of competing for albumin-binding sites with bilirubin. When the liver is mature enough that the infant

could have pediatric use of sulfa, there is no need to restrict it from the breastfeeding woman.

Midwives may remember that women should not take tetracyclines such as tetracycline (Acromycin), doxycycline (Vibramycin), or minocycline (Minocin) with dairy products as it inhibits the therapeutic effect. In a like manner, tetracyclines tend to bind with breast milk, causing only a small amount to be transferred to the infant. Studies of dosing regimens lasting 10 days or less have failed to demonstrate any adverse neonatal effects. However, since long-term use may have bone or dental impact, alternative antimicrobials are generally advised. Quinolones are usually discouraged for a woman who is breastfeeding due to the theoretical risk of arthropathies, although the AAP states that is compatible with the lactating mother. Quinolones include ofloxacine (Floxin), levofloxacin (Levaquin), and ciprofloxacin (Cipro, Baycip, Ciflox, Ciplox).

Erythromycin (e.g., e-base or Eryc, azithromycin or Zithromax, clarithromycin or Biaxin) is one of the agents that is more highly concentrated in breast milk than in maternal plasma—i.e., it has an MPR > 1.0. Many clinicians defer prescribing it until the baby is mature enough to take the drug directly, although the AAP lists it as compatible with breastfeeding. The most commonly discussed problem with this macrolide is drug-to-drug interactions with other agents, like some nonsedating antihistamines. Therefore, as usual, the midwife should consult with the woman about all her current use of drugs and herbs.

The use of metronidazole (Flagyl) by a breastfeeding woman is controversial [105]. Some authorities, including the American Academy of Pediatrics, have recommended that when a 2-gram dose is used, it is followed by manual expression/pumping for 24 hours, during which the breast milk would be discarded. However, metronidazole is a drug in pediatric use and it has an MPR close to 1.0 with a 400 mg dose given three times a day. It is the side effects that make most scientists advise temporary cessation of breastfeeding. These adverse effects have included neonatal vomiting and potential blood dyscrasias. If the woman needs the medication for treatment of bacterial vaginosis, metronidazole in vaginal gel form (MetroGel) should pose no need to cease breastfeeding as the level in breast milk is undetectable.

Aminoglycosides like kanamycin (Kantrex) are agents that are given directly to newborns. These drugs are compatible with breastfeeding.

Sex Hormones

The puerperium is a critical period for most women. Postpartum women must decide if they want more children and, if so, when. Therefore, contraception is a major area of discussion. Breastfeeding women may use the lactational amenorrhea method (LAM) with excellent results if they are exclusively breastfeeding. Modern culture is not supportive of breastfeeding and many women find themselves at work in an unsupportive environment. For them, exclusivity of breastfeeding may not be feasible. The most popular temporary method of contraception in the United States is combination oral contraceptives (COCs). These agents have been found to have a moderate inhibitory effect on breast milk, especially the older agents with 50 micrograms or more of estrogen [106]. Some of the hormones may be transferred to the newborn, and no long-term effects have been found, although women who use COCs breastfeed their infants for a shorter period of time than women who use other contraceptive methods. Therefore, most sources recommend progesterone only methods, such as progestin only pills (POPs) or medroxyprogesterone acetate in oil (DepoProvera). Progestin methods do not inhibit milk volume, and according to some research, may even increase the volume. Nonsteroidal methods such as barriers and copper intrauterine devices are compatible with breastfeeding. Data are lacking on newer methods such as vaginal rings, transdermal patches, and estrogen/progesterone injections. However, each is composed of estrogen and progesterone and should be viewed as comparable to COCs.

Analgesics

Codeine and meperidine (Demerol) appear in low levels in breast milk and generally do not warrant cessation of either the drug or breastfeeding for the couplet. Nonsteroidal anti-inflammatory drugs are considered reasonable choices while breastfeeding because negligible amounts have been found in breast milk. However, when large amounts of opiates are administered during labor, the baby may be sleepy and hypotonic at birth, causing some difficulty in initiating breastfeeding. Slower initiation of breastfeeding has been reported for primigravidas when meperidine was administered 1 hour to 4 hours prior to birth [107]. Similar concerns about neonatal disorganization after intrapartum epidurals have been proposed, although no clear data exist to address these concerns.

Gastrointestinal Drugs and Antihistamines

Cimetidine (Tagamet) is an antisecretory antihistamine in popular use for maternal pyrosis, or heartburn. However, it has antiandrogenic effects and possesses an MPR higher than 1, whereas antacids can also be used for heartburn and are compatible with breastfeeding. Many sources suggest that any antihistamine, whether indicated for respiratory or gastrointestinal reasons, should be used with caution, or avoided, during breastfeeding because of concerns regarding anticholinergic side effects and possible diminished milk supply rather than any direct effects on the newborn.

Miscellaneous

Recent studies indicate that heparin, low molecular weight heparin, and warfarin are compatible with breastfeeding. For the woman with hyperthyroidism, propylthiouracil (PTU) is the drug of choice and methimazole (Tapazole) should be avoided.

Lifestyle Drugs

As previously noted, smoking can have major negative effects on the newborn such as an increased risk of sudden infant death syndrome (SIDS). Nicotine use previously was cited as a contraindication to breastfeeding. However, today smoking is viewed as a risk-benefit issue, since there is a greater appreciation of the benefits of breastfeeding for babies of smokers. Breastfeeding has been demonstrated to ameliorate the risk of SIDS as well as to decrease the incidence of respiratory infections in children of smoking mothers compared to bottle fed babies of smoking mothers [108]. Beer and wine are often part of breastfeeding management in European countries. Although not contraindicated during lactation, alcohol changes the odor and taste of the breast milk and infants tend to consume less milk as the concentration of alcohol in milk increases [109].

Caffeine accumulates in the infant. Moderate use, such as one to two daily cups of coffee, rarely is problematic. However, caffeine tends to be ubiquitous in modern food. A woman who drinks coffee, soft drinks containing caffeine, and even caffeine-enhanced bottled water may intake large amounts. Her breastfed baby may be wide awake and hyperactive. Smoking may enhance this effect. Discontinuation or at least a major decrease of caffeine will remedy the situation.

In summary, every effort should be made to support breastfeeding. Obviously drugs should not be casually prescribed or recommended. When a drug is needed, the midwife should choose one for which data exist and one that poses the least possibility of an adverse neonatal reaction. Moreover, midwives should initiate a discussion of drugs and breastfeeding with all lactating women, including the reassurance that it would be rare to discontinue breastfeeding, but that a woman should make certain that all her providers and her infant's providers know that she is lactating. Such a proactive discussion also should decrease the chance that the woman herself might wean the baby of her own volition. Table 10-7 provides a summary of guidelines for breastfeeding and the use of medications.

Galactagogues

The most common reason for premature weaning is the assumption by the mother that she has inadequate breast milk [110]. Although this assumption may not be accurate, there are times in which a woman's milk supply may be low. Nonpharmaceutical interventions such as hydration and frequent nursing may remedy the situation. However, there are some agents, both prescription and herbal, that are called *galactagogues* and may be of therapeutic help. For example, metoclopramide

TABLE 10-7 Guidelines for Breastfeeding and Medication Use

- Reserve the use of pharmaceuticals for situations where they are necessary.
- Delay the use of pharmaceuticals as long as possible since maturation of the infant includes ability to better metabolize agents.
- Use the lowest dose for the shortest time that is therapeutic.
- Whenever possible, choose an agent that
  - Is used in pediatrics
  - Has a short half-life
  - Has a milk plasma ratio of 1 or less
  - Is not sustained release
- Manipulate timing so that the lowest amount is in the milk—usually immediately after a feeding or before the baby has a long sleep period.
- Observe the baby for any changes, including behavior or physical signs like a rash.
- Teach a woman about manual expression or use of a breast pump if the only drug available is contraindicated for the baby.
- Encourage the woman to continue to breastfeed and not see use of medications as a reason she must wean her baby.

Source: Adapted from Riordan, J., and Auerbach, K. *Breastfeeding and Human Lactation*, 2nd ed. Sudbury, MA: Jones and Bartlett, 1999.

(Reglan) is a dopamine antagonist used for gastrointestinal indications. A side effect of the drug is galactorrhea and it is used off label to help women increase their milk supply. Metoclopramide tends to have a number of side effects, including fatigue, mental exhaustion, and even extrapyramidal effects, so generally it is used for a limited duration. Herbal galactagogues are common. For example, fenugreek (*Trigonella foenum-graecum L.*) has been used for years and is well accepted in many countries, yet data demonstrating its efficacy remain elusive. Studies are ongoing in several areas of the world regarding efficacy of various galactagogues and other herbal remedies.

Conclusion

Pharmaceutical agents are part of modern life. Today's midwife should be knowledgeable about them. Like any other intervention in the midwife's repertoire, drugs and herbs should be used appropriately and monitored for therapeutic as well as adverse effects. Pharmacology is an essential area in women's health care, and it is one that continues to grow and challenge providers and women alike.

References

1. LaChance, P. Nutraceuticals and functional foods. *Food Technology* 56(1):20 (January) 2002.
2. Fahs, P. S. S., and Faucher, M. A. Nutriceuticals and cardiovascular health in women. *J. Midwifery Womens Health* 47(3):190–203 (May/June) 2002.
3. U.S. Food and Drug Administration. Cosmeceuticals. *FDA Fact Sheet*, February 24, 2000.
4. Dechaud, H., Ravard, C., Claustrat, F., de la Perriere, A. B., and Pugeat, M. Xenoestrogen interaction with human sex hormone-binding globulin (hSHBG). *Steroids* 64(5):328–334 (May) 1999.
5. Doyle, E. I., and Faucher, M. A. Pharmaceutical therapy in midwifery practice: A culturally competent approach. *J. Midwifery Womens Health* 47(3):122–129 (May/June) 2002.
6. Wolf, C.R., Smith, G., and Smith, R.L. Science, medicine and the future: Pharmacogenetics. *Br. Med. J.* 320(7240):987–990 (April 8) 2000.
7. Phillips, K., Veenstra, D., Oren, E., Lee, J., and Sadee, W. Potential role of pharmacogenomics in reducing adverse drug reactions. *JAMA* 286(18):2270–2279 (November 14) 2001.
8. Sadde, W. Pharmacogenomics. *Br. Med. J.* 319(7220):1–4 (November 13) 1999.
9. Wood, A. J. Racial differences in the response to drugs. *N. Engl. J. Med.* 344(18):1394–1396 (May 5) 2001.
10. Farmer, R., Williams, T., and Nightingale, A. Pitfalls of pharmacoepidemiology. *Br. Med. J.* 321(7272):1352 (November 25) 2000.
11. U.S. Food and Drug Administration. *CDER Report to the Nation: 1999*. Washington, DC: Government Printing Office, 1999.
12. *Pharmacy Times*. Accessed online at http://www.rxlist.com/top200.htm.
13. Kaufman, D., Kelly, J., Rosenberg, L., Anderson, T., and Mitchell, A. Recent patterns of medication use in the ambulatory adult population of the United States: The Slone Survey. *JAMA* 287(3):337–344 (January 16) 2002.
14. Woloshin, S., Schwartz, L., Tremmel, J., and Welch, H. Direct-to-consumer advertisements for prescription drugs: What are Americans being sold? *Lancet* 358(9288):1141–1146 (October 6) 2001.
15. *Pesticides and National Strategies for Health Care Providers: Draft Implementation Plan*. Rockville, MD: U.S. Government, 2000.
16. Gabbe, S., and Turner, L. Reproductive hazards of the American lifestyle: Work during pregnancy. *Am. J. Obstet. Gynecol.* 176(4):826–832 (April) 1997.
17. Jacobson, J., and Jacobson, S. Intellectual impairment in children exposed to polychlorinated biphenyls in uterus. *N. Engl. J. Med.* 335(11):783–789, September 12, 1996.
18. Jacobson, J., and Jacobson, S. Postnatal exposure to PCBs and childhood development. *Lancet* 358(9293):1568–1569 (November 10) 2001.
19. Walkowiak, J., Wiener J. A., Fastabend, A., et al. Environmental exposure to polychlorinated biphenyls and quality of home environment: effects on psychodevelopment in early childhood. *Lancet* 358(9293):1602–1607 (November 10) 2001.
20. Zuccato, E., Calamari, D., Natangelo, M., and Fanelli, R. Presence of therapeutic drugs in the environment. *Lancet* 355(9217):1789–1790 (May 20) 2000.
21. U.S. CFR Title 21: Food and Drugs: parts 1 to 1404. Accessed online at www.fda.gov.
22. Hanson, G., Venturelli, P. J., and Fleckenstein,

A. E. *Drugs and Society*, 7th ed. Sudbury, MA: Jones and Bartlett, 2002.

23. Yankowitz, J., and Niebyl, J. R. *Drug Therapy in Pregnancy*. 3rd ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2001.

24. U.S. Food and Drug Administration. Buying medicines and medical products on line. *FDA Fact Sheet*, March 29, 2002.

25. Frederickson, M. The drug development process and the pregnant woman, *J. Midwifery Womens Health* 47(6):422–425 (November/December) 2002.

26. American College of Nurse-Midwives. *Nurse-Midwifery Today: A Handbook of State Laws and Regulations*. Washington, DC: ACNM, 2001.

27. Minarik, P. A. Legislative and regulatory update: DEA registration for midlevel practitioners. *Clinical Nurse Specialist* 7(6):319, 329 (November) 1993.

28. DeVries, T. P. G. M., Hemmings, R. H., Hogerzeil, H. V., and Fresel, D. A. *The WHO Guide to Good Prescribing*. Geneva: World Health Organization, 1995.

29. Lazarou, J., Pomeranz, B., and Corey, P. Incidence of adverse drug reactions in hospitalized patients: A meta-analysis of prospective studies. *JAMA* 279(15):1200–1205 (April 15) 1998.

30. Audet, A., and Hartman, E. A 40 year old woman who noticed a medication error, 1 year later. *JAMA* 287(24):3258 (June 26) 2002.

31. Enright, M. C., Robinson, D. A., Randle, G., Feil, E. J., Grundmann, H., and Spratt, B. G. The evolutionary history of methicillin-resistant Staphylococcus aureus (MRSA). *Proc. Natl. Acad. Sci. U S A.* 99(11):7687–7692 (May 28) 2002.

32. Hooper, D. Emerging mechanisms of fluroquinolone resistance. *Emerging Infect. Dis.* 7(2):337–341 (March/April) 2001.

33. Levy, S. B. Antibacterial household products: Cause for concern. *Emerging Infect. Dis.* 7(3S):512–515 (June) 2001.

34. Kalow, W. Pharmacogenetics in biological perspective. *Pharmacol. Rev.* 49(4):369–379 (December) 1997.

35. Brucker, M. C. Resources for clinicians: Personal digital assistants and world wide web resources for pharmacology. *J. Midwifery Womens Health* 47(6):493–494 (November/December) 2002.

36. Cornell, S. Electronic prescribing: New technology can reduce errors and save time. *Adv. Nurse Pract.* 9(6):107–108 (June 1) 2001.

37. Hogan, R. New media/therapeutics: ePocrates qRx 4.0, *JAMA* 286(2):711 (July 11) 2002.

38. Tumolo, J. When poor patients can't pay, drug assistance programs will. *Adv. Nurse Pract.* 9(5):69–71 (May 1) 2001.

39. Hoffman, F. A. Regulation of dietary supplements in the United States: Understanding the Dietary Supplement Health and Education Act. *Clin. Obstet. Gynecol.* 44(4):780–788 (December) 2001.

40. Blumenthal, M., Busse, W., Goldberg, A., Gruenwald, J., Riggins, C., and Rister, R. (Eds.); Klein, S., and Rister, R. (trans.). *Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines*. Newton, MA: Integrative Medicine Communications, 1998.

41. Marty, A. T. Review: The complete German Commission E Monographs. *JAMA* 281(19):1952 (May 19) 1999.

42. Yankowitz, J., and Niebyl, J. R. *Drug Therapy in Pregnancy,* 3rd ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2001.

43. Briggs, G. G. Drug effects on the fetus and breast-fed infant. *Clin. Obstet. Gynecol.* 45(1):6–21 (March) 2002.

44. Hansen, W. F., and Yankowitz, J. Pharmacologic therapy for medical disorders during pregnancy. *Clin. Obstet. Gynecol.* 45(1):13–52 (March) 2002.

45. Briggs, G. G. Drug effects on the fetus and breast-fed infant. *Clin. Obstet. Gynecol.* 45(1):6–21 (March) 2002.

46. Cunningham, F. G., Gant, N. F., Leveno, K. J., Gilstrap, L. C., Hauth, J. C., and Wenstrom, K. D. *Williams Obstetrics*, 21st ed. New York: McGraw-Hill.

47. U.S. Food and Drug Administration. Accessed online at www.fda.gov.

48. Briggs, G. G., Freeman, R., and Sumner, S. *Drugs in Pregnancy and Lactation*. Baltimore, MD: Williams and Wilkins, 2001.

49. Henney, J. *Clinical Pharmacology During Pregnancy: Addressing Clinical Needs through Science*. Washington, DC: U.S. Food and Drug Administration, 2000.

50. Hansen, W., Peacock, A., and Yankowitz, J. Treatment of illnesses in pregnancy and lactation. *J. Midwifery Womens Health* 47(6):409–421 (November/December) 2002.

51. Mills, J. L., and D. Alexander. Teratogens and "litogens." *N. Engl. J. Med.* 315(19):1234–1236 (November 6) 1986.

52. Shiono, P., and Klebanoff, M. Bendectin and congenital malformations. *Teratology* 40(2):151–155 (August) 1989.

53. Shepard, T. "Proof" of human teratogenicity. *Teratology* 50(2):97–98 (August) 1994.

54. Bar-Oz, B., Moretti, M. E., Mareels, G., Van Tittleboom, T., and Kroen, G. Reporting bias in retrospective ascertainment of drug induced embryopathy. *Lancet* 354(9191):1700 (November 13) 1999.

55. Feldman, Y., Koren, G., Mattice, K., Shear, H., Pellegrini, E., and MacLeod, S. M. Determinants of recall and recall bias in studying drug and chemical exposure in pregnancy. *Teratology* 40(1):37–45 (July) 1989.

56. Raje, N., and Anderson, K. Thalidomide: A revival story. *N. Engl. J. Med.* 341(21):1606–1608 (November 18) 1999.

57. Koren, G., Pastuszak, A., and Ito, S. Drugs in pregnancy. *N. Engl. J. Med.* 338(16):1128–1137 (April 16) 1998.

58. Centers for Disease Control and Prevention. Accutane exposed pregnancies. *MMWR* 49(2):28–31 (January 21) 2000.

59. Yankowitz, J., and Niebyl, J. R. *Drug Therapy in Pregnancy,* 3rd ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2001.

60. Cunningham, F. G., Gant, N. F., Leveno, K. J., Gilstrap, L. C., Hauth, J. C., and Wenstrom, K. D. *Williams Obstetrics,* 21st ed. New York: McGraw-Hill.

61. Duff, P. Antibiotic selection in obstetrics: Making cost-effective choices. *Clin. Obstet. Gynecol.* 45(1):59–72 (March) 2002.

62. Yankowitz, J., and Niebyl, J. R. *Drug Therapy in Pregnancy*, 3rd ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2001.

63. Piper, J. M., Mitchel, E. F., and Ray, W. A. Prenatal use of metronidazole and birth defects: no association. *Obstet. Gynecol.* 82(3):348–352 (September) 1993.

64. Hammes, B., and Laitman, C. DES Update. *J. Midwifery Womens Health* 48(1): (January/February) 2003.

65. Fu, H., Darroch, J., Haas, T., and Ranjit, N. Contraceptive failure rates: New estimates from the 1995 National Survey of Family Growth. *Fam. Plann. Perspect.* 31(2):56–63 (March/April) 1999.

66 Rothman, K., More, L., Singer, J., Nguyen, U., Mannino, S., and Milunsky, A. Teratogenicity of high vitamin A intake. *N. Engl. J. Med.* 333(21):1369–1373 (November 23) 1995.

67. Botto, L. D., Moore, C. A., Khoury, M. J., and Erickson, J. D. Neural-tube defects. *N. Engl. J. Med.* 341(20):1509–1519 (November 11) 1999.

68. Fairfield, K., and Fletcher, R. Vitamins for chronic disease prevention in adults: scientific review. *JAMA* 287(23):3116–3126 (June 19) 2002.

69. Fletcher, R., and Fairfield, K. Vitamins for chronic disease prevention in adults: clinical applications. *JAMA* 287(23):3127–3129 (June 19) 2002.

70. Faix, R. Immunization during pregnancy. *Clin. Obstet. Gynecol.* 45(1):42–58 (March) 2002.

71. Conover, E.A. Over-the-counter products: Nonprescription medications, nutraceuticals and herbal agents. *Clin. Obstet. Gynecol.* 45(1):89–98 (March) 2002.

72. Centers for Disease Control and Prevention. Cigarette smoking during the last 3 months of pregnancy among women who gave birth to live infants in Maine 1988–1997. *MMWR* 48(20):421–426 (May 28) 1999.

73. Curet, L. B., and His, A. C. Drug abuse during pregnancy. *Clin. Obstet. Gynecol.* 45(1):73–88 (March) 2002.

74. Clausson B., Granath F., Ekbom A., et al. Effect of caffeine exposure during pregnancy on birth weight and gestational age. *Am. J. Epidemiol.* 155(5):429–436 (March 1) 2002.

75. Cnattingius S., Signorello L. B., Anneren G., et al. Caffeine intake and the risk of first-trimester spontaneous abortion. *N. Engl. J. Med.* 343(25):1839–1845 (December 21) 2000.

76. American Dietetic Association. Position statement: use of nutritive and nonnutritive sweeteners. *J. Am. Diet. Assoc.* 98(5):580–587 (May) 1998.

77. Substance Abuse and Mental Health Services Administration. Substance use among pregnancy women during 1999 and 2000. *National Household Survey on Drug Abuse.* Washington, DC: U.S. Department of Health and Human Services, 2002.

78. Singer L. T. Arendt, R., Minnes, S., et al. Cognitive and motor outcomes of cocaine-exposed infants. *JAMA* 287(15):1952–1960 (April 17) 2002.

79. Reedy, N. J. The nurse-midwife in complicated obstetrics: trend or treason. *J. Nurse-Midwifery* 24(1):11–17 (January/February) 1975.

80. Hansen, W. F., and Yankowitz, J. Pharmacologic therapy for medical disorders during pregnancy. *Clin. Obstet. Gynecol.* 45(1):136–152 (March) 2002.

81. Hernandez-Diaz, S., Werler, M., Walker, A., and Mitchell, A. Folic acid antagonists during preg-

nancy and risk of birth defects. *N. Engl. J. Med.* 343(22):1608–1614 (November 30) 2000.

82. Czeizel, A. E., Szegal, B. A., Joffe, J. M., and Racz, J. The effect of diazepam and promethazine treatment during pregnancy on the somatic development of human offspring. *Neurotoxicol. Teratol.* 21(2):157–167 (March/April) 1999.

83. Wisner, K. L., Gelenberg, A. J., Leonard, H., Zarin, D., and Frank, E. Pharmacologic treatment of depression during pregnancy. *JAMA* 282(13):1264–1269 (October 6) 1999.

84. Nulman, I., Rovet. J., Stewart, D. E., et al. Neurodevelopment of children exposed in utero to antidepressant drugs. *N. Engl. J. Med.* 336(4):258–262 (January 23) 1997.

85. Pastuszak, A., Schick-Boschetto, B., Zuber, C., et al. Pregnancy outcome following first-trimester exposure to fluoxetine (Prozac). *JAMA* 269(17):2246–2248 (May 5) 1993.

86. Cohen, L. S., Friedman, J. M., Jefferson, J. W., Johnson, E. M., and Weiner, M. L. A reevaluation of risk of in utero exposure to lithium. *JAMA* 271(2):146–150 (January 12) 1994.

87. American College of Obstetricians and Gynecologists. Thyroid disease in pregnancy. *ACOG Pract. Bull.* 37:1–8 (August) 2002.

88. Barrilleaux, R. S., and Martin, J. N. Hypertensive therapy during pregnancy. *Clin. Obstet. Gynecol.* 45(1):22–34 (March) 2002.

89. Jannet, D., Carbonne, B., Sebban, E., and Milliez, J. Nicardipine versus metoprolol in the treatment of hypertension during pregnancy: a randomized comparative trial. *Obstet. Gynecol.* 84(3):354–358 (September) 1994.

90. Hansen, W. F., and Yankowitz, J. Pharmacologic therapy for medical disorders during pregnancy. *Clin. Obstet. Gynecol.* 45(1):136–152 (March) 2002.

91. Jeyabalan, A., and Caritis, S. N. Pharmacologic inhibition of preterm labor. *Clin. Obstet. Gynecol.* 45(1):99–113 (March) 2002.

92. Reedy, N. J. Addressing the Epidemic: Pharmacotherapeutic management of diabetes in women. *J. Midwifery Womens Health* 47(6):471–486 (November/December) 2002.

93. Gonzalez, J. L. Management of diabetes in pregnancy. *Clin. Obstet. Gynecol.* 45(1):163–169 (March) 2002.

94. Langer, O., Conway, D., Berkus, M., Xenakis, E., and Gonzales, O. A comparison of glyburide and insulin in women with gestation diabetes mellitus. *N. Engl. J. Med.* 343(16):1134–1138 (October 19) 2000.

95. Leslie, K. K. Chemotherapy and pregnancy. *Clin. Obstet. Gynecol.* 45(1):153–164 (March) 2002.

96. Miller, R. Fetal drug therapy: principles and issues. *Clin. Obstet. Gynecol.* 34(2):241–250 (June) 1991.

97. Auerbach, K. G. Breastfeeding and maternal medication use. *JOGNN* 28(5):554–563 (September/October) 1999.

98. Ito, S. Drug therapy for breast-feeding women. *N. Engl. J. Med.* 343(2):118–126 (July 13) 2000.

99. Riordan, J., and Auerbach, K. *Breastfeeding and Human Lactation*, 2nd ed. Sudbury, MA: Jones and Bartlett, 1999.

100. Briggs, G. G., Freeman, R., and Sumner, S. *Drugs in Pregnancy and Lactation*. Baltimore, MD: Williams and Wilkins, 2001.

101. Hale, T. *Medications and Mother's Milk*. Austin, TX: Pharmasoft Publishing, 2000, pp. 278–280.

102. Ito, S. Drug therapy for breast-feeding women. *N. Engl. J. Med.* 343(2):118–126 (July 13) 2000.

103. American Academy of Pediatrics Committee on Drugs. The transfer of drugs and other chemicals into human milk: policy statement. *Pediatrics* 108(3):776–789 (September) 2001.

104. Briggs, G. G., Freeman, R., and Sumner, S. *Drugs in Pregnancy and Lactation*. Baltimore, MD: Williams and Wilkins, 2001.

105. Lawrence, R. A. *Breastfeeding: A Guide for the Medical Profession*. St Louis, MO: Mosby, 1999.

106. Lawrence, R. A. *Breastfeeding: A Guide for the Medical Profession*. St Louis, MO: Mosby, 1999.

107. Crowell, M. K., Hill, P. D., and Humenick, S. S. Relationship between obstetric analgesia and time of effective breast feeding. *J. Nurse-Midwifery* 39(3):150–156 (May/June) 1994.

108. Chen, Y. Synergistic effect of passive smoking and artificial feeding on hospitalization for respiratory illness in early childhood. *Chest* 95(5):1004–1007 (May) 1989.

109. Lawrence, R. A. *Breastfeeding: A Guide for the Medical Profession*. St Louis, MO: Mosby, 1999.

110. Riordan, J., and Auerbach, K. *Breastfeeding and Human Lactation*, 2nd ed. Sudbury, MA: Jones and Bartlett, 1999.

Additional References

American Academy of Pediatrics Committee on Substance Abuse and Committee on Children with Disabilities. Fetal alcohol syndrome and alcohol related neurodevelopmental disorders: policy statement. *Pediatrics* 106(2 pt 1):358–361 (August) 2000.

American College of Obstetricians and Gynecologists. Teratology. *ACOG Educ. Bull.* 236:1–8, 1997.

Ances, B. M. New concerns about thalidomide. *Obstet. Gynecol.* 99(1):125–128 (January) 2002.

Flanders-Stepans, M. Uncertainty exists in recommendations for reducing prenatal exposure to mercury. *J. Perinat. Educ.* 8(4):40–42 (July/August) 1999.

Gonzalez, C. H., Marques-Dias, M. J., Kim, C. A., et al. Congenital abnormalities in Brazilian children associated with misoprostol misuse in first trimester. *Lancet* 135(9116):1624–1628 (May 30) 1998.

Hansen, D., Lou, H., and Olsen, J. Serious life events and congenital malformations: a national study with complete followup. *Lancet* 356(9233):875–880 (September 9) 2000.

Holmes, L., Harvey, E., Coull, B., et al. The teratogenicity of anticonvulsant drugs. *N. Engl. J. Med.* 344(15):1132–1138 (April 12) 2000.

Paztuszak, A., Schüler L., Speck-Martins C. E., et al. Use of misoprostol during pregnancy and Mobius syndrome in infants. *N. Engl. J. Med.* 338(26):1881–1885 (June 25) 1998.

Rubin, P. Drug treatment during pregnancy. *Br. J. Med.* 317(7220):1503–1506 (November 28) 1998.

Samren, E., van Duijn, C. M., Christiaens, G. C., Hofman, A., and Lindhout D. Antiepileptic drug regimens and major congenital abnormalities in the offspring. *Ann. Neurol.* 46(5):739–746 (November) 1999.

Sibai, B. M. Treatment of hypertension in pregnant women. *N. Engl. J. Med.* 335(4):257–265 (July 25) 1996.

Appendix A

Top 200 Drugs by Rank, by Generic Name, and by Brand Name

TABLE 10A-1 Top 200 Drugs, 2001: By Rank

Rank	Generic Name	Brand Name	Manufacturer
1	Hydrocodone w/APAP	Hydrocodone w/APAP	Various
2	Atorvastatin	Lipitor	Parke-Davis
3	Conjugated Estrogens	Premarin	Wyeth-Ayerst
4	Atenolol	Atenolol	Various
5	Levothyroxine	Synthroid	Knoll
6	Azithromycin	Zithromax	Pfizer
7	Furosemide	Furosemide	Various
8	Amoxicillin	Amoxicillin	Various
9	Amlodipine	Norvasc	Pfizer
10	Alprazolam	Alprazolam	Various
11	Albuterol	Albuterol Aerosol	Various
12	Loratadine	Claritin	Schering
13	Hydrochlorothiazide	Hydrochlorothiazide	Various
14	Omeprazole	Prilosec	AstraZeneca
15	Sertraline	Zoloft	Pfizer
16	Paroxetine	Paxil	SK Beecham
17	Triamterene/HCTZ	Triamterene/HCTZ	Various
18	Lansoprazole	Prevacid	Tap Pharm
19	Ibuprofen	Advil, Motrin, Nuprin	Various
20	Celecoxib	Celebrex	Searle
21	Simvastatin	Zocor	Merck
22	Cephalexin	Cephalexin	Various
23	Metformin	Glucophage	B-M Squibb
24	Rofecoxib	Vioxx	Merck
25	Lisinopril	Zestril	Zeneca
26	Amoxicillin/Clavulanate	Augmentin	SK Beecham
27	Propoxyphene N/APAP	Propoxyphene N/APAP	Various
28	Conjugated Estrogens/Medroxyprogesterone	Prempro	Wyeth-Ayerst
29	Prednisone	Prednisone	Various
30	Norgestimate/Ethinyl Estradiol	Ortho Tri-Cyclen	Ortho Pharm
31	Acetaminophen/Codeine	Acetaminophen/Codeine	Various
32	Cetirizine	Zyrtec	Pfizer
33	Fexofenadine	Allegra	Hoech Mar R
34	Levothyroxine	Levoxyl	Jones Medical Ind
35	Amoxicillin	Trimox	Apothecon
36	Metoprolol	Metoprolol Tartrate	Various
37	Lorazepam	Lorazepam	Various
38	Metoprolol	Toprol-XL	AstraZeneca
39	Fluoxetine	Prozac	Lilly
40	Ranitidine	Ranitidine HCl	Various
41	Zolpidem	Ambien	Searle
42	Citalopram	Celexa	Forest Pharm
43	Amitriptyline	Amitriptyline	Various
44	Alendronate	Fosamax	Merck
45	Quinapril	Accupril	Parke-Davis
46	Sildenafil Citrate	Viagra	Pfizer
47	Pravastatin	Pravachol	B-M Squibb
48	Naproxen	Naproxen	Various
49	Gabapentin	Neurontin	Parke-Davis
50	Warfarin	Coumadin	Dupont

TABLE 10A-1 Top 200 Drugs, 2001: By Rank (continued)

Rank	Generic Name	Brand Name	Manufacturer
51	Ciprofloxacin	Cipro	Bayer Pharm
52	Verapamil	Verapamil HCl	Various
53	Digoxin	Lanoxin	Glaxo Wellcome
54	Albuterol	Albuterol Sulfate	Various
55	Bupropion HCL	Wellbutrin SR	Glaxo Wellcome
56	Lisinopril	Prinivil	Merck
57	Clonazepam	Clonazepam	Various
58	Tramadol	Ultram	McNeil
59	Cyclobenzaprine	Cyclobenzaprine	Various
60	Trazodone	Trazodone	Various
61	Fluticasone	Flonase	Glaxo Wellcome
62	Montelukast	Singulair	Schein
63	Diazepam	Diazepam	Mylan
64	Isosorbide Mononitrate S.A.	Isosorbide Mononitrate	Various
65	Glyburide	Glyburide	Various
66	Venlafaxine	Effexor XR	Wyeth-Ayerst
67	Levofloxacin	Levaquin	McNeil
68	Medroxyprogesterone	Medroxyprogesterone	Various
69	Amoxicillin	Amoxil	SK Beecham
70	Fluconazole	Diflucan	Pfizer
71	Potassium Chloride	Potassium Chloride	Various
72	Enalapril	Enalapril	Various
73	Warfarin	Warfarin	Various
74	Carisoprodol	Carisoprodol	Various
75	Potassium Chloride	K-Dur	Key Pharm
76	Trimeth/Sulfameth	Cotrim	Teva
77	Fluticasone Propionate	Flovent	Glaxo Wellcome
78	Benazepril	Lotensin	Novartis
79	Mometasone	Nasonex	Schering
80	Doxycycline	Doxycycline Hyclate	Various
81	Estradiol	Estradiol	Various
82	Allopurinol	Allopurinol	Various
83	Rosiglitazone maleate	Avandia	SK-Beecham
84	Clopidogrel	Plavix	Sanofi
85	Propranolol	Propranolol	Various
86	Amlodipine/Benazepril	Lotrel	Novartis
87	Methylprednisolone	Methylprednisolone	Various
88	Valsartan	Diovan	Novartis
89	Losartan	Cozaar	Merck
90	Human Insulin NPH	Humulin N	Lilly
91	Clonidine	Clonidine	Various
92	Diltiazem	Diltiazem HCl	Various
93	Loratidine/Pseudoephedrine	Claritin D 24HR	Schering
94	Latanoprost	Xalatan	Pharmacia/Upjohn
95	Pioglitazone	Actos	Takeda
96	Loratidine/Pseudoephedrine	Claritin D 12HR	Schering
97	Risperidone	Risperdal	Janssen
98	Fexofenadine/Pseudoephedrine	Allegra-D	Hoech Mar R
99	Amphetamine Mixed Salts	Adderall	Shire Rchwd
100	Doxazosin	Doxazosin	Various

TABLE 10A-1 Top 200 Drugs, 2001: By Rank (continued)

Rank	Generic Name	Brand Name	Manufacturer
101	Raloxifene	Evista	Lilly
102	Norethindrone/Ethinyl Estradiol	Ortho-Novum	Ortho Pharm
103	Folic Acid	Folic Acid	Various
104	Penicillin VK	Penicillin VK	Various
105	Oxycodone	Oxycontin	Purdue
106	Temazepam	Temazepam	Various
107	Diltiazem	Cartia XT	Andrx
108	Salmeterol	Serevent	Glaxo Wellcome
109	Fosinopril	Monopril	B-M Squibb
110	Oxycodone/APAP	Oxycodone/APAP	Various
111	Ramipril	Altace	Monarch
112	Promethazine	Promethazine	Various
113	Terazosin	Terazosin	Various
114	Olanzapine	Zyprexa	Lilly
115	Gemfibrozil	Gemfibrozil	Various
116	Levothyroxine	Levothroid	Forest
117	Norethindrone/Ethinyl Estradiol	Loestrin Fe	Parke-Davis
118	Sumatriptan	Imitrex Oral	Glaxo Wellcome
119	Hydroxyzine	Hydroxyzine HCl	Various
120	Meclizine	Meclizine	Various
121	Losartan/HCTZ	Hyzaar	Merck
122	Rabeprazole	Aciphex	Eisai
123	Phenytoin	Dilantin	Parke-Davis
124	Clarithromycin	Biaxin	Abbott
125	Glimepiride	Amaryl	Hoech Mar R
126	Pantoprazole	Protonix	Wyeth
127	Potassium Chloride	Klor-Con	Upsher-Smith
128	Spironolactone	Spironolactone	Various
129	Ipratropium/Albuterol	Combivent	Boehr lngel
130	Tamsulosin	Flomax	Abbott
131	Penicillin VK	Veetids	Apothecon
132	Lisinopril/HCTZ	Zestoretic	Zeneca
133	Metoclopramide	Metoclopramide	Various
134	Minocycline	Minocycline	Various
135	Bisoprolol/HCTZ	Bisoprolol/HCTZ	Various
136	Digoxin	Digitek	Bertek
137	Valsartan/HCTZ	Diovan HCT	Novartis
138	Metronidazole	Metronidazole	Various
139	Cefprozil	Cefzil	B-M Squibb
140	Triamcinolone	Triamcinolone Acetonide	Various
141	Glipizide	Glipizide	Various
142	Human Insulin 70/30	Humulin 70/30	Lilly
143	Ethinyl Estradiol/Norethindrone	Necon	Watson
144	Levonorgestrel/Ethinyl Estradiol	Alesse 28	Wyeth-Ayerst
145	Cefuroxime	Ceftin	Glaxo Wellcome
146	Nystatin	Nystatin	Various
147	Captopril	Captopril	Various
148	Promethazine/Codeine	Promethazine/Codeine	Various
149	Acyclovir	Acyclovir	Various
150	Norgestimate/Ethinyl Estradiol	Ortho-Cyclen	Ortho Pharm

TABLE 10A-1 Top 200 Drugs, 2001: By Rank (continued)

Rank	Generic Name	Brand Name	Manufacturer
151	Oxycodone/APAP	Roxicet	Roxane
152	Irbesartan	Avapro	B-M Squibb
153	Nefazodone	Serzone	B-M Squibb
154	Mirtazapine	Remeron	Organon
155	Valacyclovir	Valtrex	Glaxo Wellcome
156	Methylphenidate	Methylphenidate	Various
157	Cerivastatin	Baycol*	Bayer
158	Fluoxetine	Fluoxetine	Various
159	Nitrofurantoin	Macrobid	Procter and Gamble
160	Methylphenidate XR	Concerta	Alza
161	Loratadine	Claritin Reditabs	Schering
162	Glyburide/Metformin	Glucovance	B-M Squibb
163	Metformin	Glucophage XR	B-M Squibb
164	Diltiazem	Tiazac	Forest
165	Desogestrel/Ethinyl Estradiol	Mircette	Organon
166	Mupirocin	Bactroban	SK Beecham
167	L-Norgestrel/Ethinyl Estradiol	Triphasil	Wyeth-Ayerst
168	Fluvastatin	Lescol	Novartis
169	Aspirin	Aspirin	Various
170	Clarithromycin	Biaxin XL	Abbott
171	Clindamycin	Clindamycin	Various
172	Esomeprazole	Nexium	AstraZeneca
173	Metaxalone	Skelaxin	Elan
174	Nortriptyline	Nortriptyline	Various
175	Cimetidine	Cimetidine	Various
176	Fenofibrate	Tricor	Abbott
177	Iprotropium Bromide	Atrovent	Boehr lngel
178	Tamoxifen	Tamoxifen	Various
179	Calcitonin Salmon	Miacalcin	Novartis
180	Felodipine	Plendil	AstraZeneca
181	Levonorgestrel/Ethinyl Estradiol	Trivora-28	Watson
182	Salmeterol/Fluticasone	Advair Diskus	Glaxo Wellcome
183	Theophylline	Theophylline	Various
184	Tetracycline	Tetracycline	Various
185	Tolterodine	Detrol	Pharmacia-Upjohn
186	Gatifloxacin	Tequin	B-M Squibb
187	Nifedipine	Nifedipine ER	Various
188	Diclofenac	Diclofenac	Various
189	Triamcinolone Acetonide	Nasacort AQ	Hoech Mar R
190	Promethazine	Phenergan	R.P.R.
191	Indomethacin	Indomethacin	Various
192	Benzonatate	Benzonatate	Various
193	Phenobarbital	Phenobarbital	Various
194	Naproxen Sodium	Naproxen Sodium	Various
195	Mometasone	Elocon	Schering
196	Hydrocodone/Ibuprofen	Vicoprofen	Knoll
197	Glipizide	Glucotrol XL	Pfizer
198	Divalproex	Depakote	Abbott
199	Nitroglycerin	Nitroglycerin	Various
200	Phenazopyridine	Phenazopyridine	Various

* Removed from U.S. market in 2001.

Source: www.rxlist.com. Based upon more than 3.1 billion prescriptions; data furnished by NDC Health.

TABLE 10A-2 Top 200 Drugs, 2001: By Generic Name

Generic Name	Brand Name	Manufacturer	Rank
Acetaminophen/Codeine	Acetaminophen/Codeine	Various	31
Acyclovir	Acyclovir	Various	149
Albuterol	Albuterol Aerosol	Various	11
Albuterol	Albuterol Sulfate	Various	54
Alendronate	Fosamax	Merck	44
Allopurinol	Allopurinol	Various	82
Alprazolam	Alprazolam	Various	10
Amitriptyline	Amitriptyline	Various	43
Amlodipine	Norvasc	Pfizer	9
Amlodipine/Benazepril	Lotrel	Novartis	86
Amoxicillin	Amoxicillin	Various	8
Amoxicillin	Trimox	Apothecon	35
Amoxicillin	Amoxil	SK Beecham	69
Amoxicillin/Clavulanate	Augmentin	SK Beecham	26
Amphetamine Mixed Salts	Adderall	Shire Rchwd	99
Aspirin	Aspirin	Various	169
Atenolol	Atenolol	Various	4
Atorvastatin	Lipitor	Parke-Davis	2
Azithromycin	Zithromax	Pfizer	6
Benazepril	Lotensin	Novartis	78
Benzonatate	Benzonatate	Various	192
Bisoprolol/HCTZ	Bisoprolol/HCTZ	Various	135
Bupropion HCL	Wellbutrin SR	Glaxo Wellcome	55
Calcitonin Salmon	Miacalcin	Novartis	179
Captopril	Captopril	Various	147
Carisoprodol	Carisoprodol	Various	74
Cefprozil	Cefzil	B-M Squibb	139
Cefuroxime	Ceftin	Glaxo Wellcome	145
Celecoxib	Celebrex	Searle	20
Cephalexin	Cephalexin	Various	22
Cerivastatin	Baycol*	Bayer	157
Cetirizine	Zyrtec	Pfizer	32
Cimetidine	Cimetidine	Various	175
Ciprofloxacin	Cipro	Bayer Pharm	51
Citalopram	Celexa	Forest Pharm	42
Clarithromycin	Biaxin	Abbott	124
Clarithromycin	Biaxin XL	Abbott	170
Clindamycin	Clindamycin	Various	171
Clonazepam	Clonazepam	Various	57
Clonidine	Clonidine	Various	91
Clopidogrel	Plavix	Sanofi	84
Conjugated Estrogens	Premarin	Wyeth-Ayerst	3
Conjugated Estrogens/Medroxyprogesterone	Prempro	Wyeth-Ayerst	28
Cyclobenzaprine	Cyclobenzaprine	Various	59
Desogestrel/Ethinyl Estradiol	Mircette	Organon	165
Diazepam	Diazepam	Mylan	63
Diclofenac	Diclofenac	Various	188
Digoxin	Lanoxin	Glaxo Wellcome	53
Digoxin	Digitek	Bertek	136
Diltiazem	Diltiazem HCl	Various	92

* Removed from U.S. market in 2001.

TABLE 10A-2 Top 200 Drugs, 2001: By Generic Name (continued)

Generic Name	Brand Name	Manufacturer	Rank
Diltiazem	Cartia XT	Andrx	107
Diltiazem	Tiazac	Forest	164
Divalproex	Depakote	Abbott	198
Doxazosin	Doxazosin	Various	100
Doxycycline	Doxycycline Hyclate	Various	80
Enalapril	Enalapril	Various	72
Esomeprazole	Nexium	AstraZeneca	172
Estradiol	Estradiol	Various	81
Ethinyl Estradiol/Norethindrone	Necon	Watson	143
Felodipine	Plendil	AstraZeneca	180
Fenofibrate	Tricor	Abbott	176
Fexofenadine	Allegra	Hoech Mar R	33
Fexofenadine/Pseudoephedrine	Allegra-D	Hoech Mar R	98
Fluconazole	Diflucan	Pfizer	70
Fluoxetine	Prozac	Lilly	39
Fluoxetine	Fluoxetine	Various	158
Fluticasone	Flonase	Glaxo Wellcome	61
Fluticasone Propionate	Flovent	Glaxo Wellcome	77
Fluvastatin	Lescol	Novartis	168
Folic Acid	Folic Acid	Various	103
Fosinopril	Monopril	B-M Squibb	109
Furosemide	Furosemide	Various	7
Gabapentin	Neurontin	Parke-Davis	49
Gatifloxacin	Tequin	B-M Squibb	186
Gemfibrozil	Gemfibrozil	Various	115
Glimepiride	Amaryl	Hoech Mar R	125
Glipizide	Glipizide	Various	141
Glipizide	Glucotrol XL	Pfizer	197
Glyburide	Glyburide	Various	65
Glyburide/Metformin	Glucovance	B-M Squibb	162
Human Insulin 70/30	Humulin 70/30	Lilly	142
Human Insulin NPH	Humulin N	Lilly	90
Hydrochlorothiazide	Hydrochlorothiazide	Various	13
Hydrocodone/Ibuprofen	Vicoprofen	Knoll	196
Hydrocodone w/APAP	Hydrocodone w/APAP	Various	1
Hydroxyzine	Hydroxyzine HCl	Various	119
Ibuprofen	Advil, Motrin, Nuprin	Various	19
Indomethacin	Indomethacin	Various	191
Ipratropium/Albuterol	Combivent	Boehr lngel	129
Iprotropium Bromide	Atrovent	Boehr lngel	177
Irbesartan	Avapro	B-M Squibb	152
Isosorbide Mononitrate S.A.	Isosorbide Mononitrate	Various	64
Lansoprazole	Prevacid	Tap Pharm	18
Latanoprost	Xalatan	Pharmacia/Upjohn	94
Levofloxacin	Levaquin	McNeil	67
Levonorgestrel/Ethinyl Estradiol	Trivora-28	Watson	181
Levonorgestrel/Ethinyl Estradiol	Alesse 28	Wyeth-Ayerst	144
Levothyroxine	Synthroid	Knoll	5
Levothyroxine	Levoxyl	Jones Medical Ind	34
Levothyroxine	Levothroid	Forest	116
Lisinopril	Zestril	Zeneca	25

TABLE 10A-2 Top 200 Drugs, 2001: By Generic Name (continued)

Generic Name	Brand Name	Manufacturer	Rank
Lisinopril	Prinivil	Merck	56
Lisinopril/HCTZ	Zestoretic	Zeneca	132
L-Norgestrel/Ethinyl Estradiol	Triphasil	Wyeth-Ayerst	167
Loratadine	Claritin	Schering	12
Loratadine	Claritin Reditabs	Schering	161
Loratidine/Pseudoephedrine	Claritin D 24HR	Schering	93
Loratidine/Pseudoephedrine	Claritin D 12HR	Schering	96
Lorazepam	Lorazepam	Various	37
Losartan	Cozaar	Merck	89
Losartan/HCTZ	Hyzaar	Merck	121
Meclizine	Meclizine	Various	120
Medroxyprogesterone	Medroxyprogesterone	Various	68
Metaxalone	Skelaxin	Elan	173
Metformin	Glucophage	B-M Squibb	23
Metformin	Glucophage XR	B-M Squibb	163
Methylphenidate	Methylphenidate	Various	156
Methylphenidate XR	Concerta	Alza	160
Methylprednisolone	Methylprednisolone	Various	87
Metoclopramide	Metoclopramide	Various	133
Metoprolol	Metoprolol Tartrate	Various	36
Metoprolol	Toprol-XL	AstraZeneca	38
Metronidazole	Metronidazole	Various	138
Minocycline	Minocycline	Various	134
Mirtazapine	Remeron	Organon	154
Mometasone	Nasonex	Schering	79
Mometasone	Elocon	Schering	195
Montelukast	Singulair	Schein	62
Mupirocin	Bactroban	SK Beecham	166
Naproxen	Naproxen	Various	48
Naproxen Sodium	Naproxen Sodium	Various	194
Nefazodone	Serzone	B-M Squibb	153
Nifedipine	Nifedipine ER	Various	187
Nitrofurantoin	Macrobid	Procter and Gamble	159
Nitroglycerin	Nitroglycerin	Various	199
Norethindrone/Ethinyl Estradiol	Loestrin Fe	Parke-Davis	117
Norethindrone/Ethinyl Estradiol	Ortho-Novum	Ortho Pharm	102
Norgestimate/Ethinyl Estradiol	Ortho Tri-Cyclen	Ortho Pharm	30
Norgestimate/Ethinyl Estradiol	Ortho-Cyclen	Ortho Pharm	150
Nortriptyline	Nortriptyline	Various	174
Nystatin	Nystatin	Various	146
Olanzapine	Zyprexa	Lilly	114
Omeprazole	Prilosec	AstraZeneca	14
Oxycodone	Oxycontin	Purdue	105
Oxycodone/APAP	Oxycodone/APAP	Various	110
Oxycodone/APAP	Roxicet	Roxane	151
Pantoprazole	Protonix	Wyeth	126
Paroxetine	Paxil	SK Beecham	16
Penicillin VK	Penicillin VK	Various	104
Penicillin VK	Veetids	Apothecon	131
Phenazopyridine	Phenazopyridine	Various	200
Phenobarbital	Phenobarbital	Various	193

TABLE 10A-2 Top 200 Drugs, 2001: By Generic Name (continued)

Generic Name	Brand Name	Manufacturer	Rank
Phenytoin	Dilantin	Parke-Davis	123
Pioglitazone	Actos	Takeda	95
Potassium Chloride	Potassium Chloride	Various	71
Potassium Chloride	K-Dur	Key Pharm	75
Potassium Chloride	Klor-Con	Upsher-Smith	127
Pravastatin	Pravachol	B-M Squibb	47
Prednisone	Prednisone	Various	29
Promethazine	Promethazine	Various	112
Promethazine	Phenergan	R.P.R.	190
Promethazine/Codeine	Promethazine/Codeine	Various	148
Propoxyphene N/APAP	Propoxyphene N/APAP	Various	27
Propranolol	Propranolol	Various	85
Quinapril	Accupril	Parke-Davis	45
Rabeprazole	Aciphex	Eisai	122
Raloxifene	Evista	Lilly	101
Ramipril	Altace	Monarch	111
Ranitidine	Ranitidine HCl	Various	40
Risperidone	Risperdal	Janssen	97
Rofecoxib	Vioxx	Merck	24
Rosiglitazone maleate	Avandia	SK-Beecham	83
Salmeterol	Serevent	Glaxo Wellcome	108
Salmeterol/Fluticasone	Advair Diskus	Glaxo Wellcome	182
Sertraline	Zoloft	Pfizer	15
Sildenafil Citrate	Viagra	Pfizer	46
Simvastatin	Zocor	Merck	21
Spironolactone	Spironolactone	Various	128
Sumatriptan	Imitrex Oral	Glaxo Wellcome	118
Tamoxifen	Tamoxifen	Various	178
Tamsulosin	Flomax	Abbott	130
Temazepam	Temazepam	Various	106
Terazosin	Terazosin	Various	113
Tetracycline	Tetracycline	Various	184
Theophylline	Theophylline	Various	183
Tolterodine	Detrol	Pharmacia-Upjohn	185
Tramadol	Ultram	McNeil	58
Trazodone	Trazodone	Various	60
Triamcinolone	Triamcinolone Acetonide	Various	140
Triamcinolone Acetonide	Nasacort AQ	Hoech Mar R	189
Triamterene/HCTZ	Triamterene/HCTZ	Various	17
Trimeth/Sulfameth	Cotrim	Teva	76
Valacyclovir	Valtrex	Glaxo Wellcome	155
Valsartan	Diovan	Novartis	88
Valsartan/HCTZ	Diovan HCT	Novartis	137
Venlafaxine	Effexor XR	Wyeth-Ayerst	66
Verapamil	Verapamil HCl	Various	52
Warfarin	Coumadin	Dupont	50
Warfarin	Warfarin	Various	73
Zolpidem	Ambien	Searle	41

Source: www.rxlist.com. Based upon more than 3.1 billion prescriptions; data furnished by NDC Health.

TABLE 10A-3 Top 200 Drugs, 2001: By Brand Name

Brand Name	Generic Name	Manufacturer	Rank
Accupril	Quinapril	Parke-Davis	45
Acetaminophen/Codeine	Acetaminophen/Codeine	Various	31
Aciphex	Rabeprazole	Eisai	122
Actos	Pioglitazone	Takeda	95
Acyclovir	Acyclovir	Various	149
Adderall	Amphetamine Mixed Salts	Shire Rchwd	99
Advair Diskus	Salmeterol/Fluticasone	Glaxo Wellcome	182
Advil	Ibuprofen	Wyeth	19
Albuterol Aerosol	Albuterol	Various	11
Albuterol Sulfate	Albuterol	Various	54
Alesse 28	Levonorgestrel/Ethinyl Estradiol	Wyeth-Ayerst	144
Allegra	Fexofenadine	Hoech Mar R	33
Allegra-D	Fexofenadine/Pseudoephedrine	Hoech Mar R	98
Allopurinol	Allopurinol	Various	82
Alprazolam	Alprazolam	Various	10
Altace	Ramipril	Monarch	111
Amaryl	Glimepiride	Hoech Mar R	125
Ambien	Zolpidem	Searle	41
Amitriptyline	Amitriptyline	Various	43
Amoxicillin	Amoxicillin	Various	8
Amoxil	Amoxicillin	SK Beecham	69
Aspirin	Aspirin	Various	169
Atenolol	Atenolol	Various	4
Atrovent	Iprotropium Bromide	Boehr lngel	177
Augmentin	Amoxicillin/Clavulanate	SK Beecham	26
Avandia	Rosiglitazone maleate	SK Beecham	83
Avapro	Irbesartan	B-M Squibb	152
Bactroban	Mupirocin	SK Beecham	166
Baycol*	Cerivastatin	Bayer	157
Benzonatate	Benzonatate	Various	192
Biaxin	Clarithromycin	Abbott	124
Biaxin XL	Clarithromycin	Abbott	170
Bisoprolol/HCTZ	Bisoprolol/HCTZ	Various	135
Captopril	Captopril	Various	147
Carisoprodol	Carisoprodol	Various	74
Cartia XT	Diltiazem	Andrx	107
Ceftin	Cefuroxime	Glaxo Wellcome	145
Cefzil	Cefprozil	B-M Squibb	139
Celebrex	Celecoxib	Searle	20
Celexa	Citalopram	Forest Pharm	42
Cephalexin	Cephalexin	Various	22
Cimetidine	Cimetidine	Various	175
Cipro	Ciprofloxacin	Bayer Pharm	51
Claritin	Loratadine	Schering	12
Claritin D 12HR	Loratidine/Pseudoephedrine	Schering	96
Claritin D 24HR	Loratidine/Pseudoephedrine	Schering	93
Claritin Reditabs	Loratadine	Schering	161
Clindamycin	Clindamycin	Various	171
Clonazepam	Clonazepam	Various	57
Clonidine	Clonidine	Various	91

* Removed from U.S. market in 2001.

TABLE 10A-3 Top 200 Drugs, 2001: By Brand Name (continued)

Brand Name	Generic Name	Manufacturer	Rank
Combivent	Ipratropium/Albuterol	Boehr lngel	129
Concerta	Methylphenidate XR	Alza	160
Cotrim	Trimeth/Sulfameth	Teva	76
Coumadin	Warfarin	Dupont	50
Cozaar	Losartan	Merck	89
Cyclobenzaprine	Cyclobenzaprine	Various	59
Depakote	Divalproex	Abbott	198
Detrol	Tolterodine	Pharmacia-Upjohn	185
Diazepam	Diazepam	Mylan	63
Diclofenac	Diclofenac	Various	188
Diflucan	Fluconazole	Pfizer	70
Digitek	Digoxin	Bertek	136
Dilantin	Phenytoin	Parke-Davis	123
Diltiazem HCl	Diltiazem	Various	92
Diovan	Valsartan	Novartis	88
Diovan HCT	Valsartan/HCTZ	Novartis	137
Doxazosin	Doxazosin	Various	100
Doxycycline Hyclate	Doxycycline	Various	80
Effexor XR	Venlafaxine	Wyeth-Ayerst	66
Elocon	Mometasone	Schering	195
Enalapril	Enalapril	Various	72
Estradiol	Estradiol	Various	81
Evista	Raloxifene	Lilly	101
Flomax	Tamsulosin	Abbott	130
Flonase	Fluticasone	Glaxo Wellcome	61
Flovent	Fluticasone Propionate	Glaxo Wellcome	77
Fluoxetine	Fluoxetine	Various	158
Folic Acid	Folic Acid	Various	103
Fosamax	Alendronate	Merck	44
Furosemide	Furosemide	Various	7
Gemfibrozil	Gemfibrozil	Various	115
Glipizide	Glipizide	Various	141
Glucophage	Metformin	B-M Squibb	23
Glucophage XR	Metformin	B-M Squibb	163
Glucotrol XL	Glipizide	Pfizer	197
Glucovance	Glyburide/Metformin	B-M Squibb	162
Glyburide	Glyburide	Various	65
Humulin 70/30	Human Insulin 70/30	Lilly	142
Humulin N	Human Insulin NPH	Lilly	90
Hydrochlorothiazide	Hydrochlorothiazide	Various	13
Hydrocodone w/APAP	Hydrocodone w/APAP	Various	1
Hydroxyzine HCl	Hydroxyzine	Various	119
Hyzaar	Losartan/HCTZ	Merck	121
Ibuprofen	Ibuprofen	Various	19
Imitrex Oral	Sumatriptan	Glaxo Wellcome	118
Indomethacin	Indomethacin	Various	191
Isosorbide Mononitrate	Isosorbide Mononitrate S.A.	Various	64
K-Dur	Potassium Chloride	Key Pharm	75
Klor-Con	Potassium Chloride	Upsher-Smith	127
Lanoxin	Digoxin	Glaxo Wellcome	53
Lescol	Fluvastatin	Novartis	168

TABLE 10A-3 Top 200 Drugs, 2001: By Brand Name (continued)

Brand Name	Generic Name	Manufacturer	Rank
Levaquin	Levofloxacin	McNeil	67
Levothroid	Levothyroxine	Forest	116
Levoxyl	Levothyroxine	Jones Medical Ind	34
Lipitor	Atorvastatin	Parke-Davis	2
Loestrin Fe	Norethindrone/Ethinyl Estradiol	Parke-Davis	117
Lorazepam	Lorazepam	Various	37
Lotensin	Benazepril	Novartis	78
Lotrel	Amlodipine/Benazepril	Novartis	86
Macrobid	Nitrofurantoin	Procter and Gamble	159
Meclizine	Meclizine	Various	120
Medroxyprogesterone	Medroxyprogesterone	Various	68
Methylphenidate	Methylphenidate	Various	156
Methylprednisolone	Methylprednisolone	Various	87
Metoclopramide	Metoclopramide	Various	133
Metoprolol Tartrate	Metoprolol	Various	36
Metronidazole	Metronidazole	Various	138
Miacalcin	Calcitonin Salmon	Novartis	179
Minocycline	Minocycline	Various	134
Mircette	Desogestrel/Ethinyl Estradiol	Organon	165
Monopril	Fosinopril	B-M Squibb	109
Motrin	Ibuprofen	McNeil	19
Naproxen	Naproxen	Various	48
Naproxen Sodium	Naproxen Sodium	Various	194
Nasacort AQ	Triamcinolone Acetonide	Hoech Mar R	189
Nasonex	Mometasone	Schering	79
Necon	Ethinyl Estradiol/Norethindrone	Watson	143
Neurontin	Gabapentin	Parke-Davis	49
Nexium	Esomeprazole	AstraZeneca	172
Nifedipine ER	Nifedipine	Various	187
Nitroglycerin	Nitroglycerin	Various	199
Nortriptyline	Nortriptyline	Various	174
Norvasc	Amlodipine	Pfizer	9
Nuprin	Ibuprofen	B-M Squibb	19
Nystatin	Nystatin	Various	146
Ortho Tri-Cyclen	Norgestimate/Ethinyl Estradiol	Ortho Pharm	30
Ortho-Cyclen	Norgestimate/Ethinyl Estradiol	Ortho Pharm	150
Ortho-Novum	Norethindrone/Ethinyl Estradiol	Ortho Pharm	102
Oxycodone/APAP	Oxycodone/APAP	Various	110
Oxycontin	Oxycodone	Purdue	105
Paxil	Paroxetine	SK Beecham	16
Penicillin VK	Penicillin VK	Various	104
Phenazopyridine	Phenazopyridine	Various	200
Phenergan	Promethazine	R.P.R.	190
Phenobarbital	Phenobarbital	Various	193
Plavix	Clopidogrel	Sanofi	84
Plendil	Felodipine	AstraZeneca	180
Potassium Chloride	Potassium Chloride	Various	71
Pravachol	Pravastatin	B-M Squibb	47
Prednisone	Prednisone	Various	29
Premarin	Conjugated Estrogens	Wyeth-Ayerst	3
Prempro	Conjugated Estrogens/Medroxyprogesterone	Wyeth-Ayerst	28

TABLE 10A-3 Top 200 Drugs, 2001: By Brand Name (continued)

Brand Name	Generic Name	Manufacturer	Rank
Prevacid	Lansoprazole	Tap Pharm	18
Prilosec	Omeprazole	AstraZeneca	14
Prinivil	Lisinopril	Merck	56
Promethazine	Promethazine	Various	112
Promethazine/Codeine	Promethazine/Codeine	Various	148
Propoxyphene N/APAP	Propoxyphene N/APAP	Various	27
Propranolol	Propranolol	Various	85
Protonix	Pantoprazole	Wyeth	126
Prozac	Fluoxetine	Lilly	39
Ranitidine HCl	Ranitidine	Various	40
Remeron	Mirtazapine	Organon	154
Risperdal	Risperidone	Janssen	97
Roxicet	Oxycodone/APAP	Roxane	151
Serevent	Salmeterol	Glaxo Wellcome	108
Serzone	Nefazodone	B-M Squibb	153
Singulair	Montelukast	Schein	62
Skelaxin	Metaxalone	Elan	173
Spironolactone	Spironolactone	Various	128
Synthroid	Levothyroxine	Knoll	5
Tamoxifen	Tamoxifen	Various	178
Temazepam	Temazepam	Various	106
Tequin	Gatifloxacin	B-M Squibb	186
Terazosin	Terazosin	Various	113
Tetracycline	Tetracycline	Various	184
Theophylline	Theophylline	Various	183
Tiazac	Diltiazem	Forest	164
Toprol-XL	Metoprolol	AstraZeneca	38
Trazodone	Trazodone	Various	60
Triamcinolone Acetonide	Triamcinolone	Various	140
Triamterene/HCTZ	Triamterene/HCTZ	Various	17
Tricor	Fenofibrate	Abbott	176
Trimox	Amoxicillin	Apothecon	35
Triphasil	L-Norgestrel/Ethinyl Estradiol	Wyeth-Ayerst	167
Trivora-28	Levonorgestrel/Ethinyl Estradiol	Watson	181
Ultram	Tramadol	McNeil	58
Valtrex	Valacyclovir	Glaxo Wellcome	155
Veetids	Penicillin VK	Apothecon	131
Verapamil HCl	Verapamil	Various	52
Viagra	Sildenafil Citrate	Pfizer	46
Vicoprofen	Hydrocodone/Ibuprofen	Knoll	196
Vioxx	Rofecoxib	Merck	24
Warfarin	Warfarin	Various	73
Wellbutrin SR	Bupropion HCL	Glaxo Wellcome	55
Xalatan	Latanoprost	Pharmacia/Upjohn	94
Zestoretic	Lisinopril/HCTZ	Zeneca	132
Zestril	Lisinopril	Zeneca	25
Zithromax	Azithromycin	Pfizer	6
Zocor	Simvastatin	Merck	21
Zoloft	Sertraline	Pfizer	15
Zyprexa	Olanzapine	Lilly	114
Zyrtec	Cetirizine	Pfizer	32

Source: www.rxlist.com. Based upon more than 3.1 billion prescriptions; data furnished by NDC Health.

Appendix B

Teratology Information Systems by Location

ALABAMA

Alabama Birth Defects Surveillance
University South Alabama
(800) 423-8324 or (334) 460-7691
Department Medical Genetics
307 University Blvd., Rm. 214, CC/CB
Mobile, AL 36688-0002
Geographic Area Served: AL, MS, FL
Hours: 8:00 AM to 5:00 PM, M-F

ARIZONA

Arizona Teratogen Information Program
(888) 285-3410 or (520) 626-3410 (in Tucson)
University of Arizona
PO Box 245079
Tucson, AZ 85724-5079
Geographic Area Served: AZ/National
Hours: 8:00 AM to 5:00 PM, M-F

ARKANSAS

Arkansas Teratogen Information Service
(800) 358-7229 or (501) 296-1700
University of Arkansas for Medical Sciences
Department of Obstetrics and Gynecology
Arkansas Genetics Program
4301 West Markham - Slot 506
Little Rock, AR 72205
Geographic Area Served: AR
Hours: 8:00 AM to 4:30 PM, M-F

CALIFORNIA

California Teratogen Information Service and Clinical Research Program
(800) 532-3749 (CA Only) or (619) 543-2131
UCSD Medical Center, Department of Pediatrics
200 W. Arbor Drive #8446
San Diego, CA 92103-8446
Geographic Area Served: CA
Hours: 9:00 AM to 4:00 PM, M-F

CANADA

IMAGE: Info-Medicaments en Allaitement et Grossesse
(514) 345-2333
Pharmacy Dept. Ste. Justine Hospital
Montreal (Quebec) H3T1C5 Cn.
Geographic Area Served: Province of Quebec
Hours: 9:00 AM to 12:00 PM, 1:00 PM to 4:00 PM, M-F

Motherisk Program
(416) 813-6780
Hospital for Sick Children
555 University Ave.
Toronto, Ont. CN M5G 1X8
Geographic Area Served: Ontario (although calls accepted from across Canada)
Hours: 9:00 to 5:00 PM, M-F EST

CONNECTICUT

Connecticut Pregnancy Exposure Information Service
(800) 325-5391 (CT only) or (860) 679-8850
University of Connecticut Health Center
Division of Human Genetics MC6310
263 Farmington Ave.
Farmington, CT 06030-6310
Geographic Area Served: CT
Hours: 8:00 AM to 4 PM, M-Th,
8:00 AM to 12:00 PM, F

DISTRICT OF COLUMBIA (MARYLAND)

Reproductive Toxicology Center, a Non-Profit Foundation
(301) 620-8690 or (301) 657-5984
7831 Woodmont Ave., #375
Bethesda, MD 20814
Geographic Area Served: Unrestricted

FLORIDA

Florida Teratogen Information Service
(800) 392-3050 (FL only) or (352) 392-3050
University of Florida Health Science Center
Box 100296
Gainesville, FL 32610-0296
Geographic Area Served: Priority to FL calls; open to all callers
Hours: 8:00 AM to 5:00 PM, M-F

Florida Teratogen Information Service
(305) 243-6006
University of Miami
P.O. Box 016820
Miami, FL 33101
Geographic Area Served: South Florida
Hours: 9:00 AM to 4:30 PM, M-F

Teratogen Information Service
(813) 259-8852
University of South Florida Birth Defects Center
Department of Pediatrics
17 Davis Blvd.
Tampa, FL 33606
Geographic Area Served: Central Florida
Hours: 7:30 AM to 4:30 PM, M-F

ILLINOIS

Illinois Teratogen Information Service
(800) 252-4847 (IL only) or (312) 981-4354
680 N. Lake Shore Dr., Suite 1230
Chicago, IL 60611
Geographic Area Served: IL
Hours: 8:00 AM to 5:00 PM, M-F

INDIANA/KENTUCKY/OHIO

Indiana Teratogen Information Service
(317) 274-1071
Indiana University Medical Center
Department of Medical and Molecular Genetics 1B130
975 W. Walnut St.
Indianapolis, IN 46202-5251
Geographic Area Served: Priority to IN callers; Also serves IL, KY, OH
Hours: 8:00 AM to 5:00 PM, M-F

MASSACHUSETTS/MAINE/NEW HAMPSHIRE/ RHODE ISLAND

Massachusetts Teratogen Information Service (MaTIS)
(800) 322-5014 (MA only) or (781) 466-8474
Pregnancy Environmental Hotline
40 Second Ave., Suite 520
Waltham, MA 02451
Geographic Area Served: MA, NH, ME, RI
Hours: 9:00 AM to 2:00 PM, M-F

Genetics and Teratology Unit, Pediatric Service
(617) 726-1742
Massachusetts General Hospital
Warren Building 801
55 Fruit St.
Boston, MA 02114-2696
Geographic Area Served: Eastern Massachusetts
Hours 9:00 AM to 5:00 PM, M-F

MICHIGAN

Michigan Teratogen Information Service
(877) 52-MITIS (64847) or (313) 966-9368
4160 John R. St., Suite 616
Detroit, MI 48201
Geographic Area Served: MI and surrounding states
Hours 9:00 AM to 4:00 PM, M-F

MISSOURI

Missouri Teratogen Information Service
(800) 645-6164 or (573) 884-1345
University of Missouri Hospital and Clinics
1 Hospital Dr., DC058.00
Columbia, MO 65212
Geographic Area Served: MO
Hours: 9:00 AM to 4:00 PM, M-F

NEBRASKA

Nebraska Teratogen Project
(402) 559-5071
University of Nebraska Medical Center
985440 Nebraska Medical Center
Omaha, NE 68198-5440
Geographic Area Served: NE
Hours: 8:00 AM to 4:30 PM, M-F

NEW JERSEY/DELAWARE/PENNSYLVANIA

Pregnancy Healthline
(888) 722-2903 (NJ) or (856) 665-6000
Southern New Jersey Perinatal Cooperative
2500 McClellan Ave., Suite 110
Pennsauken, NJ 08109-4613
Geographic Area Served: NJ, DE, PA
Hours: 10:00 AM to 3:00 PM, M-F

NEW YORK

Pregnancy Risk Network
(800) 724-2454 (then press 1) (NY only)
or (716) 882-6791 (then press 1)
976 Delaware Ave.
Buffalo, NY 14209
Geographic Area Served: NY
Hours: 8:30 AM to 4:00 PM, M-F

PEDECS
(716) 275-3638
University of Rochester Medical Center
Department of Obstetrics and Gynecology
601 Elmwood Ave.
Rochester, NY 14642-8668
Geographic Area Served: NY
Hours: 8:30 AM to 4:00 PM, M-F

NORTH DAKOTA

North Dakota Teratogen Information Service
(701) 777-4277; Fax: (701) 777-3220
e-mail: ebertwsi@medicine.nodak.edu
UND School of Medicine and Health Science
Department of Pediatrics, Division of Medical Genetics
P.O. Box 9037
Grand Forks, ND 58202-9037
Geographic Area Served: ND
Hours: 8:30 AM to 4:30 PM, M-F

TEXAS

Texas Teratogen Information Service
(800) 733-4727 or (940) 565-3892
UNT Department of Biology
P.O. Box 305220
Denton, TX 76203-5220
Geographic Area Served: TX
Hours: 9:00 AM to 4:00 PM, M-F

MONTANA

Pregnancy RiskLine
(801) 328-2229 or (800) 822-2229
Utah Department of Health
P.O. Box 144691
Salt Lake City, UT 84114-4691
Geographic Area Served: UT, MT
Health Care Professionals served only from ID, NM, WY
Hours: 8:30 AM to 4:30 PM, M-F

VERMONT

Pregnancy Risk Information Service
800-531-9800 (VT only) or 800-932-4609
Vermont Regional Genetics Center
1 Mill St., Box B-10
Burlington, VT 05401
Geographic Area Served: VT and Upstate NY
Hours: 1:00 PM to 5:00 PM, Tu and F

WASHINGTON/ALASKA/IDAHO

CARE Northwest
(900) 225-2273 ($8/call)
University of Washington
Box 357920
Seattle, WA 98195-7920
Geographic Area Served: AK, ID, OR, WA
Hours: 8:00 AM to 4:00 PM, M-F

WEST VIRGINIA

West Virginia University Hospitals
(304) 293-1572
Physician Office Center
PO Box 782
OBGYN Clinic
Morgantown, WV 26507
Geographic Area Served: WV and surrounding area

WISCONSIN

Wisconsin Teratogen Information Service
(800) 442-6692
347 Waisman Center
1500 Highland
Madison, WI 53705
Geographic Area Served: WI
Hours: 9:00 AM to 3:00 PM

Source: www.fda.gov

Appendix C

The Transfer of Drugs and Other Chemicals into Human Milk*

TABLE 10C-1 Cytoxic Drugs That May Interfere with Cellular Metabolism of the Nursing Infant

Drug	Reason for Concern, Reported Sign or Symptom in Infant, or Effect on Lactation
Cyclophosphamide	Possible immune suppression; unknown effect on growth or association with carcinogenesis; neutropenia
Cyclosporine	Possible immune suppression; unknown effect on growth or association with carcinogenesis
Doxorubicin*	Possible immune suppression; unknown effect on growth or association with carcinogenesis
Methotrexate	Possible immune suppression; unknown effect on growth or association with carcinogenesis; neutropenia

* Drug is concentrated in human milk.

TABLE 10C-2 Drugs of Abuse for Which Adverse Effects on the Infant During Breastfeeding Have Been Reported*

Drug	Reported Effect or Reasons for Concern
Amphetamine†	Irritability, poor sleeping pattern
Cocaine	Cocaine intoxication: irritability, vomiting, diarrhea, tremulousness, seizures
Heroin	Tremors, restlessness, vomiting, poor feeding
Marijuana	Only 1 report in literature; no effect mentioned; very long half-life for some components
Phencyclidine	Potent hallucinogen

* The Committee on Drugs strongly believes that nursing mothers should not ingest drugs of abuse, because they are hazardous to the nursing infant and to the health of the mother.

† Drug is concentrated in human milk.

TABLE 10C-3 Radioactive Compounds That Require Temporary Cessation of Breastfeeding*

Compound	Recommended Time for Cessation of Breastfeeding
Copper 64 (64Cu)	Radioactivity in milk present at 50 hr
Gallium 67 (67Ga)	Radioactivity in milk present for 2 wk
Indium 111 (111In)	Very small amount present at 20 hr
Iodine 123 (123I)	Radioactivity in milk present up to 36 hr
Iodine 125 (125I)	Radioactivity in milk present for 12 d
Iodine 131 (131I)	Radioactivity in milk present 2–14 d, depending on study
Iodine 131	If used for treatment of thyroid cancer, high radioactivity may prolong exposure to infant
Radioactive sodium	Radioactivity in milk present 96 hr
Technetium 99m (99mTc), 99mTc macroaggregates, 99mTc O4	Radioactivity in milk present 15 hr to 3 d

* Consult nuclear medicine physician before performing diagnostic study so that radionuclide that has the shortest excretion time in breast milk can be used. Before study, the mother should pump her breast and store enough milk in the freezer for feeding the infant; after study, the mother should pump her breast to maintain milk production but discard all milk pumped for the required time that radioactivity is present in milk. Milk samples can be screened by radiology departments for radioactivity before resumption of nursing.

Source: The 7 tables in this appendix are from the American Academy of Pediatrics, Committee on Drugs. The transfer of drugs and other chemicals into human breast milk. *Pediatrics*. 2001; 108:776–789 or go to: http://www.aap.org/policy/0063.html.

TABLE 10C-4 Drugs for Which the Effect on Nursing Infants Is Unknown but May Be of Concern*

Drug	Reported or Possible Effect
Antianxiety	
Alprazolam	None
Diazepam	None
Lorazepam	None
Midazolam	-
Perphenazine	None
Prazepam†	None
Quazepam	None
Temazepam	-
Antidepressants	
Amitriptyline	None
Amoxapine	None
Bupropion	None
Clomipramine	None
Desipramine	None
Dothiepin	None
Doxepin	None
Fluoxetine	Colic, irritability, feeding and sleep disorders, slow weight gain
Fluvoxamine	-
Imipramine	None
Nortriptyline	None
Paroxetine	None
Sertraline†	None
Trazodone	None
Antipsychotic	
Chlorpromazine	Galactorrhea in mother; drowsiness and lethargy in infant; decline in developmental scores
Chlorprothixene	None
Clozapine†	None
Haloperidol	Decline in developmental scores
Mesoridazine	None
Trifluoperazine	None
Others	
Amiodarone	Possible hypothyroidism
Chloramphenicol	Possible idiosyncratic bone marrow suppression
Clofazimine	Potential for transfer of high percentage of maternal dose; possible increase in skin pigmentation
Lamotrigine	Potential therapeutic serum concentrations in infant
Metoclopramide†	None described; dopaminergic blocking agent
Metronidazole	In vitro mutagen; may discontinue breastfeeding for 12–24 hr to allow excretion of dose when single-dose therapy given to mother
Tinidazole	See metronidazole

* Psychotropic drugs, the compounds listed under antianxiety, antidepressant, and antipsychotic categories, are of special concern when given to nursing mothers for long periods. Although there are very few case reports of adverse effects in breastfeeding infants, these drugs do appear in human milk and, thus, could conceivably alter short-term and long-term central nervous system function.

† Drug is concentrated in human milk relative to simultaneous maternal plasma concentrations.

TABLE 10C-5 Drugs That Have Been Associated with Significant Effects on Some Nursing Infants and Should Be Given to Nursing Mothers with Caution*

Drug	Reported Effect
Acebutolol	Hypotension; bradycardia; tachypnea
5-Aminosalicylic acid	Diarrhea (1 case)
Atenolol	Cyanosis; bradycardia
Bromocriptine	Suppresses lactation; may be hazardous to the mother
Aspirin (salicylates)	Metabolic acidosis (1 case)
Clemastine	Drowsiness, irritability, refusal to feed, high-pitched cry, neck stiffness (1 case)
Ergotamine	Vomiting, diarrhea, convulsions (doses used in migraine medications)
Lithium	One-third to one-half therapeutic blood concentration in infants
Phenindione	Anticoagulant: increased prothrombin and partial thromboplastin time in 1 infant; not used in United States
Phenobarbital	Sedation; infantile spasms after weaning from milk containing phenobarbital, methemoglobinemia (1 case)
Primidone	Sedation, feeding problems
Sulfasalazine (salicylazosulfapyridine)	Bloody diarrhea (1 case)

* Blood concentration in the infant may be of clinical importance.

TABLE 10C-6 Maternal Medication Usually Compatible with Breastfeeding*

Drug	Reported Sign or Symptom in Infant or Effect on Lactation
Acetaminophen	None
Acetazolamide	None
Acitretin	—
Acyclovir†	None
Alcohol (ethanol)	With large amounts, drowsiness, diaphoresis, deep sleep, weakness, decrease in linear growth, abnormal weight gain; maternal ingestion of 1 g/kg daily decreases milk ejection reflex
Allopurinol	—
Amoxicillin	None
Antimony	—
Atropine	None
Azapropazone (apazone)	—
Aztreonam	None
B_1 (thiamin)	None
B_6 (pyridoxine)	None
B_{12}	None
Baclofen	None
Barbiturate	See Table 10C-5
Bendroflumethiazide	Suppresses lactation
Bishydroxycoumarin (dicumarol)	None
Bromide	Rash, weakness, absence of cry with maternal intake of 5.4 g/d
Butorphanol	None
Caffeine	Irritability, poor sleeping pattern, excreted slowly; no effect with moderate intake of caffeinated beverages (2–3 cups per day)
Captopril	None
Carbamazepine	None
Carbetocin	None
Carbimazole	Goiter
Cascara	None
Cefadroxil	None
Cefazolin	None
Cefotaxime	None

TABLE 10C-6 Maternal Medication Usually Compatible with Breastfeeding* (continued)

Drug	Reported Sign or Symptom in Infant or Effect on Lactation
Cefoxitin	None
Cefprozil	—
Ceftazidime	None
Ceftriaxone	None
Chloral hydrate	Sleepiness
Chloroform	None
Chloroquine	None
Chlorothiazide	None
Chlorthalidone	Excreted slowly
Cimetidine†	None
Ciprofloxacin	None
Cisapride	None
Cisplatin	Not found in milk
Clindamycin	None
Clogestone	None
Codeine	None
Colchicine	—
Contraceptive pill with estrogen/progesterone	Rare breast enlargement; decrease in milk production and protein content (not confirmed in several studies)
Cycloserine	None
D (vitamin)	None; follow up infant's serum calcium level if mother receives pharmacologic doses
Danthron	Increased bowel activity
Dapsone	None; sulfonamide detected in infant's urine
Dexbrompheniramine maleate with d-isoephedrine	Crying, poor sleeping patterns, irritability
Diatrizoate	None
Digoxin	None
Diltiazem	None
Dipyrone	None
Disopyramide	None
Domperidone	None
Dyphylline†	None
Enalapril	—
Erythromycin†	None
Estradiol	Withdrawal, vaginal bleeding
Ethambutol	None
Ethanol (cf. alcohol)	—
Ethosuximide	None, drug appears in infant serum
Fentanyl	—
Fexofenadine	None
Flecainide	—
Fleroxacin	One 400-mg dose given to nursing mothers; infants not given breast milk for 48 hr
Fluconazole	None
Flufenamic acid	None
Fluorescein	—
Folic acid	None
Gadopentetic (Gadolinium)	None
Gentamicin	None
Gold salts	None
Halothane	None
Hydralazine	None
Hydrochlorothiazide	—
Hydroxychloroquine†	None

TABLE 10C-6 Maternal Medication Usually Compatible with Breastfeeding* (continued)

Drug	Reported Sign or Symptom in Infant or Effect on Lactation
Ibuprofen	None
Indomethacin	Seizure (1 case)
Interferon-α	–
Iodides	May affect thyroid activity; see iodine
Iodine	Goiter
Iodine (povidone-iodine—for example, in a vaginal douche)	Elevated iodine levels in breast milk, odor of iodine on infant's skin
Iohexol	None
Iopanoic acid	None
Isoniazid	None; acetyl (hepatotoxic) metabolite secreted but no hepatotoxicity reported in infants
Ivermectin	None
K1 (vitamin)	None
Kanamycin	None
Ketoconazole	None
Ketorolac	–
Labetalol	None
Levonorgestrel	–
Levothyroxine	None
Lidocaine	None
Loperamide	–
Loratadine	None
Magnesium sulfate	None
Medroxyprogesterone	None
Mefenamic acid	None
Meperidine	None
Methadone	None
Methimazole (active metabolite of carbimazole)	None
Methohexital	None
Methyldopa	None
Methyprylon	Drowsiness
Metoprolol†	None
Metrizamide	None
Metrizoate	None
Mexiletine	None
Minoxidil	None
Morphine	None; infant may have measurable blood concentration
Moxalactam	None
Nadolol†	None
Nalidixic acid	Hemolysis in infant with glucose-6-phosphate dehydrogenase (G6PD) deficiency
Naproxen	—
Nefopam	None
Nifedipine	—
Nitrofurantoin	Hemolysis in infant with G6PD deficiency
Norethynodrel	None
Norsteroids	None
Noscapine	None
Ofloxacin	None
Oxprenolol	None
Phenylbutazone	None
Phenytoin	Methemoglobinemia (1 case)
Piroxicam	None

TABLE 10C-6 Maternal Medication Usually Compatible with Breastfeeding* (continued)

Drug	Reported Sign or Symptom in Infant or Effect on Lactation
Prednisolone	None
Prednisone	None
Procainamide	None
Progesterone	None
Propoxyphene	None
Propranolol	None
Propylthiouracil	None
Pseudoephedrine†	None
Pyridostigmine	None
Pyrimethamine	None
Quinidine	None
Quinine	None
Riboflavin	None
Rifampin	None
Scopolamine	—
Secobarbital	None
Senna	None
Sotalol	—
Spironolactone	None
Streptomycin	None
Sulbactam	None
Sulfapyridine	Caution in infant with jaundice or G6PD deficiency and ill, stressed, or premature infant; appears in infant's milk
Sulfisoxazole	Caution in infant with jaundice or G6PD deficiency and ill, stressed, or premature infant; appears in infant's milk
Sumatriptan	None
Suprofen	None
Terbutaline	None
Terfenadine	None
Tetracycline	None; negligible absorption by infant
Theophylline	Irritability
Thiopental	None
Thiouracil	None mentioned; drug not used in United States
Ticarcillin	None
Timolol	None
Tolbutamide	Possible jaundice
Tolmetin	None
Trimethoprim/sulfamethoxazole	None
Triprolidine	None
Valproic acid	None
Verapamil	None
Warfarin	None
Zolpidem	None

* Drugs listed have been reported in the literature as having the effects listed or no effect. The word "none" means that no observable change was seen in the nursing infant while the mother was ingesting the compound. Dashes indicate no mention of clinical effect on the infant. It is emphasized that many of the literature citations concern single case reports or small series of infants.

† Drug is concentrated in human milk.

TABLE 10C-7 Food and Environmental Agents: Effects on Breastfeeding

Agent	Reported Sign or Symptom in Infant or Effect on Lactation
Aflatoxin	None
Aspartame	Caution if mother or infant has phenylketonuria
Bromide (photographic laboratory)	Potential absorption and bromide transfer into milk; see Table 10C-6
Cadmium	None reported
Chlordane	None reported
Chocolate (theobromine)	Irritability or increased bowel activity if excess amounts (>16 oz/d) consumed by mother
DDT, benzene hexachlorides, dieldrin, aldrin, hepatachlorepoxide	None
Fava beans	Hemolysis in patient with G6PD deficiency
Fluorides	None
Hexachlorobenzene	Skin rash, diarrhea, vomiting, dark urine, neurotoxicity, death
Hexachlorophene	None; possible contamination of milk from nipple washing
Lead	Possible neurotoxicity
Mercury, methylmercury	May affect neurodevelopment
Methylmethacrylate	None
Monosodium glutamate	None
Polychlorinated biphenyls and polybrominated biphenyls	Lack of endurance, hypotonia, sullen, expressionless facies
Silicone	Esophageal dysmotility
Tetrachloroethylene cleaning fluid (perchloroethylene)	Obstructive jaundice, dark urine
Vegetarian diet	Signs of vitamin B_{12} deficiency

CHAPTER

11

Health Issues of Lesbian and Bisexual Women

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Background

Lesbianism has a much broader meaning than the narrow dictionary definition of a woman who is sexually attracted to other women. The concept comprises an identity based on a woman's choices as well as on a sexual orientation, psychological responses, cultural values, and societal expectations. Psychosocial and biomedical aspects of health care are influenced by a woman's sexual activity with women; thus midwives need to understand how lesbians are unique with respect to sexually transmitted diseases (STDs), HIV, cancer risk and screening, childbearing and family formation. It is important to every woman's well-being that health care providers use language free of heterosexual assumptions.

Most lesbians defy stereotypes; any female client can be lesbian or bisexual. Lesbian identity and sexual practices cross all divisions of socioeconomic, racial, ethnic, regional, religious, geographic, and age groups. Surveys estimate that 2 to 10 percent of the population are women sexually active with women. Lesbian sexual practices range from celibacy to sexual activity that may include both men and women. According to research studies, the majority of lesbians have at some point participated in heterosexual coitus [1–9].

Although lesbians have always existed as a marginal group in society, they have become increasingly visible in the mainstream since the 1990s. This visibility is a result of both the women's movement of the 1970s and 1980s and the media coverage of the HIV/AIDS epidemic with its devastating effect on the gay male population. Language changed in public media: the *New York Times* first printed the words *gay* and *lesbian* instead of *homosexual* after years of active lobbying from various gay and lesbian groups. The mainstreaming of language began to legitimize lesbian and gay issues as worthy of the civil and human rights that were granted to the heterosexual population.

This more open social climate had a positive effect on lesbian childbearing as more lesbians incorporated children into their families. Popular culture began to openly portray a particular view of lesbian "culture" in fashion, TV sitcoms, and advertisements. Movies that included empathetic portrayals of lesbians and the realities of discrimination have won national awards.

As public visibility increases, however, homophobia, expressed in various forms including extreme violence, continues to occur. Hate crimes against lesbians are also on the rise. Antigay hate crimes accounted for 11.6 percent of the statistics collected by the FBI in 1996, making this the third largest category following racial hate crimes and crimes based on religions. Most lesbians have experienced public verbal attacks because they were lesbian [8].

Lesbians are often afraid to disclose their sexual orientation/practices to their health care provider for fear of negative treatment. In general, lesbians do not feel safe in the clinical setting and thus are more likely to delay health care that includes preventive screening. Understanding a

client's culture is essential to developing appropriate assessments and interventions. Thus, midwives need to expand their competency in cultural issues by gaining knowledge and respect for the complexity of lesbian health care.

The reasons lesbians may not seek or receive routine health care include fear of discrimination from health care providers; a feeling of detachment and invasion when questioned about sexual history, birth control, and marital status in a homophobic manner; a societal misperception that lesbians do not need the same tests and procedures as heterosexual women; and the lack of lesbian-sensitive and lesbian-knowledgeable health professionals. Access to health care is often blocked or delayed for financial reasons because of inequitable wages and because domestic partner benefits are seldom offered [3, 4, 10–14].

Combating Heterosexist Attitudes

Homophobia is culturally constructed. The existence of lesbians calls into question the normative societal ideology about women. This norm identifies heterosexuality as universal, superior, and natural for all women. In a study that explored the cultural roots of homophobia in order to provide a better midwifery service for lesbian clients [15], five themes underlying cultural expression of homophobia were identified:

1. Anxiety about sexual difference
2. Fear of female sexuality
3. The sexualization of lesbianism
4. The characterization of lesbianism as "sick" or "unnatural"
5. The inability to identify lesbians with any certainty

In the context of midwifery, these themes are particularly powerful. The provision of safe and respectful care that honors each individual woman and her family is a component of midwifery care; midwives are thus in a unique position to provide sensitive and effective care to lesbians and bisexual women.

The American College of Nurse-Midwives has designated hallmarks that characterize the art and science of midwifery. They include cultural competency and proficiency as well as care to vulnerable populations [16]. The quality of health care is dependent upon the relationship between the midwife and the client. Research indicates that many lesbians believe their care is compromised because of negative attitudes held by health care practitioners. Disclosure of lesbian identity is known to evoke a wide array of negative reactions from health care providers, ranging from embarrassment to overt hostility. Reported responses include fear, ostracism, refusal to treat, cool detachment, shock, pity, voyeuristic curiosity, demeaning jokes, avoidance of physical contact, insults, invasions of privacy, rough physical handling, and breaches of confidentiality [8, 14, 15, 17].

Heterosexist health care structures make lesbians feel invisible and unwelcome. The assumption that heterosexuality is the norm is apparent in health brochures and posters, intake financial forms, health intake and history forms, interviews, comments, and other forms of communication. In hospital-based facilities, preventive services for women are located almost exclusively in birth control and obstetric clinics and outreach to lesbian communities is largely nonexistent.

There is no validation for lesbians in the health care system. Repeated negative experiences often influence lesbians to delay their health care needs until they can no longer be ignored. Lesbians and women who partner with women may also delay care because of insufficient finances, lack of insurance, past negative experiences, or failure to see themselves at risk for illnesses such as sexually transmitted infections, breast cancer, and cervical cancer.

Midwives need to involve themselves in exploring the unique health care needs of lesbians by communicating an openness to care. It is both the process of communication and the content of the message that demonstrate a provider's ability to provide care to lesbians. Lesbian clients must be able to trust that their life experiences and identities are not beyond the routine of a competent midwife. All midwives should acquire basic knowledge about the health care needs of lesbians, bisexual, and transgender (male-to-female) lesbians and of available resources (see the appendix at the end of this chapter). Midwives must practice with an open attitude in order to provide good health care.

Clinical Research on Lesbian Health Issues

For the first time in U.S. history, improved data collection and analysis around lesbian, gay, bisexual, and transgender (LGBT) health issues will be a goal of the U.S. government. *Healthy People 2010* (*HP 2010*), a publication of the U.S. Department of Health and Human Services (HHS), is the government's public health plan focused on the elimination of health disparities across racial, ethnic,

regional, gender, age, and (for the first time) sexual orientation lines [11, 12]. The unique aspect that has emerged in the development of *HP 2010* is the recognition that sexual orientation also affects access to, and utilization of, health services. In the past, the federal government had focused its lesbian and gay health concerns on HIV. The Gay and Lesbian Medical Association (GLMA) and the Center for Lesbian, Gay, Bisexual and Transgender Health at Columbia University's Joseph L. Mailman School of Public Health, with the support of the Health Resources and Services Administration (HRSA), created the *White Paper: LGBT Health: Findings and Concerns*, which summarized the research and pointed to the need for data on lesbian, gay, bisexual, and transgender health needs [10].

Research is needed to identify health disparities in order to address them and eradicate them. Lesbians are difficult to recruit for clinical studies because they feel unsafe in the clinical setting. Like other socially or legally stigmatized populations, lesbians may feel that research findings will be used against them. Nonetheless, sampling a vulnerable and hidden population is necessary in order to ascertain their diverse characteristics. Current research has often failed to look for information on lesbian experiences across race, culture, socioeconomic groups, geographic area, and age.

Research, clinical services, and community advocacy are most effective when they nurture one another [2, 8, 14, 18]. When lesbians feel safe in seeking health care, the clinical setting will become more conducive to conducting clinical research to identify health care needs and necessary interventions.

Data Collection

History/Interview Skills

The initial barrier to inclusive care that the lesbian client encounters is often the heterosexist structure of the health care setting. Informational brochures about Pap smears, breast exam, and STDs usually reflect heterosexual experience. Posters on the wall depict heterosexual families and coupling. In maternity areas of hospitals, signs may read, "visiting hours for fathers only." If the environment is perceived as completely unsafe, questioning by the provider will elicit an inaccurate history. Midwives should be aware that excellent educational materials focusing on LGBT care are available from various health care centers [35].

Financial intake and health history forms often reflect heterosexist assumptions in their language. For example, intake forms often ask women whether they are married, divorced, widowed, or single. They ask about a spouse's income and health insurance coverage. Health history intake forms need to be written with open-ended language. Questions about significant others should not assume gender. Many lesbians feel uncomfortable if the intake form does not allow them to indicate a same-sex relationship. If the only option for emergency contact is for a "husband, wife, or spouse," many lesbian clients assume it is unsafe to list a lesbian partner [36].

An atmosphere of silence about lesbianism provides little evidence to clients that the midwife has the knowledge base and awareness of the diversity of lesbian life experience. The client must have a sense that the provider understands lesbian partnerships, family and friendship networks, sexual practices, cultural and community resources, health care concerns, and local laws regarding domestic partnership, marriage, and parenting/adoption [3, 4, 8, 14, 18] in order to actively participate in an effective interview. A midwife can convey understanding with both verbal and nonverbal language that conveys open-minded respect as well as a basic knowledge base.

Lesbian clients report that interviewing frequently ceases once the provider ascertains through questioning that her client is a lesbian [3, 4, 14]. Often, on a traditional health history questionnaire, the sexual history appears after the obstetrical, gynecological, and contraceptive histories. This order of questioning may promote assumptions about a client's sexuality. Questions related to sexual activity should not assume heterosexual activity. The following example of assumed heterosexuality with uncomfortable results is not uncommon:

Q: Are you using birth control?
A: No.
Q: Are you sexually active?
A: Yes.
Q: Do you need birth control today?
A: No.
Q: Are you planning a pregnancy?
A: No.

If the client is brave enough, she may add, "I am a lesbian" or "My partner is a woman." The usual response by the health care provider after this revelation is silence and awkwardness; the client is left on the defensive and distrustful.

It is imperative that information from an open-ended sexual history be known by the provider before the obstetric, gynecological, and contraceptive histories are taken. A midwife has to transcend biases and stereotypes in order to embrace the humanity of her client's experience and conduct an interview that is respectful and effective for assessing health. Table 11-1 provides examples of phrasing sociosexual questions in a way that allows a lesbian to reveal her health needs in an affirmative manner.

Gynecological Exam

The gynecological exam provides a unique opportunity to share information in a sensitive manner. Lesbian couples may accompany each other to exams, which enables family-centered education to occur. It is always important to take a history that includes the sexual practices of your lesbian client and to ascertain whether vaginal entry from heterosexual intercourse or hands or sex toys has occurred in order to know how to proceed with both the speculum and bimanual exam. Some lesbians have never practiced vaginal entry of any sort. It is also important to know whether there has been a history of sexual abuse. This also impacts on methods for bimanual and speculum exams. If vaginal entry is a concern for your client, teaching exercises to relax and stretch the vaginal introitus may be appropriate. In some cases a pediatric speculum may be needed. Teaching your client about her anatomy and also teaching her and/or her partner to insert the speculum may foster a sense of control over her body. The pelvic exam may even be postponed to another date if that seems to put the lesbian client at ease.

Breast care has been a neglected area in lesbian health care. Some lesbians have had negative experiences with health care providers that involved their breasts. This may be due to a false assumption that lesbians know more about breast care because their sexuality involves the breasts of another woman. Awareness of each individual's history and needs, as well as sensitivity in performing the breast exam are key. For a lesbian, a positive experience with a gynecological exam may prove truly empowering.

TABLE 11-1 Phrasing Sociosexual Questions

With whom do you live? (alone / friend / partner / husband / children / pets / other)
Who is your emergency contact?
Do you currently have a sexual partner?
Have you ever had a sexual partner?
Is your current sexual partner female / male / both / transgender / none?
Have your sexual partner(s) in the past been male / female / both / transgender?
Do you have a need for birth control at this time?
Have you ever used contraception?
What methods have you used?
Are you currently using any birth control method?
Do you identify as heterosexual / lesbian / bisexual / transgender / celibate / other?
Do you experience orgasm?
Does your sexual activity include vaginal entry?
Do you have pain with vaginal entry?
Are you aware of safer sex practices?
Do you use safer sex practices?
If yes, please list the methods you are currently using.
Have you ever had sex without your consent?

Source: Adapted from Carroll, N. M. Providing gynecological and obstetric care for lesbians. *Contemp. Rev. Obstet. Gynecol.* March 2000. Table 1, p. 76.

Management of Health Care Issues

There are several areas of health care management in which lesbians may have specific differences from their heterosexual counterparts: sexual practices and safer sex; cancer screening; STD transmission, and HIV.

Lesbian Sexual Practices

Lesbian sexual practices span a wide range. Intimacy and sexual activity may be distinct or intertwined. Stereotypes and myths portray lesbian couples as less sexual than gay male couples and heterosexual couples. It is important for midwives to be competent in sexuality counseling to make accurate assessments and appropriate interventions. This requires both a thorough knowledge base and a projected attitude of comfort and nonjudgment. Sexual practices are often less proscribed than heterosexual coitus and may range from affectionate, nongenital contact to genital and/or anal entry. They vary according to the preferences of each partner and perceptions of erotic behaviors; these behaviors and preferences may change over time. Sexual practices may include mutual masturbation involving vagina/vagina, mouth/vagina, mouth/anus, hand/vagina, or hand/anus contact. Arousal of breast tissue may be integrated into sexual activity. Both partners or only one may desire vaginal or anal entry. Vaginal entry with

fingers, tongue, fist, or sex toys and/or anal entry with fingers, tongue, or sex toys may be included. Sex toys may include dildos and vibrators as well as other objects such as candles and vegetables. When rougher sex is practiced, there is an increased risk for lesions and exchange of body fluids. A cardinal guideline is not to make assumptions about sexual practices without obtaining confirmation from the client [1, 3, 4, 8].

Safer Sex Practices Safer sex practices are dependent on sexual behavior and the sexual history of the partners involved. The midwife must take a sensitive sexual history in order to assist the couple in decision making about safer sex practices. Is the couple using sex toys? Are they sharing them? Is their sex gentle, rough, or somewhere in between? So little research has been done on actual rates of transmission of infection from woman to woman that a lesbian couple needs extra encouragement to assess their risk factors in order to make sound decisions about safer sex practices. Safer sex practices will decrease the likelihood of the exchange of body fluids including vaginal secretions, anal secretions, saliva, and blood. Safer sex practices for lesbians include careful handwashing before and after sexual activity, keeping fingernails short and clean, good oral hygiene, and awareness of any lesions of the mouth and tongue. Bleeding of the gums and periodontal disease should be attended to. Caution is important during menses; it may be best to avoid oral sex during menstruation, although the level of HIV in menstrual blood is unknown [3, 4, 8, 9, 13, 27, 29, 36]. Awareness and care of any known lesion(s) or cuts on the mouth, hands, fingers, genital, and anal areas are important to decrease the risk of transmission of infections. Tissue in the anus is more friable than tissue in the vagina.

Water-soluble lubricants such as Astroglide will decrease the likelihood of lesions. Latex barriers may be used and they include dental dams or latex sheets for oral sex; gloves or finger cots for vaginal or anal entry. Awareness of latex allergy or sensitivity must be considered. Vegetable oils and massage oils will break down latex; they should not be used together.

Sex toys should be washed with warm water and soap in between use; water soluble lubricants can be used on sex toys. Ideally each partner should have her own sex toys and they should not be shared. A dildo should not enter the vagina after going into the anus or vice versa unless it has been carefully washed or covered with a condom. Creative sex toys such as candles, fruits, and vegetables should also be carefully washed.

Cancer Screening

Cervical There is considerable room for improvement in knowledge, perceptions, and practices of all women regarding cervical cancer. Many lesbians are unaware of the cofactors which when combined with human papillomavirus (HPV) makes a woman at high risk for cervical cancer: cigarette smoking, multiple male sexual partners, sexual intercourse with a male partner before age 16, history of STDs, and history of or currently having genital warts (condylomata acuminata) [3–8, 13, 22, 23, 36–40]. The majority of lesbians report having engaged in heterosexual intercourse at some time. Further, woman to woman transmission of HPV can occur. Clients may not be aware of their risk for cervical cancer and the need to be regularly screened with Pap smears. It is important that all women are educated about cervical cancer screening and early detection because of their lifesaving potential. Educational material and community outreach that are inclusive of lesbians and women who partner with women need to be developed.

Ovarian/Endometrial Protective factors against ovarian and endometrial cancers include the use of oral contraceptives, and having been pregnant or given birth to a live infant. Lesbians, even those with a prior history of heterosexual intercourse, have used oral contraceptives less often and for a shorter period of time than their heterosexual counterparts [36–39]. They are also significantly less likely to have been pregnant or given birth. Therefore, many lesbians have a theoretical risk of ovarian cancer. If a lesbian has never used contraception, the potential benefit of even six to twelve months of use in reducing ovarian cancer risk could be considered [3, 4, 36–39].

Breast All women are at risk for breast cancer. Some factors that may increase an individual's risk are nulliparity or having her first child after the age of 35, heavy alcohol use, menarche before age 12, menopause after age 55, cigarette smoking, high body mass index, and hormone therapy [3, 4, 6, 8, 23–25, 36–38]. Lesbians and women who partner with women have lower rates of childbearing and higher rates of alcohol use [8, 26, 36–38]. While these factors may play a role in overall risk, the main concern for lesbians is lack of screening, which leads to delayed diagnosis and

treatment. There has been little research done on lesbians and breast cancer. A recent study found that lesbians report more breast biopsies than their heterosexual counterparts [25]. This finding needs further exploration. The current studies have predominantly sampled young Caucasian women. Future studies should sample women of different ages, ethnicity, economic groups, and geographic regions.

In the only study about understanding lesbians' mammography utilization, barriers were found to be consistent with barriers for women in general. Most often cited were systems barriers such as financial cost, scheduling, and geographic location. The sample of lesbians suggested that respect and outreach efforts targeted specifically to lesbians would promote utilization of mammography services [24].

STD Transmission

Vaginal secretions can readily be exchanged by a variety of sexual behaviors practiced by lesbians including hand/vagina, hand/anus, vagina/vagina, mouth/vagina, and mouth/anus contact. They can also be transmitted by sharing sex toys (dildos, vibrators, etc.). Because it is likely that sexually transmitted diseases can be transmitted from woman to woman, routine screening for STDs should be offered to all lesbians.

Bacterial vaginosis (BV) and candidiasis can occur when the vaginal environment becomes unbalanced. They can occur with new sexual partner(s) as different vaginal flora are introduced. It is possible for BV and vaginal candidiasis to be sexually transmitted between women [1, 3, 4, 27, 28, 36–40]. BV may be associated with pelvic inflammatory disease (PID), adverse pregnancy outcomes, and enhanced HIV transmission. These infections can also arise in women who are virginal or not currently sexually active. Lesbian partners should always be offered testing and treatment.

Risk factors for specific STDs such as chlamydia, syphilis, gonorrhea, HPV, and herpes simplex virus (HSV) include the sexual history of the female partner as well as sexual partnering with a man in the past or present. Although rates of chlamydia and gonorrhea infection are reported as low among lesbian populations, this may be due to lack of screening. HPV and HSV can be easily transmitted [36–39]. HPV is often diagnosed by cytological findings on a Pap smear; thus lesbians who delay preventive health care screening may be underdiagnosed [40].

HIV

Lesbians are a hidden population in human immunodeficiency virus (HIV) transmission statistics. Although HIV-related research on women who have sex with women, regardless of their sexual orientation, has been scarce, there have been some notable findings [8, 39]:

1. Higher HIV seroprevalence rates among women who have sex with both women and men compared to exclusively lesbian or heterosexual counterparts
2. High levels of risk for HIV infection through unprotected sex with men who inject drugs
3. Risk for HIV infection of unknown magnitude owing to artificial insemination with unscreened semen

A lesbian or bisexual woman is at risk for HIV if she or her partner has a history of a male sexual partner within the last ten years or a history of intravenous drug use. According to recent studies, from 10 to 40 percent of the lesbian and bisexual population fall into these risk behavior categories. Lesbians who perceive low-risk identity may be practicing high-risk sexual behavior [29, 39]. Sensitive education about risks and an assessment of risk behaviors are key factors. Midwives gain necessary knowledge about the range of sexual behavior of individual clients by obtaining a complete sexual history including past and present sexual behavior and intravenous drug use.

Childbearing and Parenting

Family Configurations

There are an estimated 6 million to 14 million children raised by lesbian and gay individuals in the United States [36]. Lesbian mothers cross all class, racial, ethnic, nationality, and physical ability lines. They live in heterosexual marriages or alternative family structures. Prior to the 1970s and 1980s and the lesbian feminist movement, most lesbian mothers became parents via heterosexual intercourse. The women's, civil rights, and lesbian/gay movements of the 1960s and 1970s gave confidence to lesbians to parent children. Sperm banks and adoption agencies became accessible to single parents, giving lesbians more options for having children [19].

Lesbian mothers are pioneer developers of new family forms (see Figure 11-1). Lesbian parent configurations may include any of the following:

1. A single woman with one or more children
2. Two female lovers with one or more children
3. Two or more friends with one or more children
4. A combined family consisting of two or more families coparenting each other's children
5. An extended lesbian family consisting of a single lesbian or a lesbian couple with children and other friends or ex-lovers actively involved in childrearing
6. Extended biological families of origin [19]

There is an increase in interracial lesbian families that present new opportunities and challenges within a heterosexist and racist society. The midwife needs to remember that lesbian family configurations defy traditional definitions and may take a variety of creative forms. Many studies have examined the psychosocial development of children raised by lesbians and have found no differences in sexual or gender identity compared with children of heterosexual parents [20].

FIGURE 11-1 Family rejoicing.
Source: Photo courtesy of Debbie Parker.

Although in some communities, particularly in large urban settings, well-developed resources and support groups are available for lesbian parents, in more rural settings lesbian parents and their children may be much more isolated [3, 4, 8, 36].

Options for Parenthood

The birth mother has many considerations, beginning with method of conception. A thorough preconception visit is a wonderful opportunity to explore methods of alternative insemination. Homophobic stigmatization of lesbians as inappropriate parents include potential rejection by family of origin, lack of access to and availability of resources such as sperm banks, and denial of insurance coverage. Most health insurers refuse to cover the costs of semen and office inseminations for lesbians or single women who want to become pregnant until there have been 12 cycles of insemination without conception, at which point they may qualify for infertility services [3, 4, 8]. The birth mother needs information about fertility, basal body temperature charting, ovulation prediction kits, donor selection from sperm banks, laboratory testing, insemination methods, and sensitive prenatal care.

Alternative fertilization (donor insemination), as a form of woman-controlled conception, is the process of introducing a donor specimen of sperm, either fresh or frozen, into the woman's vagina at or near the time of ovulation with the intention of fertilizing the ovum (ova). The woman herself, her partner, or a health care provider can insert the sperm. Both partners should be included in all preconception counseling and decision making as well as in prenatal, intrapartal and postpartum care. Midwives can be an excellent resource for a lesbian or lesbian couple in advocating and facilitating this process.

Whether to use a known or unknown donor has important repercussions. Issues to explore with a known donor include: Will the donor be involved in parenting? How will the lesbian mother(s) protect herself (themselves) if the donor desires custody of the child(ren)? With an unknown donor, the central issue is how much information will be available to the children. The AIDS pandemic has changed donor options. It is imperative to take thorough sexual histories and to screen for HIV and STDs in donor semen. Frozen semen should be quarantined until it is tested two times, six months apart, with negative results.

Adoption is also an option for lesbians who desire children. The issue of second parent adoption

has been fiercely contested in many states. Second parent adoption provides legal adoptive parental rights to the social/nonbiological mother. This allows both the biological and nonbiological mothers to have equal legal status as parents. Three states (Utah, Mississippi, and Florida) effectively ban second parent adoptions; Washington, D.C., and seven states (Vermont, Connecticut, California, Illinois, New York, New Jersey, and Massachusetts) permit them by law or court ruling, and otherwise the legal status varies widely. In a number of states, lesbians cannot adopt openly as a family but must apply as a single parent if two women plan to coparent. In early 2002, the American Academy of Pediatrics announced its support for the right of gay men and lesbians to adopt their partners' biological or adopted children [41]. A growing body of scientific literature demonstrates that children who grow up with one or two lesbian parents fare as well in emotional, cognitive, social, and sexual functioning as do children whose parents are heterosexual [42]. Midwives need to be familiar with local adoption regulations in order to counsel lesbians seeking to adopt children [2, 3, 8, 19].

Birth Mother

Once pregnant, the birth mother is vulnerable in unique ways and may find herself "coming out" all over again, as a pregnant lesbian, then again later as a lesbian mother. Once pregnant, her physical status becomes public. Public assumption of heterosexuality becomes pervasive. A pregnant lesbian may endure a range of questions from family of origin members, coworkers, and neighbors as well as shopkeepers and passersby. Questioning may be as benign as curiosity or as dangerous as open hostility. Women who choose to give birth as open lesbians challenge societal notions of family. A pregnant lesbian may have to come out to people whose response is not predictable—i.e., hospital administrators, pediatricians, sonographers, and third-party payors.

The birth mother and her partner face unique stressors that include the constant invention of their role(s) as mother(s) in a patriarchal society. She (they) must decide what level of disclosure about their identities and choices are optimum in each new situation in the hopes of gaining respect and attaining basic needs. Even if the midwife is respectful, the birth mother often faces homophobic attitudes and policies throughout her pregnancy and birth. Hospital staff may demonstrate a range of behaviors from ignorance about lesbian coparenting to open hostility toward the parental couple. The couple may be made to feel invisible as a parental team through lack of validation of their relationship. During labor and the birth, this can be especially stressful for an emerging family. The couple may have to endure overheard homophobic remarks. During the vulnerable postpartum period, the birth mother may face policies that deny parental visitation rights to the social mother. A knowledgeable and supportive network of caregivers is vital.

Coparenting

"Nonbiological mother" is the most common term used to describe the coparent, although this gives a sense of negation. More inclusive terms include "coparent," "comother," "social mother," "other mother," and "second female parent." Some families invent their own terms in this rapidly evolving kinship role. Lesbian families are creating a new female parent; the stress and isolation of the new female parent are due to lack of social and legal recognition. Generally, the second female parent's lesbianism is visible, while her motherhood is invisible. She may experience tremendous pain when her parenting role is not recognized by colleagues, family of origin, neighbors, and friends [19].

Children growing up with same-sex parents also must struggle with homophobic attitudes of friends, teachers, camp counselors, and societal institutions. Children do best with open and honest discussion as well as a supportive environment that values their family configuration. Children need to be educated that love is the most important family ingredient. Midwives who are educated to empower families are in a position to promote social recognition by including the second female parent as an equal family member as well as providing public support for the lesbian family configuration.

Legal Issues

Legal concerns of lesbian parents include the custody rights a donor may have to the child and custody rights of the social mother in lesbian "divorce" cases or in the event of the death of the biological mother. Individual state laws concerning parent-child relationships should be understood before using donor fertilization. Some states recognize the rights of the social mother through a second parent adoption [8]. This recognition gives the social mother equal parental rights under the law includ-

ing the rights and responsibilities of all legally recognized parents. Several documents may protect lesbian parental relationships in the event that second parent adoption is not a legal option: a will nominating the social mother as guardian in the event of the biological mother's death; a nomination of guardianship; a parental agreement between the birth mother and the social mother that recognizes the social mother's parental role and responsibility in the event of separation; and a medical consent form giving the comother medical authority. Midwives can guide their lesbian clients toward the need for legal resources and preparations during the pregnancy.

Special Health Concerns

Certain health areas of special concern have unique meaning for lesbian clients who may live in secrecy and certainly are influenced by homophobia in daily living. Midwives and other clinical providers may be the first person to whom a lesbian client reveals her vulnerability.

Mental Health Concerns

Lesbians suffer from the stress of living in a homophobic society and often need to be secretive about their lives with families, coworkers, and friends. Fears of loss of job, loss of benefits, poverty, and loss of custody if one's lesbian identity is revealed increase the risk of various mental health disorders. The process of coming out of this secrecy can lead to anxiety, rejection, loss of loved ones, and depression. In some studies adolescent gays and lesbians were more than twice as likely to attempt suicide as heterosexual young women [8, 21]. The number of hate or bias crimes against lesbians, including verbal abuse, threats of violence, property damage, physical violence, and murder is increasing each year [8, 10, 12].

All of these issues create unusual stresses on lesbian couples. Disruptions and breakups in lesbian couples, with or without children, can also be particularly difficult because of the lack of the usual societal structures and supports. The lack of traditional sanctions such as marriage and divorce create an invisibility of these breakups and losses to the world.

The midwife may be one of the few persons in whom lesbians can confide. Inquiry about the couple and family life of lesbians is usually most welcome and helpful in determining the need for assistance, intervention, or referral. Screening for social, as well as domestic violence, life stressors and coping mechanisms are part of a comprehensive health assessment.

Substance Use: Cigarettes, Alcohol, and Drug Use

Higher than typical rates of alcohol use by lesbians have been suggested. Some sources suggest that alcoholism affects as much as 30 percent of the lesbian population, compared with 10 percent of the general female population. Alcohol abuse is often correlated with other substance abuse. Lesbians who are heavy alcohol users have high rates of cirrhosis, accidents, suicide, depression, hypertension, menstrual and reproductive problems, malnutrition, colon and stomach cancer, and gastrointestinal hemorrhage [8, 11, 13].

In various surveys, 27 to 31 percent of lesbians reported currently smoking cigarettes. The rate of current smokers increases in each age group whereas in the female population in general smoking rates decrease as the age increases. Very few data are available to document the use of illegal drugs by lesbians [8].

Domestic Violence

Violence in lesbian relationships, as in heterosexual relationships, has existed behind closed doors for a long time. Abuse in lesbian relationships more often takes a nonphysical than a physical form. However, physical abuse is also used as a mechanism for resolving conflicts [8, 30–32]. Because lesbians often live in secrecy and isolation, issues of domestic violence become even more taboo and frightening.

It is crucial for midwives to be aware of the possibility of same-sex partner abuse in order to help the victims of intimate violence. Methods of conflict resolution in the lesbian couple relationship need exploration. The belief that there is a high level of emotional merging in a lesbian relationship, possibly coupled with blurred personal and role boundaries, may enhance abusive behaviors [30]. Further research is needed on the incidence and correlates of violence in all forms of intimate adult relationships in order to provide better counseling services to lesbian batterers and their victims.

Racial and Ethnic Minority Groups

Views of sexual identity and sexual behavior can vary significantly across cultures, so it should not be assumed that a lesbian sexual identity is the same

for lesbians of different racial, ethnic, or cultural backgrounds. Nor should the midwife assume that racial and ethnic minority cultures share views of lesbian sexual orientation identical with the dominant culture. It can certainly be hypothesized that the stress effects of homophobic attitudes may be greatest for lesbians who are subject to multiple forms of discrimination, such as lesbians who are also members of racial and ethnic minority groups. Lesbians of color may also experience racism within the lesbian community. The combination of homophobia, racism, and sex-based discrimination has been referred to as being in "triple jeopardy" [8]. Stress-related illnesses such as elevated blood pressure and depression are likely to be exacerbated by racism.

Transgender Lesbians (Male to Female)

Transgender lesbians are individuals who through medical and/or surgical procedures have transformed their gender and identity from male to female and then self-identified as lesbian. Society continues to view transgender people as abnormal. For many transgender people, this results in secrecy, shame, depression, and fear. This leads to isolation and delayed utilization of preventive health care. A transgender lesbian needs sensitive and knowledgeable care. A transgender male to female (MTF) lesbian does not need gynecological care although she does need breast care. She may need a referral to a urologist for specialized care. A transgender female to male (FTM) person will continue to need pap smears unless he has had a hysterectomy and closure of the vagina. An FTM individual will also continue to need breast exams. Almost no research has been done to ascertain the unique health care needs of transgender people. Midwives who are educated to provide respectful care that honors the full range of human experience can provide sensitive care to this misunderstood minority [33, 34].

Youth and Elder Needs

There are unique needs of both young and elder lesbians. The adolescent lesbian is especially vulnerable to the emotional distress of coming out and is at increased risk of attempting suicide. Parental acceptance during this process may be a primary determinant of the development of healthy self-esteem. It is important for midwives to screen adolescents for these signs and to consider confusion about sexual orientation in the differential diagnosis of depression and substance abuse [3, 4, 8, 21].

At the other end of the spectrum, lesbians who are menopausal and postmenopausal may encounter special situations associated with their sexual orientation, such as adverse societal attitudes, family rejection, and internalized homophobia. For many lesbians, the health concerns of aging may be their first entry into the health care system. Since many lesbians have not had children and have not had routine preventive screening, they are at higher risk for reproductive cancers. Societal supports such as next-of-kin benefits are not often available due to the lack of recognition of long-term lesbian relationships. Social support is lacking for elder lesbians who experience being with a partner through illness, hospitalization, hospice, funeral arrangements, and other stressful developmental events of getting older. They may not receive the same societal recognition of grief at the death of a long-term partner. Older lesbians may also be more isolated and at higher risk for stress-related illnesses. Regardless of whether they are sexually active, elder lesbians who still identify themselves as lesbian may not feel accepted in the dominant heterosexual environment of many assisted living communities [3, 4, 8, 12, 36].

Summary

Protective factors such as strong social support systems, religious institutions, schools, and community groups can promote optimum health for lesbians. Strong ties with friends and family may also decrease the stressors of homophobia. As midwives gain basic skills about the special health care needs of lesbians and how to enhance a sense of safety and assertion within the health care system, there will no doubt be an increase in utilization by lesbians of midwifery's unique offerings.

References

1. Carroll, N. M. Gynecological infections and sexual practices of Massachusetts lesbian and bisexual women. *J. Gay Lesbian Med. Assoc.* 1(1):15–23,1997.
2. Carroll, N. M. Developing a lesbian health research program: Fenway Community Health Center's experience and evolution. *J. Gay Lesbian Med. Assoc.* 3(4):145–152, 1999.
3. Carroll, N. M. Optimal gynecologic and obstetric care for lesbians. *Obstet. Gynecol.* 93(4):611–613 (April) 1999.

4. Carroll, N. M. Providing gynecological and obstetric care of lesbians. *Contemp. Rev. Obstet. Gynecol.* 75–79 (March) 2000.
5. Price, J. H., Easton, A. N., and Telljohann, S. K., et al. Perceptions of cervical cancer and Pap smear screening behavior by women's sexual orientation. *J. Community Health* 21(2):89–105 (April) 1996.
6. Rankow, E. J. Breast and cervical cancer among lesbians. *Women's Health Issues* 5(3):123–129 (Fall)1995.
7. Rankow, E. J., and Tessaro, I. Cervical cancer risk and Papanicolaou screening in a sample of lesbian and bisexual women. *J. Fam. Pract.* 47(2):139–143, 1998.
8. Solarz, A. L., (Ed.), *Lesbian Health*. Washington, D.C.: Institute of Medicine, National Academy Press, 1999.
9. White, J. C. HIV risk assessment and prevention in lesbians and women who have sex with women: practical information for clinicians, *Health Care Women Int.* 18(2):127–138 (Review) 1997.
10. Gay and Lesbian Medical Association, *The White Paper: LGBT Health: Findings and Concerns*, 2000. Accessed online at www.glma.org/policy/whitepaper/index.html.
11. U.S. Department of Health and Human Services, *Healthy People 2010,* 2000. Accessed online at www.health.gov/healthypeople/document.
12. U.S. Department of Health and Human Services, *Healthy People 2010 Companion Document for LGBT populations*, 2000. Accessed online at www.glma.org/policy/hp2010/index.html.
13. Koh, A. S. Use of preventive health behaviors by lesbian, bisexual, and heterosexual women: questionnaire survey. *West J. Med*, 172:379–384, 2000.
14. Stevens, P. E. Structural and interpersonal impact of heterosexual assumptions on lesbian health care clients. *Nurs. Res.* 44(1):25–30 (January/February) 1995.
15. Diamant, A. L., Schuster, M. A., and Lever, J., et al. Receipt of preventive health care services by lesbians. *Am. J. Prev. Med.* 19(3):141–148, 2000.
16. Wilton, T. Towards an understanding of the cultural roots of homophobia in order to provide a better midwifery service for lesbian clients. *Midwifery* 15(3):154–164, 1999.
17. American College of Nurse-Midwives, *ACNM Core Competencies*, 1997. Accessed online at www.acnm.org/about/display.cfm?id=137.
18. White, J. C. Challenges and opportunities in clinical research on lesbian health [editorial]. *J. Gay Lesbian Med. Assoc.* 2(2):55–57, 1998.
19. Zeidenstein, L. Lesbian mothers. In Rothman, B. K. (Ed.), *Encyclopedia of Childbearing, Critical Perspectives*, Phoenix, Arizona: Oryx Press, 1993, pp. 225–226.
20. Gold, M. A., Perrin, E. C., Futterman, D., and Friedman, S. B. Children of gay or lesbian parents. *Pediatr. Rev.* 15:354–358, 1994.
21. Savin-Williams, R. C. Verbal and physical abuse stressors in the lives of lesbian, gay male, and bisexual youths: associations with school problems, running away, substance abuse, prostitution, and suicide. *J. Consult. Clin. Psychol.* 67(2):261–269, 1994.
22. Kunkel, M. S., and Skokan, L. A. Factors which influence cervical cancer screening among lesbians. *J. Gay Lesbian Med. Assoc.* 2(1):7–15, 1998.
23. White, J. C., and Dull, V. T. Health risk factors and health-seeking behavior in lesbians. *J. Womens Health* 6(1):103–112, 1997.
24. Lauver, D. R., Karon, S. L., and Egan, J. Understanding lesbians' mammography utilization. *Women's Health Issues* 9(5):264–273 (September/October) 1999.
25. Roberts, S. A., Dibble, S. L., and Scanlon, J. L. Differences in risk factors for breast cancer: lesbian and heterosexual women. *J. Gay Lesbian Med. Assoc.* 2(3):93–101, 1998.
26. Hefferman, K. The nature and predictors of substance use among lesbians. *Addict. Behav.* 23(4):517–528, 1998.
27. Berger, B. J., Kolton, S., and Zenilman, J. M. Bacterial vaginosis in lesbians: a sexually transmitted disease. *Clin. Infect. Dis.* 21:1402–1405 (December) 1995.
28. McCaffrey, M., Varney, P., and Evans, B. Bacterial vaginosis in lesbians: evidence for lack of sexual transmission. *Int. J. STD AIDS* 10:305–308 (May) 1999.
29. Norman, A. D., Perry, M. J., and Stevenson, L. Y. Lesbian and bisexual women in small cities—at risk for HIV? *Public Health Rep.* 111:347–352 (July/August) 1996.
30. Lockhart, L. L., White, B. W., and Causby, V. Letting out the secret: violence in lesbian relationships. *J. Interpersonal Violence*, 9(4):469–492 (December) 1994.
31. Burke, L. K., Follingstad, D. R. Violence in lesbian and gay relationships: theory, prevalence, and correlational factors. *Clin. Psychol. Rev.* 19(5):487–542, 1999.

32. Rankow, E. J., Cambre, K. M., and Cooper, K. Health care seeking behavior of adult lesbian and bisexual survivors of childhood sexual abuse. *J. Gay Lesbian Med. Assoc*. 2(2):69–76, 1998.

33. Lawrence, A. A., Shaffer, J. D., and Snow, W. R. Health care needs of transgendered patients. [letter to the editor] *JAMA* 276(11):874 (September) 1996.

34. Israel, G. E., and Tarver II, D. E. *Transgender Care*. Philadelphia, PA: Temple University Press, 1997.

35. LGBT brochures and educational materials can be obtained from Callen-Lorde Community Health Center, 356 West 18th Street, New York, NY, 10011; telephone (212) 271-7200 or access online at www.Callen-Lorde.org.

36. Association of Reproductive Health Professionals and Mautner Project for Lesbians with Cancer (eds.) Lesbian health [special issue]. *Health and Sexuality* 6 (2):1–15, 2001.

37. Cochran, S. D., Mays, V. M., Bowen, D., et al. Cancer-related risk indicators and preventive screening behaviors among lesbians and bisexual women. *Am. J. Public Health*, 91(4):591–597, 2001.

38. Rosenberg, J. Lesbians are more likely than U.S. women overall to have risk factors for gynecologic and breast cancer. *Fam. Plann. Perspect*. 33(4):183–184, 2001.

39. Marrazzo, J. M., Koutsky, L. A., and Handsfield, H. H. Characteristics of female STD clinic clients who report same-sex behavior. *Int. J. STD AIDS* 12(1):41–46, 2001.

40. Marrazzo, J. M., Koutsky, L. A., Kiviat, N. B., Kuypers, J. M., and Stine, K. Papanicolaou test screening and prevalence of genital human papillomavirus among women who have sex with women. *Am. J. Public Health* 91(6):947–952, 2001.

41. American Academy of Pediatrics Policy Statement. Coparent or Second-Parent Adoption by Same-Sex Parents. *Pediatrics* 109(3):339–340 (February) 2002.

42. Perrin, E. C., and Committee on Psychosocial Aspects of Child and Family Health. Technical report: coparent or second-parent adoption by same-sex parents, *Pediatrics* 109(3): 341–344 (February) 2002.

Appendix

Resources

National Organizations

PFLAG: Parents, Families and Friends of Lesbians and Gays
1101 14th St., NW
Suite 1030
Washington, DC, 20005
(202) 638-4200
www.pflag.org

LAMBDA Legal Defense and Education Fund
120 Wall St.
New York, NY 10005-3904
(212) 809-8585
www.lambdalegal.org

Gay, Lesbian and Straight Education Network
121 West 27th St., Suite 804
New York, NY 10001
(212) 727-0135
www.glastn.org

Michael Callen-Audre Lorde Community Health Center
356 West 18th St.
New York, NY 10011
(212) 271-7200
www.Callen-Lorde.org

SAGE: Senior Action in a Gay Environment
305 Seventh Ave. 16th floor
New York, NY 10001
(212) 741-2247
www.sageusa@aol.com

National Lesbian and Gay Health Association
1407 S St. N.W.
Washington, DC 20009
(202) 939-7880

Mary-Helen Mautner Project for Lesbians with Cancer
1707 L St. N.W., Suite 1060
Washington, DC 20036
(202) 332-5536(Voice/TTY)
www.mautnerproject.org

Lesbian Health Fund/Gay and Lesbian Medical Association
459 Fulton St., Suite 107
San Francisco, CA 94102
(415) 255-4547
www.glma.org
info@glma.org

Literature

Inside Out is an online magazine for gay, lesbian, and bisexual youth.
www.iomag.com

The American Psychological Association has a Web site with annotated books on gay and lesbian parenting.
www.apa.org/pi/l&bbks.html

COLAGE (Children of Lesbians and Gays Everywhere) has annotated lists of books and other publications for lesbian and gay parents.
3543 18th Street, #17
San Francisco, CA 94110
(415) 861-5437
www.colage.org/research/bibliography.html

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CHAPTER

12

Substance Abuse

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Introduction

Substance abuse is defined as "a pattern of psychoactive substance use that involves hazards to health" [1]. Substances that are of concern include caffeine, tobacco, and alcohol as well as licit and illicit drugs. Abuse may take various forms, including occasional experimentation, misuse of prescription medication, or addiction. Addiction indicates a physical and/or psychological dependence on the substance(s) of abuse. Substance abuse, whether occasional use or addiction, has implications for the health of a woman and her fetus or newborn. A glossary of commonly used terms is presented in Table 12-1.

Women who abuse alcohol and drugs frequently suffer from serious psychological problems, are at risk for nutritional deficiencies, report late for prenatal care, and may have frequent interactions with the legal system as well as difficulty complying with recommended visit and treatment schedules. In addition, their personal and social lives are often difficult and place them at high risk for physical abuse and sexually transmitted infections.

Women and Substance Abuse

According to the National Household Survey on Drug Abuse issued in 2002, men are more likely to be users of illicit drugs than women (7.7 percent compared to 5.0 percent) [2]. However, the nonmedical use of psychotherapeutic agents (e.g., analgesics, tranquilizers, and sedatives) was slightly less than 2 percent, essentially the same for both women and men. Thus, there are both similarities and differences between genders. Reyes suggested dividing gender differences in substance disorders into four categories: (1) social issues, (2) biological variations, (3) psychiatric comorbidity, and (4) medical sequelae [3].

Social Issues

Compared to men, women experience more social stigma when they engage in substance abuse. Therefore, it is not unanticipated that, when compared to men, women who are substance abusers tend to be secretive and hide their addictions [4]. Women are more likely to live with other substance-abusing individuals. These women are more likely than men or nonabusing women to have had spouses or other nuclear family with drug addiction patterns and to be currently separated or divorced. Unlike men, who tend to have more problems at work, women tend to have more disruptive patterns in their families. Alcoholic women are more likely to have experienced childhood victimization than nonalcoholic women.

Biological Variations

Biological variations are also apparent between men and women substance abusers, especially in relationship to various types of abuse. Men metabolize nicotine more rapidly than women, resulting in a longer half-life for nicotine in smoking women. This potentially makes it easier for women to become addicted to cigarettes. Since women have less gastric alcohol dehydrogenase, they experience higher levels of intoxication after ingesting less alcohol than men. In addition, estrogen may make

TABLE 12-1 Glossary of Terms Used in Substance Abuse

Term	Definition
Designer drugs	A term that has different connotations. In the context of licit drugs, indicates new drugs intentionally created to minimize certain adverse effects (e.g., selective estrogen receptor modulators designed to decrease the risk of breast cancer). In the context of substance abuse, indicates new categories of hybrid drugs created usually by underground chemists to enhance such effects as euphoria.
Drug abuse	Also known as chemical or substance abuse. Intentional misuse of either licit or illicit drugs for recreation, perceived necessity, or convenience. Drug abuse is a more intense misuse of drugs than connoted by the term *drug use*.
Drug addiction	According to the World Health Organization, "a state of periodic or chronic intoxication detrimental to the individual and society, which is characterized by an overwhelming desire to continue taking the drug and to obtain it by any means."
Drug misuse	Inappropriate use of prescribed or OTC drugs. Examples include taking more prescribed or OTC drugs than indicated, for a longer period than indicated, mixing drugs to potentiate euphoria, sharing drugs with others, or discontinuing drugs early.
Gateway drug	An agent that leads to another drug. Alcohol, tobacco, and marijuana are the most commonly used first drugs.
Illicit drug	Illegal drugs, such as marijuana, cocaine, and LSD.
Licit drug	Legal drugs, such as caffeine-containing agents, alcohol, and tobacco.
Over-the-counter drugs (OTC)	OTC drugs account for approximately $19 billion dollars in sales per year, based on 2002 statistics. Some of these agents are misused or abused, including laxatives, diet pills, and cough suppressants.
Polypharmacy	The use of multiple agents simultaneously, risking additive, antagonistic, or synergistic effects. Also called *polydrug use*.
Prescribed drugs	Licit drugs that may be used, especially analgesics. In 2001, 3.1 billion prescriptions were written, and analgesics like oxycodone (Vicodin) were among the top 200 drugs in the United States.
Psychoactive drugs	Substances that affect the central nervous system. They alter consciousness and/or perceptions.
Recreational drug use	Use of drugs to achieve a certain mental or psychic state.
Substance abuse	See Drug abuse.

Sources: Goode, E. *Drugs in American Society*, 5th ed. Boston, MA: McGraw-Hill, 1999; Hanson, G. R., Venturelli, P. J., and Fleckenstein, A. E. *Drugs and Society*, 7th ed. Sudbury, MA: Jones and Bartlett Publishers, Inc., 2002.

liver damage with alcohol worse for women. Women alcoholics are more likely to die from cirrhosis. Some research exists indicating that in addition to alcohol and tobacco, addiction to cocaine and opiates may progress faster among women than men. This phenomenon has been termed telescoping [4]. For women, chronic use of alcohol and cocaine may result in amenorrhea or other menstrual disorders. Menstrual irregularities may be perceived by the woman as evidence of infertility, and may lead a woman not to seek contraception or recognize early pregnancy when it occurs.

Psychiatric Comorbidity

Women usually first have psychiatric problems, followed by substance use disorders. This sequence is the opposite with men. Women who abuse alcohol are more likely to have higher rates of depression, panic disorders, and phobias than their male counterparts. Male substance abusers are more likely to have conduct disorders and antisocial personality disorders than female substance abusers. Among women, depression often accompanies treatment relapse. Depressed women are less successful than depressed men in attempting smoking cessation. No significant differences appear to exist between alcoholic men and women in relation to rates of concomitant illicit drug use [3].

Medical Sequelae

In addition to risks of cirrhosis and the increased incidence of amenorrhea for some subgroups of

women substance abusers, other medical sequelae exist. Diseases of the liver, heart, and gastrointestinal system proceed more rapidly among women substance abusers than men. Higher rates of osteoporosis and breast cancer have been reported for some subgroups. In general, mortality rates among women who abuse substances are higher than among men with similar abusing patterns. When compared to nonabusing women, females who engage in substance abuse are more likely to have sexually transmitted infections, including HIV and hepatitis [4].

Attraction of Substance Abuse

Recreational drug use has been documented for more than four millennia. Attempts at drug regulation were made as early as 2240 BC [5]. Historical drug use includes opiate lozenges for the Assyrians, hashish candies for the Romans, and cocaine found in Coca Cola's original recipe for Americans. However, less is known about why certain individuals become addicted to substances, others are occasional users, and yet others are never substance abusers. Some substance abusers say that they become users because they are bored, frustrated, or alienated. For them, drugs may provide pleasurable feelings or heighten pleasure. Some drugs may temporarily relieve stress or tension or even help the individuals dissociate themselves from daily issues. For adolescents in particular, peer use of drugs may promote drug use. Some individuals begin to use analgesics and other drugs because of an acute or chronic disease and find themselves psychologically and/or physically dependent upon the agents.

The absolute etiology of substance abuse remains elusive, especially since it may vary among different individuals. Without a single etiology, or even several specific etiologies, assessment and treatment of substance abuse remain a major challenge, not only for midwives, but also for society in general.

Additionally, most substance abusers use a wide repertoire of drugs. Many individuals begin drug use with a gateway drug but then continue to mix drugs and may escalate to illicit drugs. For example, a woman may both smoke and drink a cup of coffee. That could be called a caffeine/nicotine mix. Alcohol and sedatives or opiates have proved to be deadly combinations, as illustrated by several well-publicized celebrity deaths. This polypharmacy, or polydrug, approach makes research and clinical management in the area even more difficult. Table 12-2 illustrates some examples of polypharmacy and the common interactions of agents with substances of abuse.

TABLE 12-2 Examples of Polypharmacy: Common Interactions of Agents and Substances of Abuse

Agent	Combined With	Result
Sedatives		
Diazepam (Valium) or Triazolam (Halcion)	Alcohol Barbiturates	Increased sedative effects
Stimulants		
Amphetamines or Cocaine	Insulin Antidepressants	Decreased hypoglycemic effects Increased hypertensive effects
Opiates		
Heroin or Morphine	Barbiturates, diazepam Anticoagulants Antidepressants Amphetamines	Increased sedative effects Increased bleeding Increased sedative effects Increased euphoria
Tobacco		
Nicotine	Antihypertensives Amphetamines, cocaine	Increased blood pressure Increased cardiovascular effects
Alcohol	Cocaine	Production of cocaethylene, which enhances euphoria and toxicity

Source: Hanson, G.R., Venturelli, P.J., and Fleckenstein, A.E. *Drugs and Society*, 7th ed. Sudbury, MA: Jones and Bartlett Publishers, Inc., 2002.

Assessment of Drug Use

There is no single assessment technique for evaluating substance abuse. The complexity of individual motivations and the various physical reactions to drugs and their interactions, as well as the widespread tendency toward polypharmacy, all contribute to this problem.

However, the best available method of evaluation is a good general history. When seeking an initial or annual history for a woman, use of alcohol, tobacco, caffeine, and all drugs should be explored. Since individuals who are substance abusers also tend to have a higher incidence of sexually transmitted infections or domestic violence, it is useful to discuss substance abuse if those conditions occur. Signs or symptoms of depression, family dysfunction, sleep disorders, and gastrointestinal problems may all indicate comorbidity with substance abuse and should alert the midwife to the possibility of drug abuse. Whenever one substance of abuse, such as cigarettes, is found, there should be a concerted effort to ascertain whether or not others are also being abused.

In regard to pregnancy, the optimal time to assess for substance abuse is during a preconceptional visit. If substance abuse is identified then, there is time to implement management and treatment regimens before the woman becomes pregnant. Unfortunately, many women who abuse drugs are reluctant to interact with the health care system and may seek care later in pregnancy, if at all, especially when illicit drugs are involved, causing fear of legal implications.

Some assessment instruments are substance specific. If a woman uses alcohol, a short questionnaire may be of value. Many clinicians are familiar with the CAGE questionnaire that consists of four questions. However, the CAGE has been found to be less accurate among women, particularly Whites. Recently, the TWEAK questionnaire has been advocated [6]. Table 12-3 presents the components of the TWEAK questionnaire, including the weighting of each question. If a woman scores two to three points on the TWEAK scale, whether she is pregnant or not, it is considered a positive result. Some clinicians recommend that TWEAK scales be administered annually for all women in outpatient facilities [4]. It should be noted that this questionnaire has been studied with alcohol, but there is no strong recommendation for its use if adapted to other substances of abuse.

If the midwife is caring for a woman whom she believes to be under the influence of drugs that will impact her life or that of her fetus or child, immediate drug testing may be indicated. Drug testing may be done on urine, blood, or hair. In the case of a newborn, positive drug testing of meconium provides indication that drugs have been used within the last two to three days. The most common source for drug testing for adults and adolescents is urine, but midwives should be aware that confounding factors can interfere with the accuracy of the results. For example, poppy seeds found in pastries may cause a urine test to be positive for narcotics. Sodium bicarbonate antacids alkalizes urine and increases excretion of some drugs such as methamphetamines. Use of diuretics may dilute the volume of drugs in the urine, making it more difficult to find them via urine tests.

Legal and institutional policies and regulations may influence the situations wherein a midwife can

TABLE 12-3 The TWEAK Questionnaire for Alcohol Use

T	Tolerance (2 points)	How many drinks can you hold? (Cutoff: Four or more is a conservative cutoff for use with women compared to six or more for men)
W	Worried (2 points)	Have close friends or relatives worried or complained about your drinking in the past year?
E	Eye Openers (1 point)	Do you sometimes take a drink in the morning when you first get up?
A	Amnesia (1 point)	Has a friend or family member ever told you about things you said or did while you were drinking that you could not remember?
K	Cut down (1 point)	Do you sometimes feel the need to cut down on your drinking?

Note: A total of 2 to 3 points may indicate an alcohol abuse problem.

Source: Chan, A. K., Pristach, E. A., Welte, J. W., et al. The TWEAK test in screening for alcoholism/heavy drinking in three populations. *Alcoholism: Clinical and Experimental Research* 6:1188–1192, 1993.

order drug testing. A midwife should know the appropriate policies and recognize that when such testing is performed the collection and results should be confidential.

General Treatment Issues

The care of a woman struggling with substance abuse requires the collaboration of her midwife and professionals in multidisciplinary programs who have skills in treating chemical abuse and addictions. The professionals may include social workers, chemical abuse counselors, psychologists, psychiatrists, nutritionists, pharmacologists, and physicians with knowledge and experience in managing withdrawal, detoxification, and long-term treatment. The midwife must coordinate care for the woman with the professionals in substance abuse treatment. It is essential that the woman in treatment receive consistent information and that all team members hold the same expectations for her behavior. The course of treatment and recovery is often long, marked by periods of success and times of relapse. The cycle of recovery includes a period when the woman does not recognize the need to change behavior, a period of contemplation when the problem is recognized but no action is taken, a period when the woman plans action, a period of action, and a period of maintenance [7]. Relapses are to be expected, and recovery after relapse means repeating the cycle of recovery.

The factors that motivate recovery in a woman who has been abusing drugs or alcohol are varied and unpredictable. Sometimes concern about a baby during pregnancy may be the catalyst to begin the cycle of recovery. For a woman with an addiction who has not moved into a recovery cycle, any concern for a baby may be overridden by her concern for acquiring drugs. The woman alone has the power to change her addictive behavior. The midwife must provide continuous support to the woman while recognizing the recovery and relapse pattern of addiction. By providing ongoing care, the midwife can work to minimize maternal and fetal complications, encourage decreased substance usage, and support the cycle of recovery.

Many methods of drug treatment have evolved over the last several decades. These methods include self-help groups, institutional rehabilitation, therapeutic counseling, and use of various pharmaceuticals, or any combination thereof. In general, it is difficult to ascertain the effectiveness of the methods since few randomized controlled trials have been conducted. Perhaps the most famous of the self-help groups is Alcoholics Anonymous. Detoxification, or detox, units were common at one time in order to provide a facility for people undergoing withdrawal symptoms, but such units are no longer as common since the emergence of inpatient institutional care.

Institutional rehabilitation was made popular by the introduction of the Minnesota Model, an inpatient facility where a person could go for approximately one month during which time individual and group work would address some of the issues of desire and craving. The original 28-day time frame was determined by insurance reimbursement in Minnesota at the time but has since become a general standard. In addition to the original Minnesota facility, other institutions such as California's Betty Ford Clinic made institutional treatment in style. Therapeutic counseling and behavioral modification have become the cornerstone of many programs. A wide variety of pharmaceutical agents including antidepressants and narcotic antagonists have been used in the quest for addiction treatment. However, the unique relationship of an individual with her addiction, the polypharmacy aspects, and the lack of quality research make it difficult to implement management with a known degree of success.

General Management of Substance Abuse During Pregnancy

Obtaining a thorough patient history with questions specifically directed to detect substance abuse is essential. Midwives should recognize that women often use more than one substance. For example, use of caffeine and cigarettes is highly correlated; women who abuse sedatives may also abuse stimulants. Polydrug use is common in women using illicit drugs such as cocaine, heroin, or marijuana. The midwife must ask for information on all substances used, including over-the-counter medications, prescription drugs, illicit drugs, tobacco, and alcohol. It is important to know the method of consumption, amount, and combinations of drugs that

the woman uses. Combining drugs may potentiate the effect of the individual substances.

After identification, management is directed at reducing or eliminating the substances and the concomitant risks. Specific strategies for intervening in substance abuse situations depend on the substance and pattern of usage.

When substance abuse occurs during pregnancy, management must take into account the maternal, fetal, and neonatal risks associated with the substance(s) used. In prescribing medications or recommending over-the-counter medications, care must be taken to avoid preparations with high alcohol content. For the woman abusing alcohol and/or drugs, products containing alcohol can potentiate the effects of other drugs she is using. Prescribing medications containing alcohol sabotages the woman who is working toward abstinence.

When a woman is suspected of actively abusing alcohol or drugs or is known to do so, care must be taken in managing acute pain such as that experienced during labor and delivery. Women need the full support of analgesics and anesthetics. A careful history and monitoring of the woman's reaction to medication will enable appropriate pain relief without risk of overmedication. Withholding medication because of past or current substance abuse is cruel and unnecessary. Appropriate pain management will not precipitate a relapse or reinforce a drug habit. More information about pregnancy is contained in the discussion about common substances of abuse. Table 12-4 provides an overview of substances of abuse, maternal overdose, and neonatal effects.

Substance Abuse and Lactation

Substances used by lactating women can be passed to the infant during breastfeeding. The benefits of breastfeeding must be weighed against the risks of the infant's ingesting the abused substance. The infant, with an immature liver, may have diminished ability to metabolize and excrete the drug. In addition, the effect of the drug on the infant (for example, irritability) may compound the mother's problems in caring for the infant. Women who abuse substances often have decreased ability and resources to cope with difficult infants. Women actively abusing drugs are at increased risk of behaviors that predispose them to sexually transmitted infections, including HIV, which can be transmitted to the baby in breast milk. The midwife must help the mother make a decision about whether to breastfeed after reviewing her history, current drug usage, social situation, and the risk to the infant posed by the drug used by the mother. Alternatively, midwives should not assume that a woman who abuses substances should automatically not breastfeed since this vulnerable dyad may benefit best by the nutritional and psychological advantages of breastfeeding. In the following discussion of specific substances, lactation is discussed in relationship to each of the common substances of abuse.

Neonatal Implications

Some states require reporting of substance abuse in pregnancy, and some require universal screening of newborns for evidence of maternal drug usage during pregnancy. The ethics of screening are the subject of active debate. It is important for the midwife to know and to comply with state laws governing screening and/or reporting. In some jurisdictions, a positive test for maternal drug use mandates social services referrals and may result in the newborn being removed from maternal care. Therefore, such interventions must not be capricious for the sake of all involved. The midwife must be supportive of the family's needs and concerns, while intervening in the child's best interest.

Occasionally, the first time that substance abuse is noticed is when neonatal signs are observed. The classic withdrawal signs of a newborn, especially associated with maternal opiate use, include CNS irritability (e.g., tremors, jitteriness), respiratory distress (e.g., increased rate of sneezing, increase in respiratory rate), fever, sweating, excessive sucking, and poor feeding. Nonpharmacological interventions such as swaddling and other calming behaviors are often implemented. As with maternal treatments, neonatal treatments have rarely been assessed with great scientific rigor and much remains to be understood about substance abuse and the newborn, including the best methods of care. Table 12-5 uses the algorithm of "withdrawals" to summarize symptoms of neonatal withdrawal and associated physical problems.

TABLE 12-4 Substances of Abuse, Maternal Overdose, and Fetal/Neonatal Effects

Substance of Abuse	Maternal Overdose/Withdrawal	Fetal/Neonatal Effects
Alcohol	*Overdose:* Unusual behavior, depression, amnesia, hypotension *Withdrawal:* Agitation, tremors	Microcephaly, growth retardation, mental retardation, craniofacial abnormalities, abortion Growth restriction occurs both before and after birth Nutritional deficiencies, smoking and polypharmacy confound data The fetus of a woman who ingests six drinks per day is at a 40% risk of developing some features of FAS, but the threshold is still unknown
Anticholinergics Atropine Belladonna Scopolamine	*Overdose:* Pupils dilated and fixed, increased heart rate and temperature, amnesia, vagueness *Withdrawal:* None	None noted
Cannabis Marijuana THC Hashish	*Overdose:* Infected conjunctiva with normal pupils, decreased blood pressure when standing, increased heart rate, time and space disoriented *Withdrawal:* None	Some subtle behavioral alterations noted but no anomalies or growth delay
CNS sedatives Barbiturates Chlordiazepoxide Diazepam Flurazepam Glutethimide Meprobamate	*Overdose:* Normal pupils, decreased, shocky blood pressure, depressed respiration, depressed tendon reflexes, coma, ataxia, slurring, convulsions *Withdrawal:* Tremulousness, insomnia, chronic blink reflex, agitation, toxic psychosis	No anomalies Limp baby
CNS stimulants Antiobesity Amphetamines Cocaine Methylphenidate Phenmetrazine Methaqualone	*Overdose:* Dilated and reactive pupils, shallow respirations, increased blood pressure, hyperactive reflexes, cardiac arrhythmias, dry mouth, tremors, sensorium hyperacute *Withdrawal:* muscle aches, abdominal pain, hunger, prolonged sleep, possibly suicidal	Questionable increased rate of abortion, hyperactivity in utero, depression of interactive behavior, controversy about anomalies Cocaine has been linked with some bowel atresias and possible congenital malformations of heart, limbs, face, and GU tract as well as growth restriction. Maternal and fetal complications include sudden death and placental abruption (sixfold increase in obstetrical complications)
Hallucinogens LSD Ketamine Mescaline Dimethyltryptamine Phencyclidine (PCP)	*Overdose:* Dilated pupils, increased blood pressure, heart rate and tendon reflexes, flush face, euphoria, anxiety, illusions, hallucinations *Withdrawal:* None	Dysmorphic face Behavioral problems
Opiates Codeine Heroin Hydromorphone Meperidine Morphine Opium Pentazocine Tripelennamine	*Overdose:* Constricted pupils, decreased blood pressure, heart rate and reflexes, hypoactive sensorium *Withdrawal:* Agitation, flu like symptoms, dilated pupils, abdominal pain	Intrauterine withdrawal with increased fetal activity Neonatal withdrawal Depressed breathing movements Methadone usually treatment of choice

Sources: Rayburn, W. F., and Zuspan, F. P. *Drug Therapy in Obstetrics and Gynecology*. St. Louis, MO: Mosby Year Book, 1992; American College of Obstetricians and Gynecologists. Teratology. *ACOG Educ. Bull.* 233, 1–8, 1997; Wang, E. C. Methadone treatment during pregnancy. *JOGNN* 28(6):615–622, 1999; Dunbar, A. E., O'Neil, M., and Marben, L. *Johns Hopkins Children's Center NICU Guidebook 1999–2000*. Baltimore, MD: Johns Hopkins University, 1999.

TABLE 12-5 Signs and Symptoms of Neonatal Withdrawal and Associated Physical Problems

Signs and Symptoms	
W	Wakefulness
I	Irritability, insomnia
T	Tremors, temperature variations, tachypnea, twitching (jitteriness)
H	Hyperactivity, high-pitched cry, hiccups, hyperreflexia, hypertonus
D	Diarrhea (explosive), diaphoresis, disorganized suck
R	Rub marks, respiratory distress, rhinorrhea, regurgitation
A	Apnea, autonomic dysfunction
W	Weight loss (failure to gain weight)
A	Alkalosis (respiratory)
L	Lacrimation (photophobia), lethargy
S	"Stuffy" nose, sweating, sucking (nonproductive), sneezing, seizures
Physical Problems	
P	Prematurity
H	High incidence of intestinal, genital, and urinary tract abnormalities, hypertension
Y	"Yellow" (jaundice)
S	SGA, small head, SIDS (8–10 times increase in risk), stroke
I	Immune system suppression (infection)
C	Cranial abnormalities (abnormal EEG, seizures)
A	Asphyxia, aspiration pneumonia, "abnormalities" aspiration (meconium), abruptio placenta
L	Low birth weight
	Others: Vomiting, yawning, coughing, shock

Source: Adapted from Rayburn, W. F., and Zuspan, F. P. *Drug Therapy in Obstetrics and Gynecology*. St. Louis, MO: Mosby Year Book, 1992.

Common Substances of Abuse

The following sections address the most common substances that are abused. Common treatments and implications for pregnancy and lactation are described. It should be noted that with the advent of designer drugs, new combinations frequently emerge and midwives need to continue to be aware of such complications. Public health and law enforcement agencies often provide updates on "street" drugs in a given locality.

Caffeine

Caffeine is the most common substance of abuse in the United States. It is estimated that the average daily intake is more than 200 milligrams and approximately one-third of the population consumes more than 500 milligrams. Caffeine is a methylxanthine or xanthine and is known as a mild central nervous system stimulant. Although coffee and tea are the best-known sources of caffeine, soft drinks, chocolate, cocoa, over-the-counter drugs, and prescription drugs can also contain caffeine. Table 12-6 lists caffeine content of common foods and beverages.

Many women drink a cup of coffee every morning because it tends to enhance alertness and diminish fatigue [8]. However, caffeine can cause heart rate and rhythm changes as well as the more common effects of sleeplessness, irritability, nervousness, and anxiety. More minor effects include an increase in gastric secretions, potentially increasing hunger symptoms, as well as mild diuretic effects. Adults who consume more than 500 milligrams of caffeine daily may experience symptoms such as headache, nausea, and lethargy when caffeine is stopped or withdrawn. Many individuals consume caffeine regularly, but when they note some of the above symptoms, they will decrease their consumption until they are asymptomatic. Individuals suffering from caffeinism—severe symptoms caused by chronic consumption of high doses of caffeine—may be treated by slow or abrupt withdrawal. It should be noted that caffeine dependence is usually very difficult to cure. More than two-thirds of people who are treated for caffeinism relapse [5].

Caffeine dependence often is viewed as a minor issue, if one at all, in the field of substance abuse. However, it has been a major area of controversy among health care providers of pregnant women.

TABLE 12-6 Caffeine Content of Common Foods and Beverages

Food	Estimated Caffeine (mg)	Serving Size
Brewed coffee	180–250	10 oz
Instant coffee	70–320	10 oz
Decaffeinated coffee	2–12	10 oz
Tea	50–250	10 oz
Coca Cola (caffeinated)	46	12 oz (1 can)
Mountain Dew soft drink	54	12 oz (1 can)
Red Bull energy drink	80	8.3 oz
Chocolate bar	1–35	1 oz

Source: Hanson, G.R., Venturelli, P.J., and Fleckenstein, A.E. *Drugs and Society*, 7th ed. Sudbury, MA: Jones and Bartlett Publishers, Inc., 2002.

During pregnancy, the half-life of caffeine increases twofold to fourfold [9]. Thus a woman who experiences the caffeine "buzz" when she drinks six cups of coffee may find herself irritable, anxious, and tachycardic after only two cups when she is pregnant. Therefore, she may self-discontinue or decrease her intake. Not only is maternal tachycardia possible, but fetal tachycardia is also common after ingestion of high doses of caffeine. A woman should not imbibe a beverage containing caffeine for a few hours prior to fetal monitoring or a nonstress test.

In the past, there were several observational studies that suggested caffeine intake was associated with low birth weight infants. However, these early studies did not account for the factor of smoking. Subsequent studies were less clear about any association. Currently, the recommendation is that moderate use of caffeine poses no major issue to the birth weight of the newborn.

Studies about caffeine and spontaneous abortion have been inconsistent. In 1996, Dlugosz and colleagues suggested that caffeine might result in a higher risk of first trimester abortion [10]. Klebanoff and colleagues provided reassurance that if such a link existed, it was unlikely for women drinking six cups or less of coffee daily. They also found that caffeine metabolites are higher with women who smoke [11]. Cnattingius and colleagues may have provided more insight into the issue when they noted that many women who have nausea during pregnancy self-discontinue or decrease caffeine as a comfort measure. Considering that there is some research suggestion that gestational nausea tends to be associated with healthy pregnancies, women who are destined to abort may be the ones who continue to consume caffeine [12]. Additional studies are ongoing regarding caffeine and pregnancy. Caffeine is not contraindicated for breastfeeding women, but if sleeplessness and irritability are seen in the breastfed infant, the mother should decrease her intake.

Tobacco

More people die annually in the United States from tobacco-related illnesses than all deaths due to alcohol, cocaine, heroin, AIDS, suicides, homicides, fires, airplane and car crashes, fires, drowning, and the death penalty combined [3]. Smoking and passive, or secondary, smoking (inhaling the smoke of others) have received significant attention from public health agencies, with a resulting overall decrease in smoking nationwide. Figure 12-1 illustrates the general decrease in smoking juxtaposed with major public health and other historical events.

However, smoking remains a major health concern, especially for women and girls. In 1997 and 1998, 34.5 percent of American Indian or Alaskan Native, 23.5 percent of White, 21.9 percent of African American, 13.8 percent of Hispanic, and 11.2 percent Asian/Pacific Islander women were current smokers. Among high school seniors, past-month current smoking rates for girls decreased from 39.9 percent in 1977 to 25.8 percent in 1992, but again increased to 35.3 percent during 1997. In 2000, smoking prevalence declined again to 29.7 percent. However, that percentage is essentially the same as in 1988, eradicating any success of the 1990s in decreasing smoking among the group [13].

Nicotine is a powerful vasoconstrictor, and it increases blood pressure, heart rate, and blood levels of epinephrine and norepinephrine. Prolonged tobacco use is associated with cancers, particularly lung cancer in smokers but also cancer of the oropharynx and even the bladder. Women who smoke are at increased risk of cardiovascular and respiratory disease as well as experiencing menopause at an earlier age [14]. Few women smoked in the early twentieth century, but as more adopted the habit, lung cancer overtook breast cancer in relation to mortality, as illustrated in Figure 12-2. Today lung cancer is the most common cause of cancer death among females.

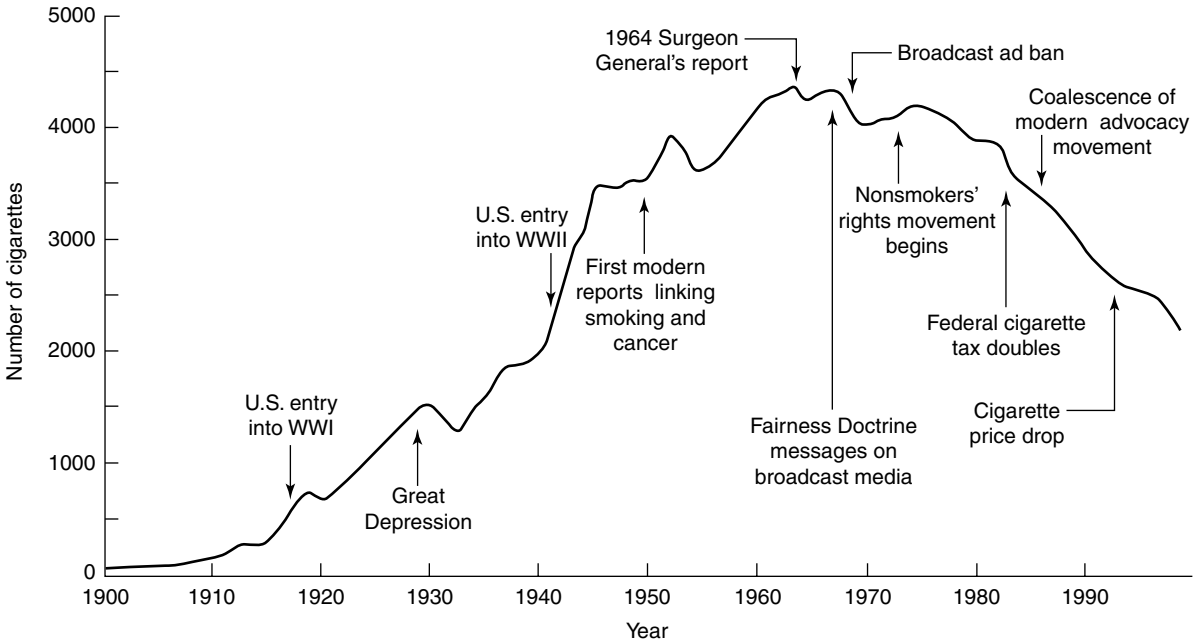


FIGURE 12-1 Adult per capita cigarette consumption and major smoking and health events, from 1900–1999 in the United States.

Source: Goode, E. *Drugs in American Society*, 5th ed. Boston, MA: McGraw-Hill, 1999.

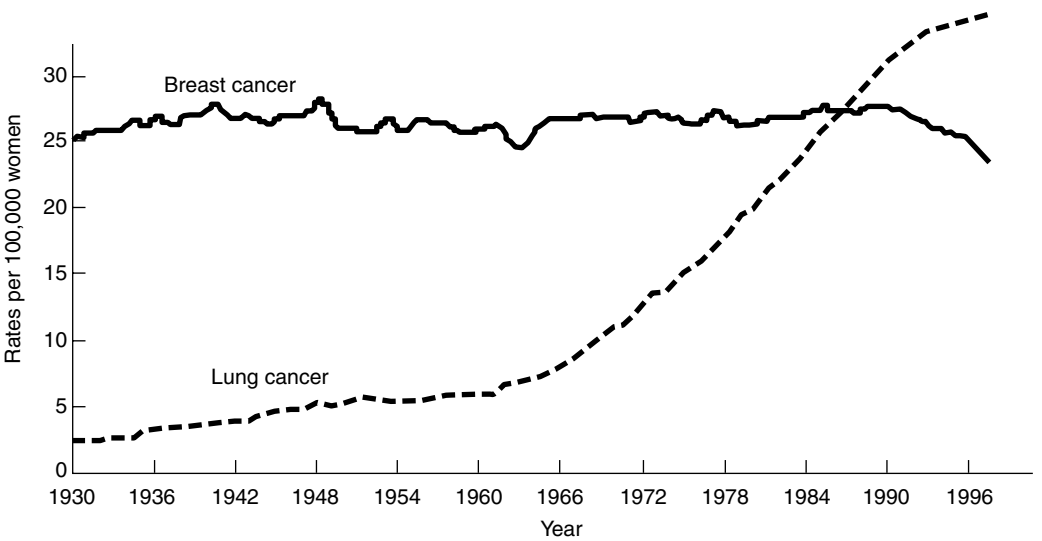


FIGURE 12-2 Age-adjusted death rates for lung cancer and breast cancer among women, from 1930–1997 in the United States.

Source: U.S. Surgeon General. *Women and Smoking*. Washington, DC: Government Printing Office, 2001.

Preventive health care for all women, especially adolescents, must include avoidance of tobacco and tobacco smoke (passive smoking). The woman who smokes a cigarette once or twice a month may be able to stop smoking when given information on the impact of smoking on her health and/or the health of her children. Information alone may not be enough for the pregnant woman with a history of years of heavy smoking.

Tobacco cessation is a major problem for most smokers. The majority of men and women who stop smoking, do so by the "cold turkey" method, without the aid of any drug or agent. However, individuals who are unable to self-discontinue smok-

ing may benefit from nicotine replacement therapy (NRT). No one method is best for all individuals, but any NRT appears to be better than placebos for recalcitrant smokers [15]. Combining NRT with buproprion (Zyban), a pharmaceutical that reduces nicotine craving, produces a higher cessation rate than either method alone [16]. A handout from the American Lung Association in regard to NRT and smoking cessation is found in the appendix at the end of this chapter. Table 12-7 provides a summary of evidence-based systematic reviews on various tobacco cessation methods [17–32].

The use of NRT during pregnancy is controversial. One study explored nicotine patches for six pregnant women in late pregnancy and found no adverse maternal or fetal effects. It was well received by the women, but the small sample size limits any conclusions [33]. According to evidence-based systematic review, smoking cessation programs in general during pregnancy appear to reduce smoking, which in turn lowers the incidence of low birthweight and preterm birth, but no effect was detected for very low birthweight or perinatal mortality [34].

Despite the adverse implications, smoking continues to be a relatively common activity in pregnancy, with an estimated 10 to 20 percent of pregnant women smoking. Of the various ethnic/racial groups, almost a quarter of Native American women smoke during pregnancy, as shown in Figure 12-3 [35].

Smoking prior to or early in pregnancy increases the risk of spontaneous abortion and abnormal placentation (including abruptio and placenta previa). During pregnancy, nicotine, carbon monoxide, and the various other components of cigarettes affect maternal circulation and cause constriction of uterine and placental vessels. In particular, carbon monoxide diminishes the oxygen carried to the fetus, culminating in growth restriction [36]. Studies of the placentas of smokers are able to isolate some metabolites from cigarettes, including nitrosaminioketone (NNK), a known carcinogen. It has been suggested that these biological components may make the intrauterine fetus more likely to engage in smoking as an adult and may explain in part why daughters whose mothers smoked during pregnancy seem to be more likely to smoke, even when their mothers stopped smoking shortly after their births [37].

Smoking during pregnancy is closely associated with low birth weight, decreased birth length, and preterm delivery. These fetal effects seem to be more pronounced if the woman combines cocaine with

TABLE 12-7 Results of Evidence-Based Systematic Reviews of Various Methods Used for Tobacco Cessation

Evidence of Effectiveness*
Antidepressants: bupropion (Zyban, Wellbutrin), nortriptyline (Sensaval)
Clonidine: Catapres
Community interventions for youth
Group therapy
Individual counseling
Nicotine replacement therapy (NRT)
Self-help groups
Insufficient Evidence of Effectiveness†
Aversion therapy
Anxiolytics: diazepam or Valium; meprobamate or Equanil, Meprospan and Miltown; metoprolol or Toprol; and oxpreonol or Trasicor
Exercise
Mecamylamine or Inversine (nicotine antagonist/antihypertensive)
Opiate antagonist: naloxone or Narcan
Telephone counseling
No Evidence of effectiveness
Acupuncture
Hypnosis
Lobeline (partial nicotine agonist)

* Degree of effectiveness is not the same for each intervention, but all demonstrate some effectiveness.

† Usually too few studies available.

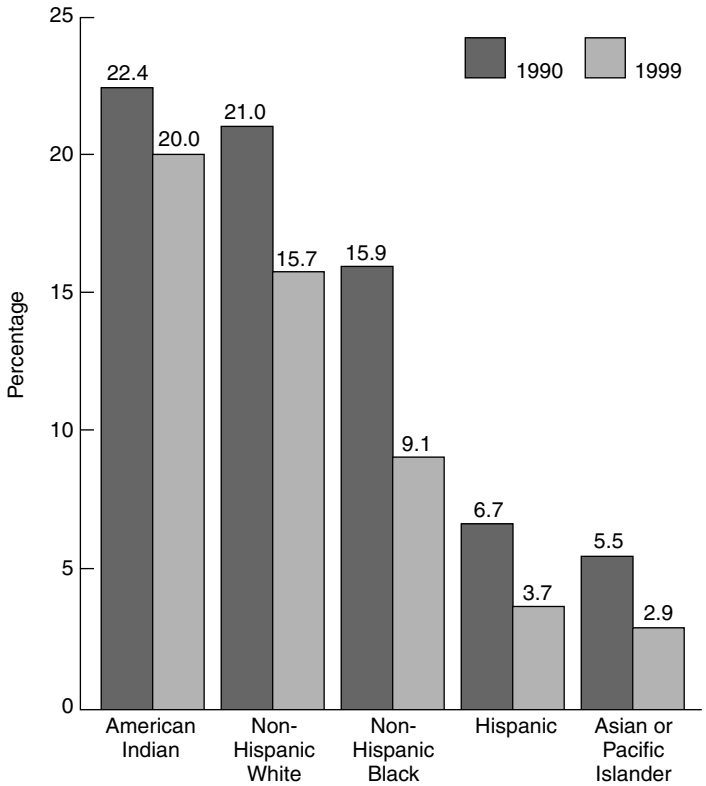


FIGURE 12-3 Percentage of mothers who smoked during pregnancy, by race and Hispanic origin: Selected reporting areas, 1990 and 1999.

Note: Excludes California, Indiana, New York State and South Dakota for 1999 and California, Indiana, New York, Oklahoma, and South Dakota for 1990.

Source: Matthews, T. J. Smoking during pregnancy in the 1990s. *Natl. Vital Statistics Rep*. 49(7):1–15 (November 19) 2001.

cigarettes [38]. Infants of women who smoke have a higher incidence of apnea and sudden infant death syndrome. The newborn effects may be a combination of intrauterine effects of smoking and the passive smoking during the newborn period.

Women should be helped to stop smoking not only during pregnancy but also during breastfeeding. The infant is at risk from ingestion of nicotine through breast milk and also from the effect of passive smoking. However, for women who are unable to completely stop smoking, breastfeeding should not be contraindicated. The myriad of benefits of breastfeeding should be available to children of smokers.

Marijuana

Of all the drugs involved in substance abuse, perhaps the most controversial is marijuana. Derived from the hemp plant, *Cannabis sativa*, it has a long history of use as a drug in Asia and Europe. In the United States, hemp was used in colonial times for making rope and apparel, and also for folk medicine. By the 1930s, marijuana began to be perceived as a narcotic, and a link was assumed with violent criminal acts. Its use rose with the counterculture movement in the 1960s and then it began to decline. By the 1990s, however, marijuana use unexpectedly rose. Two percent of women aged 26 and older reported using marijuana in 2000, which although relatively small, reflects an increase of more than 40 percent from the previous year [39].

Marijuana remains controversial today: Proponents for its use and legalization are engaged in ongoing battles with those who strongly disapprove of the drug. Advocates point out that there are no reports that anyone has ever died of a marijuana overdose and characterize the agent as a mild lifestyle drug, similar to if not less problematic than alcohol. Furthermore, they point to the use of medical marijuana for such therapy as reduction of nausea and vomiting. Opponents emphasize the hallucinogenic properties of the drug and even suggest that centuries ago assassins emerged from hashish cults. As usual, it is likely that the truth lies between.

Marijuana is classified as a hallucinogen, although the psychoactive ingredient tetrahydrocannabinol (THC) specifically has been found to have characteristics of stimulants, depressants, and psychedelic agents. The action of marijuana is similar to that of alcohol, with an initial stimulation followed by a sense of well-being or mild euphoria, called a "high." Marijuana causes tachycardia and decreased blood pressure, resulting in orthostatic hypotension. Marijuana smoke has effects on the lungs that are similar to those caused by tobacco smoke. Marijuana smoking increases respiratory diseases and produces more residue in the lungs than tobacco, particularly because the smoker tends to inhale more deeply. Smoking marijuana carries the same or an even greater risk for cancer as smoking tobacco.

Marijuana is considered a gateway drug, although most users do not go beyond marijuana, cigarettes, and/or alcohol. For most people, the high experienced with marijuana is mild, but it is associated with impaired memory, coordination, and critical thinking. Thus, it is dangerous for a pregnant woman or new mother to attempt to perform tasks requiring complex mental components. Although the high lasts a few hours, THC and the other metabolites are fat-soluble and may remain stored in adiposity for prolonged periods. Even THC in plasma can be found for several days after a single use [40].

Some research has linked a condition known as the amotivational syndrome with marijuana users. The syndrome involves poor productivity and lack of motivation and is seen in some heavy marijuana users. However, it is difficult to ascertain any cause and effect between the drug use and the syndrome since it has been argued that the syndrome may preexist use of the drug. The symptoms even may cause the individual to seek solace in marijuana use.

Over the last decade, controversy has swelled around the use of medicinal marijuana, which has been found to have some therapeutic effects against nausea, glaucoma, asthma, and muscle spasms as well as positive effects as an appetite stimulant, antidepressant, and antiseizure agent [41]. Although marijuana is an illicit drug, some locales have legalized the use for medical purposes and discussion is under way in many others.

Few programs exist specifically to help individuals discontinue marijuana. Research has not focused on various treatment modalities. Most reports of discontinuation are based on anecdotes or personal stories involving cold turkey or self-help groups.

During childbearing, no adverse effects of marijuana have been confirmed, although debate continues. Theoretically it may be surmised that smoking marijuana, like smoking cigarettes, would produce low birth weight infants. However, either due to secrecy about the drug habit, or consumption of less marijuana than tobacco, no link between the drug and small infants has been found. What is known is that marijuana commonly is used with other substances and the combination may alter the effects of the individual drugs. Marijuana potentiates the adverse effects of alcohol during pregnancy and may increase the risk of fetal alcohol syndrome.

According to the American Academy of Pediatrics (AAP), marijuana is a substance of abuse that should not be used by the lactating woman. Among the almost 400 research-based references on which their policy statement was based, the AAP Committee on Drugs noted only one study of marijuana during breastfeeding. No untoward effect was found, although it was noted that there possibly was a longer half-life for the psychoactive ingredients [42].

Alcohol

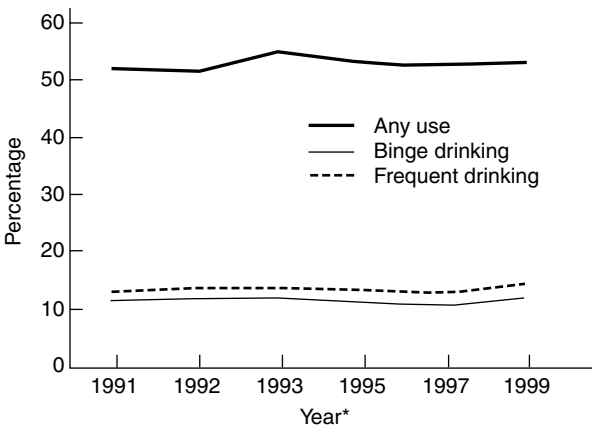
Alcohol consumption in the United States has a long and paradoxical history. In colonial times, alcohol use was viewed favorably. The slave trade involved the procurement of molasses, which was transported to New England where the manufacturing of rum became the area's largest and most profitable industry. Patent medicines liberally laced their concoctions with alcohol. By the mid-nineteenth century, the availability of alcohol and the number of alcoholics caused the temperance movement to gain momentum so that by the early twentieth century many locales had abstinence acts. In 1919 the Eighteenth Amendment to the U.S. Constitution abolished alcohol, but within the next decade criminally supported illegal trade in alcohol flourished. In 1933, the amendment was repealed. In the latter half of the twentieth century risks associated with alcohol again gained center stage when groups coalesced around drug and alcohol issues. For example, MADD (Mothers Against Drunk Drivers) emerged in 1980 as a powerful societal force in America.

Alcohol is a central nervous system depressant. After caffeine, it is the most widely used drug in the United States. Alcohol is a common ingredient in over-the-counter medications, especially liquid cough and cold preparations. Although men are

more likely than women to drink, according to the 2000 National Household Survey of Drug Abuse, more than 40 percent of women were current drinkers [43]. In contrast to men, women are more likely to start drinking heavily later in life. Working women tend to drink at the end of the work day, while women who do not work outside the home are more likely to drink throughout the day.

A basic problem with alcohol as a substance of abuse concerns how to define alcoholism. Some individuals drink essentially all the time, others binge drink or drink to excess only at certain times, and yet others are frequent drinkers but never to the degree of intoxication. The percentage of women who drink, binge drink, or frequently drink has remained relatively constant in the last decade, as illustrated in Figure 12-4 [44]. Alcoholism is described by the National Institute on Alcohol Abuse and Alcoholism as being composed of craving, tolerance, physical dependency, and loss of control [45]. The average alcoholic is not a skid row bum, but rather the typical working person.

As a chemical agent, alcohol is readily absorbed in the stomach and gastrointestinal system. In the healthy adult, more than 90 percent of ingested alcohol is metabolized in the liver. Intoxication occurs when more alcohol is ingested than can be metabolized. Tolerance develops when the metabolism has accommodated the chronic presence of alcohol and more alcohol is required to produce the same effects. Of particular concern is the cross-tolerance that can develop between alcohol and other central nervous system depressants. Individuals who develop a tolerance for alcohol may have a similar tolerance for sedatives and hypnotics, thereby requiring more drug to achieve an effect. Even when they have developed tolerance, women who abuse both alcohol and sedatives or hypnotics will show the additive effect of two central nervous system depressants.



*Data were not collected in 1994, 1996, and 1998.

FIGURE 12-4 Weighted percentage of nonpregnant women aged 18 to 44 years who reported alcohol use, from 1991 to 1999 in the United States.

Source: Centers for Disease Control and Prevention. Alcohol use among women of childbearing age: United States, 1991–1999. *MMWR* 51(13):273–276 (April 5) 2002.

Like other substances of abuse, there is no single effective treatment for alcoholism. Relapse is a constant issue for an alcoholic, especially since, unlike other addictive substances, alcohol is socially sanctioned. Withdrawal from alcohol is associated with severe withdrawal symptoms. Of the many treatment options for alcoholics, one of the oldest is the self-help group Alcoholics Anonymous (AA). This organization was founded approximately 75 years ago and sponsors meetings around the world. Offshoots of AA include groups for families and friends such as Al-Anon and Alateen. Local meeting locations can be found on the Web site for AA (www.alcoholics-anonymous.com). Research about the effectiveness of AA has been scant since the program is committed to the anonymity of its members. Membership is voluntary, and members tend to be homogeneous in terms of socioeconomic level, education, etc.

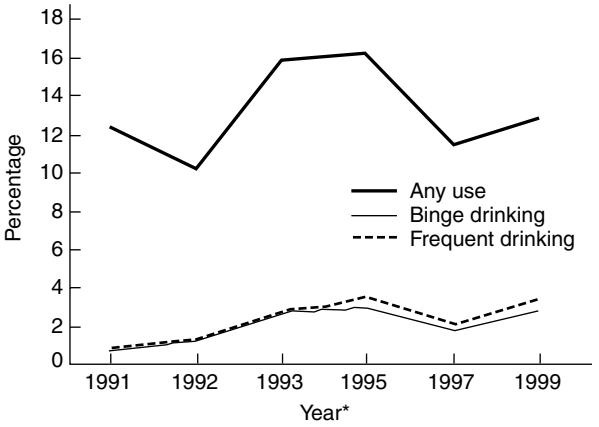
Detoxification units once were very popular but have been replaced largely by institutional rehabilitation settings where withdrawal can be medically supervised and therapeutic counseling begun. Opiate antagonists such as naloxone (Narcan) are sometimes used to augment therapy, and they have demonstrated some effectiveness, although recent evidence-based scientific review found the research insufficient to draw the conclusion that the pharmaceuticals should be part of management [46]. Disulfiram (Antabuse) is a deterrent drug that, when combined with alcohol, results in profound nausea and vomiting. It must be ingested by the alcoholic and may be of greatest value in deterring impulsive drinking.

During pregnancy, it is unclear how much alcohol intake, or what threshold, will result in abnormalities and features of fetal alcohol syndrome (FAS). The fetus seems to be the most vulnerable to alcohol during the first few weeks of pregnancy, usually before the woman suspects she is pregnant. Regular moderate (more than two mixed drinks, two glasses of wine, or two beers a day) to heavy alcohol consumption during any stage in pregnancy has been associated with central nervous system ab-

normalities, behavioral abnormalities, and features of fetal alcohol syndrome.

Because there is no known threshold, public health officials in the United States advocate total abstinence during pregnancy. In other countries, moderation or restriction of alcohol are the public politics. In spite of widespread public health campaigns to stop drinking in pregnancy, between 10 and 20 percent of American women continue to drink during pregnancy, with 2 to 4 percent frequently drinking or binge drinking, as illustrated in Figure 12-5 [47].

Alcohol consumption during pregnancy is associated with increased risk of second trimester spontaneous abortion and nutritional deficiency. Alcohol is teratogenic to the fetus; the degree of effect depends on the amount of alcohol consumed and the point in the pregnancy when it is consumed. Fetal alcohol syndrome manifests itself as prenatal and postnatal growth retardation, central nervous system abnormalities in the fetus and child, and abnormal facies. Classic fetal alcohol syndrome includes at least two of the following: microcephaly, micropthalmia, short palpebral fissure, and poorly developed philtrum. Figure 12-6 illustrates the facial features of a baby with FAS. Software programs have been developed to help health care professionals assess neonatal facies for the characteristics of FAS. Additional abnormalities associated with alcohol include cardiac septal defects, hemangiomas, abnormal oral cavities, and hypospadias.



*Data were not collected in 1994, 1996, and 1998.

FIGURE 12-5 Weighted percentage of pregnant women aged 18 to 44 years who reported alcohol use, from 1991 to 1999 in the United States.

Source: Centers for Disease Control and Prevention. Alcohol use among women of childbearing age: United States, 1991–1999. *MMWR* 51(13):273–276 (April 5) 2002.

The prevalence of FAS is unknown. According to the U.S. National Center for Birth Defects and Disabilities, prevalence rates for the United States range from 0.3 to 2.2 cases per 1000 births. Therefore, every year, between 1200 and 8800 babies are born with FAS. Babies may have some, but not all of the manifestations of FAS. These children are said to have alcohol-related neurodevelopmental disorder (ARND), which shares some but not all of the characteristics of FAS [48].

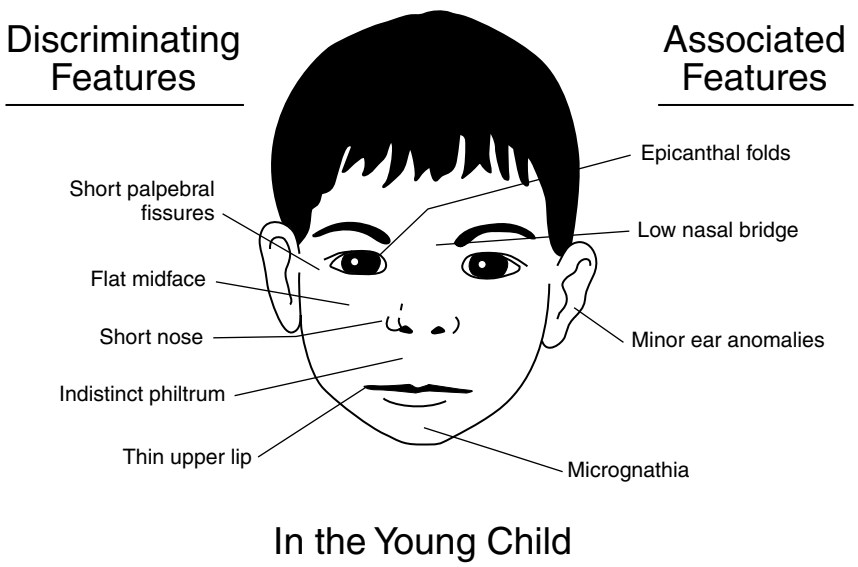


FIGURE 12-6 Facial characteristics of a child with fetal alcohol syndrome.

Source: Used by permission of Milner-Fenwick, Inc.

Women should be counseled before pregnancy to avoid alcohol if they are planning a pregnancy or if pregnancy is suspected. During pregnancy, the woman abusing or addicted to alcohol should be encouraged to reduce her consumption with the goal of total abstinence. A safe level of alcohol consumption during pregnancy is unknown.

According to the Academy of Pediatrics Committee on Drugs, alcohol is compatible with breastfeeding. However, neonatal drowsiness, diaphoresis, deep sleep, weakness, decrease in linear growth, and abnormal weight gain have been reported when mothers drink large amounts of alcohol. Maternal use may also decrease the milk ejection reflex. Contrary to popular thought, alcohol tends to change the scent/taste of the milk, causing babies to consume less [49].

Cocaine

Until recently, it was believed that cocaine did not cause dependency because withdrawal symptoms were so minor, especially compared to alcohol. Yet the popularity of cocaine, particularly since the 1980s, has resulted in a new respect for the serious nature of cocaine addiction. Cocaine has been available for centuries in the form of coca leaves. However, cocaine derived directly from the leaves tends to be mild. In the late nineteenth century, chemists were able to remove the active ingredient from the leaf, purify it, and obtain a far more potent version. Cocaine became a common ingredient in patent medicines, and even Sigmund Freud characterized it as a magical cure-all. Within the next several decades, the addictive properties of cocaine were recognized and it fell into disuse. With the advent of the 1980s, cocaine developed a cachet among prominent actors, athletes, and other celebrities. Within the decade, individuals at all socioeconomic levels were using it.

A sophisticated infrastructure exists to move cocaine throughout the world, and especially into America. The U.S./Mexico border is the primary point of entry for cocaine shipments into the United States. The price of a kilogram of cocaine in a major metropolitan area can be as high as $25,000. However, crack cocaine, or "rock," is relatively inexpensive with small amounts available from $5 to $25, making it within the reach of most people [50].

A central nervous system stimulant, cocaine can be taken in virtually every form—orally, intravenously, subcutaneously, and inhaled through the nose—and it can also be smoked, a method known as "freebasing." A particularly powerful and pure form of cocaine is "crack," which is inhaled and/or smoked. The euphoria brought on by crack is rapid and profound. The danger is that cocaine consumed by freebasing or in crack form is purer than other forms, and the abuser may inadvertently overdose.

Effects of cocaine ingestion include tachycardia and cardiac dysrhythmia, vasoconstriction, hypertension, hyperthermia, and seizures. Complications as a result of the vascular effects of cocaine include myocardial infarction, cerebrovascular accidents, and death. A woman who has recently used cocaine may be misdiagnosed as preeclamptic or eclamptic during pregnancy [51].

Cocaine withdrawal does exist, and the symptoms are related to the duration and intensity of use. Symptoms of withdrawal include depression, sleep disorders, and agitation. Three phases have been identified during recovery from cocaine dependence: (1) crash, (2) withdrawal, and (3) extinction. A variety of drugs have been suggested to aid in therapy during this time. None of the three major pharmaceuticals tried—antidepressants, dopamine agonists, and the antiseizure drug carbamazepine (e.g., Tegretol)—demonstrated effectiveness in randomized clinical trials [52–54].

During pregnancy, cocaine use is associated with spontaneous abortion, preterm labor and delivery, abruptio placentae, rapid labor and delivery, fetal intolerance to labor, low birth weight, and fetal death. Cocaine has been linked with fetal bowel atresias and possible congenital malformations of heart, limbs, face, and GU tract as well as growth restriction, although no clear teratogenic link has been established. Women who abuse cocaine need the full services of a drug treatment program and a health care facility prepared to manage the complications of labor, delivery, and the newborn.

Newborns exposed to cocaine have a higher incidence of congenital malformations in general, although unlike alcohol no particular facies have been identified. Behavioral abnormalities, especially short sleep cycles and irritability, have been noted. Babies exposed to cocaine in utero have a higher risk of sudden infant death syndrome. Intrauterine exposure to cocaine has been linked to cognitive delays, although not necessarily mental retardation [55]. Long-term effects are unknown. Withdrawal in the newborns of cocaine-addicted mothers is milder than in babies born addicted to opiates, but it still exists. Symptoms of withdrawal in the newborn include irritability, gastrointestinal problems, and respiratory problems.

Breastfed neonates are at risk if their mothers use cocaine. Cocaine intoxication manifesting itself by neonatal irritability, vomiting, diarrhea, tremulousness, and seizures has been reported. Thus it is important that the breastfeeding mother refrain from cocaine.

Amphetamines

Amphetamines are potent synthetic central nervous system stimulants that are essentially a chemical product of the twentieth century. Originally they were used therapeutically as decongestants, although they no longer are indicated for that use. Today, they are FDA approved for treatment of narcolepsy, attention deficit hyperactivity disorder, and weight reduction.

Amphetamines can be synthesized in kitchen laboratories, and in some parts of the country they are more popular than cocaine. One type, a methamphetamine known as speed, tends to be less expensive and longer acting than cocaine. Amphetamines can be ingested orally or intravenously or they can be smoked. A smokable form of methamphetamine commonly is called ice. In recent years, a designer amphetamine, methylenedioxymethamphetamine—also known as MDMA or Ecstasy—has developed a following among adolescents and young adults due to its availability at clubs and dance parties such as raves. It has been estimated that almost one-third of people aged 16 to 25 in England have used Ecstasy [56].

People who abuse amphetamines often do so to enhance the effects of other drugs such as cocaine. The risks of amphetamines depend upon amount and duration. These risks include the increased stress on the cardiovascular system, like cocaine, as well as psychological symptoms. For example, decreased fatigue, irritability, and talkativeness can evolve into apprehension, fearfulness, paranoia, hallucinations, and psychosis.

Treatment for amphetamine addiction is similar to other general treatments. Support groups and therapy to help modify behaviors are among the most common. Withdrawal has been estimated to occur in more than 80 percent of amphetamine users. No pharmaceutical treatment or model has been found to be effective, and supportive therapy remains the standard for withdrawal and amphetamine psychosis [57, 58]. Treatment during the recovery phase is also limited. There is some evidence that fluoxetine (Prozac) may decrease cravings to some degree and imipramine (Tofranil) may increase duration of adherence to treatment [59].

In spite of the growing popularity of amphetamines, little has been published about maternal and fetal effects. It is generally accepted that fetal and newborn effects are similar to those associated with cocaine. A breastfed baby of a mother using amphetamines will often demonstrate similar signs of irritability and sleeplessness that the woman manifests. More research is needed in this area.

Narcotics/Opiates

The term *narcotic* is from a Greek word meaning deadening or numbing. In the past the word has been applied liberally to a variety of drugs including heroin, marijuana, and cocaine. Today, many scientists advocate use of the term *opiate* instead of *narcotic* because opiates have a clearer pharmaceutical definition. Functioning as central nervous system depressants that act on opiate receptors opiates, or opioids, include heroin, morphine, codeine, meperidine (Demerol), fentanyl (Sublimaze), hydromorphone (Dilaudid), methadone (Methadose), nalbuphine (Nubain), oxycodone (OxyContin), and oxymorphone (Numorphan). A commonly abused drug is the combination of acetaminophen and hydrocodone known as Vicodin.

Natural opiates are derived from the opium poppy, *Papaver somniferum*. The addictive properties of opium have been known for centuries, and in the United States they were used for medical analgesia as well as in many folk remedies or patent medicines. Heroin was first introduced into the country in the late 1800s as a cough suppressant, and as an alternative to opium for those addicted. Since heroin enters the brain more quickly than opium, it rapidly replaced opium as the drug of choice for abuse, and it was banned from medical practice in 1924. Unlike other substances that are used only for abuse, opiates such as meperidine, morphine, and others continue to be major therapeutic agents.

Opiates are primarily taken intravenously, although a few are usually taken orally. Since the 1980s, a smokable form of heroin has been available, sometimes called Persian heroin. The risks of the intravenous forms of the drugs are compounded by the risks associated with shared needles: hepatitis, human immunodeficiency virus, endocarditis, abscess, and cellulitis. Women dependent on opiates are at high risk for sexually transmitted infections, severe nutritional deficiency, and polydrug use. The acute dangers in opiate use are overdose and withdrawal.

Symptoms of withdrawal include anxiety, yawning, perspiring, pupil dilation, insomnia, hypertension, hyperglycemia, diarrhea, and vomiting. The symptoms vary according to duration and to the purity of the drug involved. In the last several years, purity of heroin has increased, and the price has dropped. The advent of smokable and sniffable heroin introduced the drug to groups that previously had avoided it in an intravenous form.

Treatment of opiate dependency and addiction, as with other substances, is challenging. However, treatment programs for most other substances of abuse strive for total cessation. Heroin addiction in particular is refractory, and for more than a quarter of a century many heroin addicts have substituted a synthetic opiate, methadone, for heroin. Methadone is FDA approved as an opiate maintenance therapy although there is no single standard procedure for use [60]. Other similar preparations have been suggested, including LAAM (L-alpha-acetyl-methadol), which is long-lasting and requires only three weekly administrations, and buprenorphine (Buprenex, Subutex), an opiate agonist/antagonist that substitutes for the opiate but has minimal issues with dependency. Naltrexone (ReVia) has also been suggested for maintenance treatment, but studies are insufficient at this time to draw conclusions about effectiveness [61].

Systematic reviews evaluating withdrawal treatments have found that naltrexone (ReVia), buprenorphine (Buprenex, Subutex), and clonidine (Catapres) appear to ameliorate the signs and symptoms of withdrawal from opiates [62, 63]. When treatment attempts to wean people from opiates by the use of methadone or clonidine (Catapres), both seem effective, although side effects appear less with methadone and people remain in treatment longer [64].

Withdrawal from opiates during pregnancy has been associated with fetal distress and fetal death. Chronic opiate use is associated with low birth weight and small head circumference in the newborn. Withdrawal in the newborn requires supportive as well as drug therapy. Usually women who abuse opiates, such as heroin, will have a child born dependent upon the agents. Most neonates demonstrate withdrawal symptoms between six hours and eight days after birth, although the timing seems to be associated with type and dose of opiate involved. Neonatal symptoms tend to be multisystemic and usually involve prolonged neurological changes, including hyperirritability, respiratory distress, tremors, and vasomotor irritability. Treatment combines nonpharmaceutical and pharmaceutical interventions such as loose swaddling, a quite environment, and a diluted opiate like paregoric that is administered by slowly decreasing the dosage. Newborns who have been exposed to opiates are considered at risk for developmental and cognitive problems and should have early and continued developmental follow-up.

The midwife should consult with a physician regarding management and possible detoxification or conversion to methadone for the opiate-addicted woman. The woman may be offered a methadone program during pregnancy so that the drug received can be regulated and the risks of overdose and withdrawal can be avoided. The use of methadone is controversial because the newborn's withdrawal from methadone is often more severe than withdrawal from opiates and because the woman may use the methadone in addition to illicit drugs.

During labor, care must be taken to watch for signs of withdrawal, including vomiting, diarrhea, anxiety, restlessness, sweating, and abdominal cramping. Because these symptoms can also be normal findings in labor, careful evaluation is required. On her admission to labor and delivery, it is essential to question the woman carefully to ascertain when she last ingested opiates. If symptoms consistent with withdrawal begin, prompt assessment and provision of narcotic are required. Adequate drug levels need to be maintained to avoid withdrawal and the concomitant risk to the mother and fetus. When opiate use or addiction is suspected, butorphanol (Stadol) should be avoided in labor because this may precipitate withdrawal in the woman who has been using opiates.

Appendix A

Health Education Fact Sheet from the American Lung Association on Nicotine Replacement Therapy (NRT)

Nicotine replacement products help relieve some of the withdrawal symptoms people experience when they quit smoking. Three nicotine replacement products are currently available over-the-counter in the United States, including two nicotine patches and nicotine gum.

Nicotine nasal spray and a nicotine inhaler are available only by prescription. A new non-nicotine pill also is available as a smoking cessation treat-

ment option. To be most effective, nicotine replacement products should be used in conjunction with a behavior change program.

The nicotine patch releases a constant amount of nicotine in the body; the nicotine dissolves right through the skin and enters the body. The patches are similar to adhesive bandages and are available in different shapes and sizes. A larger patch delivers more nicotine through the skin.

Less nicotine is obtained through the patch than in cigarettes. The patch also does not contain all the tars and poisonous gases that are found in cigarettes.

Most of the patch products are changed once every 24 hours. One particular patch is worn only during the waking hours and is removed during sleep.

Studies have shown that it is much easier to give up the patch than it would be to give up cigarettes for two reasons. First, people usually develop cravings for things that provide immediate satisfaction, such as chocolate. With the patch, the nicotine level in the body stays relatively constant day after day. There is not immediate satisfaction, so there is little craving for a patch. Second, anything people do often, such as smoking, becomes a habit; since you apply the patch only once a day, there is no strong habit to break.

The goal in using nicotine medications is to stop smoking completely. If you plan to take nicotine medications, begin using them on the day you quit. If you continue to have strong urges to smoke or are struggling to stop smoking completely, ask your health care provider about additional help.

Some side effects from wearing the patch can include

- Headaches
- Dizziness
- Upset stomach
- Weakness
- Blurred vision
- Vivid dreams
- Mild itching and burning on the skin
- Diarrhea

Wearing the nicotine patch lessens chances of suffering from several of the major smoking withdrawal symptoms such as tenseness, irritability, drowsiness, and lack of concentration.

Nicotine gum contains enough nicotine to reduce the urge to smoke. The over-the-counter gum is available in the same strength as the original prescription product, 2 milligrams (for smokers of 24 or fewer cigarettes each day) and 4 milligrams (for smokers of 25 or more cigarettes each day).

Like nicotine patches, nicotine gum helps take the edge off cigarette cravings without providing the tars and poisonous gases found in cigarettes. It is a temporary aid that reduces symptoms of nicotine withdrawal after quitting smoking.

Nicotine gum must be used properly in order to be effective. Steps for nicotine gum users to follow include:

> Stop all smoking when beginning the nicotine gum therapy. Do not eat or drink for 15 minutes before using, or while chewing the gum (some beverages can reduce its effectiveness). Chew the gum slowly on and off for 30 minutes to release most of the nicotine. Parking the gum between the cheek and gum allows the absorption of nicotine into the lining of the cheek. Chew enough gum to reduce withdrawal symptoms (10 to 15 pieces a day but no more than 30 a day). Use the gum every day for about a month or so, then start to reduce the number of pieces you chew a day, chewing only what you need to avoid withdrawal symptoms. Discontinue use of gum after three months.

Nicotine nasal spray, dispensed from a pump bottle, relieves cravings for a cigarette. It delivers nicotine to the nasal membranes and reaches the bloodstream faster than any other NRT products. It is available by prescription.

The nicotine inhaler consists of a plastic cylinder containing a cartridge that delivers nicotine when you puff on it. Although similar in appearance to a cigarette, the inhaler delivers nicotine into the mouth, not the lung, and enters the body much more slowly than the nicotine in cigarettes. The nicotine inhaler is available only by prescription.

A non-nicotine pill, bupropion hydrochloride (Zyban) was approved in 1997 to help smokers quit. The drug, available by prescription only, is also sold as an antidepressant under the name Wellbutrin.

It is necessary with all types of nicotine replacement therapy to follow the health care provider's orders and use these products only as prescribed and/or according to labeling. These products can also be dangerous for pregnant women.

Source: Accessed online from the American Lung Association at http://www.lungusa.org/tobacco/replacement_factsheet99.html.

References

1. Bennett, G., and Woolf, D. S. *Substance Abuse: Pharmacologic, Developmental and Clinical Perspectives*. New York: Delmar, 1991.
2. U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration (SAMHSA). *National Household Survey on Drug Abuse: 1999*. Washington, DC: Government Printing Office, 2002.
3. Reyes, C. D. *Addiction and Special Issues: Report from 33rd Annual Meeting and Medical-Scientific Conference American Society of Addition Medicine 2002*. Accessed online at www.medscape.com/viewarticle/433837 on August 10, 2002.
4. Uzel-Miller, N. D., and Dresner, N. Addressing substance abuse in obstetrics and gynecology. *Primary Care Update Obstet. Gynecol.* 9(3):98–104 (May/June) 2002.
5. Goode, E. *Drugs in American Society*, 5th ed. Boston, MA: McGraw-Hill, 1999.
6. Bradley, K. A., Boyd-Wickizer, J., and Powell, S. H. Alcohol screening questionnaires in women: a critical review. *JAMA* 280:166–171 (July 8) 1998.
7. Prochaska, J. O., DiClemente, C. C., and Norcross, J. C. In search of how people change: applications to addictive behaviors. *Am. Psychol.* 47(9):1102–1114 (September) 1992.
8. Daly, J., and Fredholm, B. Caffeine: an atypical drug of dependence. *Drug Alcohol Dependence* 51(1-2):199–206 (June/July) 1998.
9. Knutti, R., Rothweiler, H., and Schlatter, C. The effect of pregnancy on the pharmacokinetics of caffeine. *Arch. Toxicol.* (suppl.) 5:187–192, 1982.
10. Dlugosz, L., Belanger, K., Hellenbrand, K., Holford, T. R., Leaderer, B., and Bracken, M. B. Maternal caffeine consumption and spontaneous abortion: a prospective cohort study. *Epidemiol.* 7(3):250–255 (May) 1996.
11. Klebanoff, M. A., Levine, R. J., Clemens, J. D., and Wilkins, D. G. Maternal serum caffeine metabolites and small-for-gestational-age birth. *Am. J. Epidemiol.* 155(1):32–37 (January 1) 2002.
12. Cnattingius, S., Signorello, L. B., Anneren, G., et al. Caffeine intake and the risk of first-trimester spontaneous abortion. *N. Eng. J. Med.* 343(25):1839–1845 (December 21) 2000.
13. U.S. Surgeon General. *Women and Smoking*. Washington, DC: Government Printing Office, 2001.
14. Spangler, J. G. Smoking and hormone-related disorders. *Primary Care: Clin. Office Pract.* 26(3):499–511 (September) 1999.
15. Centers for Disease Control and Prevention. Reducing tobacco use: a report of the Surgeon General executive summary. *MMWR* 49(16):1–40 (April 28) 2000.
16. Joenby, D. E., Lieschow, S. J., Nides, M. A., et al. A controlled trial of sustained-release bupropion, a nicotine patch or both for smoking cessation. *N. Eng. J. Med.* 340:685–691 (March 4) 1999.
17. Hughes, J. R., Stead, L. F., and Lancaster, T. Antidepressants for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.
18. Gourlay, S. G., Stead, L. F., and Benowitz, N. L. Clonidine for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.
19. Sowden, A., and Arblaster, L. Community interventions for preventing smoking in young people. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.
20. Stead, L. F., and Lancaster, T. Group behaviour therapy programmes for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.
21. Lancaster, T., and Stead, L. F. Individual behavioural counseling for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.
22. Silagy, C., Lancaster, T., Stead, L., Mant, D., and Fowler, G. Nicotine replacement therapy for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.
23. Lancaster, T., and Stead, L. F. Self-help interventions for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.
24. Hajek, P., and Stead, L. F. Aversive smoking for smoking cessation. *Cochrane Tobacco Addiction Group. Cochrane Database of Systematic Reviews* Issue 1, 2002.
25. Hughes, J. R., Stead, L. F., and Lancaster, T. Anxiolytics for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.
26. Ussher, M. H., West, R., Taylor, A. H., and McEwen, A. Exercise interventions for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

27. Lancaster, T., and Stead, L. F. Mecamylamine (a nicotine antagonist) for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

28. David, S., Lancaster, T., and Stead, L. F. Opioid antagonists for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

29. Stead, L. F., and Lancaster, T. Telephone counseling for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

30. White, A. R., Rampes, H., and Ernst, E. Acupuncture for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

31. Abbot, N. C., Stead, L. F., White, A. R., and Barnes, J. Hypnotherapy for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

32. Stead, L. F., and Hughes, J. R. Lobeline for smoking cessation. *Cochrane Tobacco Addiction Group, Cochrane Database of Systematic Reviews*.

33. Wright, L. N., Thorp, J. M. Jr., Kuller, J. A., Shrewsbury, R. P., Ananth, C., and Hartmann, K. Transdermal nicotine replacement in pregnancy: maternal pharmacokinetics and fetal effects. *Am. J. Obstet. Gynecol.* 176(5):1090–1094 (May) 1997.

34. Lumley, J., Oliver, S., and Waters, E. Interventions for promoting smoking cessation during pregnancy. *Cochrane Pregnancy and Childbirth Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

35. Matthews, T. J. Smoking during pregnancy in the 1990s. *Natl. Vital Statistics Rep*. 49(7):1–15 (November 19) 2001.

36. Hanson, G. R., Venturelli, P. J., and Fleckenstein, A. E. *Drugs and Society*, 7th ed. Sudbury, MA: Jones and Bartlett, 2002.

37. Mathias, R. Daughters of mothers who smoked during pregnancy are more likely to smoke. *NIDA Notes* 10(5):11–14 (September/October) 1995.

38. Pastrakuljic, A., Derewlany, L. O., and Koren, G. Maternal cocaine use and cigarette smoking in pregnancy in relation to amino acid transport and fetal growth. *Placenta* 20(7):499–512 (September) 1999.

39. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration (SAMHSA). *National Household Survey on Drug Abuse: 2000*. Washington, DC: Government Printing Office, 2002.

40. Hanson, G. R., Venturelli, P. J., and Fleckenstein, A. E. *Drugs and Society*, 7th ed. Sudbury, MA: Jones and Bartlett, 2002.

41. Sibbald B. A primer for patients' use of medicinal marijuana. *Can. Med. Assoc. J.* 165(3):329 (August 7) 2001.

42. American Academy of Pediatrics Committee on Drugs. The transfer of drugs and other chemicals into human milk. *Pediatrics* 108(5):776–789 (September) 2001.

43. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration (SAMHSA). *National Household Survey on Drug Abuse 2000*. Washington, DC: Government Printing Office, 2002.

44. Centers for Disease Control and Prevention. Alcohol use among women of childbearing age: United States, 1991–1999. *MMWR* 51(13):273–276 (April 5) 2002.

45. National Institute on Alcohol Abuse and Alcoholism. Diagnostic criteria for alcohol abuse and dependence. *Alcohol Alert* 359(30):1 (October) 1995.

46. Srisurapanont, M., and Jarusuraisin, N. Opioid antagonists for alcohol dependence. *Cochrane Drugs and Alcohol Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

47. Centers for Disease Control and Prevention. Alcohol use among women of childbearing age United States, 1991–1999. *MMWR* 51(13):273–276 (April 5) 2002.

48. Centers for Disease Control and Prevention. National Center for Birth Defects and Disabilities, *Fetal Alcohol Syndrome*. Accessed online at http://www.cdc.gov/ncbddd/fas/default.htm.

49. American Academy of Pediatrics Committee on Drugs. The transfer of drugs and other chemicals into human milk. *Pediatrics* 108(5):776–789 (September) 2001.

50. U.S. Drug Enforcement Administration. State Fact Sheets. Washington, DC: DEA, 2002.

51. Towers, C. V., Pircon, R. A., Nageotte, M. P., Porto, M., and Garite, T. J. Cocaine intoxication presenting as preeclampsia and eclampsia. *Obstet. Gynecol.* 81(4):545–547 (April) 1993.

52. Lima, M. S., Reisser, A. A. P., Soares, B. G. O., and Farrell, M. Antidepressants for cocaine dependence. *Cochrane Drugs and Alcohol Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

53. Lima, A. R., Lima, M. S., Soares, B. G. O., and Farrell, M. Carbamazepine for cocaine dependence. *Cochrane Drugs and Alcohol Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

54. Soares, B. G. O., Lima, M. S., Reisser, A. A. P., and Farrell, M. Dopamine agonists for cocaine dependence. *Cochrane Drugs and Alcohol Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

55. Singer, L. T., Arendt, R., Minnes, S., Farkas, K., Salvator, A., Kirchner, H. L., and Kliegman, R. Cognitive and motor outcomes of cocaine-exposed infants. *JAMA* 287(15):1952–1960 (April 17) 2002.

56. Gorb, C., Poland, R., Chang, L., and Ernst, T. Psychobiological effects of 3,4-methylenedioxymethamphetamine in humans. *Behav. Brain Research* 73:103–107, 1995.

57. Srisurapanont, M., Jarusuraisin, N., and Kittirattanapaiboon, P. Treatment for amphetamine withdrawal. *Cochrane Drugs and Alcohol Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

58. Srisurapanont, M., Kittiratanapaiboon, P., and Jarusuraisin, N. Treatment for amphetamine psychosis. *Cochrane Drugs and Alcohol Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

59. Srisurapanont, M., Jarusuraisin, N., and Kittirattanapaiboon, P. Treatment for amphetamine dependence and abuse. *Cochrane Drugs and Alcohol Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

60. Amato, L., Davoli, M., Ferri, M., and Ali, R. Methadone at tapered doses for the management of opioid withdrawal. *Cochrane Drugs and Alcohol Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

61. Kirchmayer, U., Davoli, M., and Verster, A. Naltrexone maintenance treatment for opioid dependence. *Cochrane Drugs and Alcohol Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

62. Gowing, L., Ali, R., and White, J. Opioid antagonists and adrenergic agonists for the management of opioid withdrawal. *Cochrane Drugs and Alcohol Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

63. Gowing, L., Ali, R., and White, J. Buprenorphine for the management of opioid withdrawal. *Cochrane Drugs and Alcohol Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

64. Gowing, L., Farrell, M., Ali, R., and White, J. Alpha2 adrenergic agonists for the management of opioid withdrawal. *Cochrane Drugs and Alcohol Group, Cochrane Database of Systematic Reviews* Issue 1, 2002.

• • • Additional References

American College of Obstetricians and Gynecologists. Teratology. *ACOG Educ. Bull.* 233, 1–8, 1997.

Chan, A. K., Pristach, E. A., Welte, J. W., et al. The TWEAK test in screening for alcoholism/heavy drinking in three populations. *Alcoholism: Clinical and Experimental Research* 6:1188–1192, 1993.

Dunbar, A. E., O'Neil, M., and Marben, L. *Johns Hopkins Children's Center NICU Guidebook 1999–2000*. Baltimore, MD: Johns Hopkins University, 1999. Also found online at http://www.med.jhu.edu/peds/neonatology/neo/ResidentGuidebook_1999-2000/ResidentGuidebook.htm#Table.

Hanson, G. R., Venturelli, P. J., and Fleckenstein, A. E. *Drugs and Society*. Boston, MA: Jones and Bartlett, 2002.

Rayburn, W. F., and Zuspan, F. P. *Drug Therapy in Obstetrics and Gynecology*. St. Louis, MO: Mosby Year Book, 1992.

Wang, E. C. Methadone treatment during pregnancy. *JOGNN* 28(6):615–622 (November/December) 1999.

CHAPTER

13

Health Care of Midlife and Aging Women

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Menopause is a normal life event, not a disease. The Massachusetts Women's Health Study—the largest and most comprehensive prospective, longitudinal study of middle-aged women, conducted between 1981 and 1986—demonstrates that the menopause is not a negative experience for most women [1]. Midlife, though, is a time of change. Only the multiple influences of biology, psychology, and sociocultural factors can explain many of the behavioral complaints that occur. The normalcy of the process cannot be overemphasized. Changes in menstrual function are not symbols of ominous change; understanding the physiologic reasons for these changes will do much to reinforce a healthy, normal attitude toward menopause [2].

For many decades the medicalization of menopause has caused Western society to perceive the cessation of menses in a very negative light, as a time of impending decline rather than a developmental milestone that promises a positive time of life with new opportunities. Many women with questions or concerns are told simply that they may either choose hormone therapy or not. There has been little opportunity for unfettered exchange of information and alternative therapies such as lifestyle modifications to reduce the symptoms and risk factors for diseases occurring decades after menopause.

Definitions

Margaret Lock suggests that the term *menopause* should be restricted to the actual event—the end of menstruation—and that it describes, not a condition, but rather a physical and psychological change that takes place at a certain time in a woman's life [3].

Menopause is the permanent cessation of menses. The prefix *men-* is derived from the Greek word *men*, which refers to the menstrual cycle; *-pause*, a Latin word, signifies the cessation of the process. Since cessation of menstruation affects only a few days in a woman's life, it is worthwhile to think of menopause more broadly, as the period of time during which women define themselves to be in the "change." This refers to the period when social, physiological, or psychological changes are occurring—a phase that can last from a few months to more than a decade. The physiological changes include a series of hormonal and clinical alterations reflecting declining ovarian function. Gilligan suggests using the term *the change*, because "the change of life" implies women's capacity for change during this period and suggests that this is the time when women learn to care for themselves after having always taken care of others [4].

The *climacteric*, the name of the transition period as a whole, is defined as the phase of the aging process during which a woman passes from the reproductive to the nonreproductive stage. Since medieval times the term *climacteric* was used to express the idea of a transition at midlife, making no distinction between men and women. The climacteric (derived from the Greek word for rung on a ladder) is usually the seven to ten years of physiological change in the reproductive system that culminates in the last menstrual period. *Premenopause* is the part

of the climacteric before the menopause occurs—the time during which the menstrual cycle is likely to be irregular and during which time women may experience climacteric symptoms such as hot flashes. *Postmenopause* is that phase after menopause with the end point not well defined—until symptoms disappear or until the end of life. *Perimenopause* is the term applied to the several years prior to and following the cessation of menses.

Age at Menopause

In the Massachusetts Women's Health Study, women who reported irregular menstrual periods were considered to be perimenopausal [5]. The authors found the median age for the onset of this time period was 47.5 years and the premenopausal period was approximately four years' duration. The median age for menopause for this group of women was 51.3 years, with only current smoking found to be related to an earlier menopause (by 1.5 years). The range of menopause is between the ages of 48 and 55 for most women. Other authors also report the average age at which menopause occurs in the United States as 51 years [6, 7].

Approximately 1 percent of women will undergo menopause prior to age 40, when it is considered premature ovarian failure rather than menopause [8]. Women who have had an abdominal hysterectomy without oophorectomy may also be at risk for premature ovarian failure, presumably due to compromise of the ovarian vasculature [9]. Genetic inheritance is thought to play the most important role in the etiology of premature ovarian failure [10].

Adult Development, Society, and Menopause

According to Neugarten and Kraines, reflection and self-evaluation become characteristic for both sexes during the fifth decade [11]. They report that men become more affiliative and nurturant, and increasingly abstract and cognitive, while women become more comfortable with aggressive and egocentric impulses and deal with the environment in increasingly affective and expressive terms. Neugarten was one of the first investigators of psychology of the menopause and its relationship to midlife. She and her coworkers found that biological events were not necessarily the important events in understanding the psychology of adulthood.

Menopause is symbolic because it is colored by two processes: (1) the change from reproductive to postreproductive life, and (2) aging [12]. The emphasis in the literature on menopause as loss has meant that the developmental context of midlife has been undervalued and consequently, underevaluated. Benedek [13] described menopause as a time of freeing of constructive energy, which is seen in the postmenopausal energy that supports many women's activities. Menopause tends to be hardest for women who have defined themselves solely in terms of childbearing and who have been cut off from other options [14]. For those women with options, however, the menopause can be a time of renewed energy, new interests, and new definitions.

If we conceptualize menopause as a deficiency disease, related to the estrogen effects on cardiovascular and bone health, then we are left with the problem of having no way to think of women's functioning other than in reproductive terms [12]. Broadening the role of menopause and its interrelationships with such events as family development, the growth of the capacity to work, and physical and psychological changes, can lead to a deeper, and more functional view of menopause.

Medicalization of Menopause

Symptoms, Signs, or Age-Related Change?

What is normal and what is defined as disease, as well as the way individuals subjectively experience and report symptoms, vary through time and space [15]. Lifestyle transitions including birth and menopause have increasingly come under medical management and although it has sometimes resulted in the improved health and well-being of women, the focus has been mostly on pathology. While there is often room for improvement in any woman's health, most women entering midlife are healthy. At the same time, most assumptions thought to be universal about menopause were drawn from research on small nonrepresentative samples in clinical settings—findings that were then extrapolated inappropriately to the population of women at large [16]. The normal midlife changes may not be a revolutionary transition at all [15, 17–20] but rather a time of changing hormones, relationships, and roles during which most women get along quite well.

During the nineteenth century, the dominant view was that menopause was a physiological crisis leading to physical and psychological diseases such as tumors, depression, hysteria, and insanity [21]. Scientific explanations focused on women's education, past attempts at contraception or abortion, undue sexual indulgence, insufficient devotion to husband or children, or advocacy of women's suffrage [22]. In other words, a crisis occurred under certain conditions and the most important of these were social—a woman's adherence to or departure from her prescribed social role [23]. Long after that era, the definition and meaning of menopause have been negotiated and renegotiated regularly; the challenges to this definition have come from both within and outside the medical community and continue to raise questions, such as what the symptoms of menopause are.

Sociologists have begun to study the origins and consequences of defining and treating human experiences as medical problems (medicalization of menopause, pregnancy, homosexuality, alcoholism, hyperactivity etc.), drawing attention to the political and social elements of medicine [23]. In 1972, Zola warned that "medicine is becoming a major institution of social control . . . the new repository of truth, the place where absolute and often final judgments are made by supposedly morally neutral and objective experts" [24]. MacPherson [22] looks upon the medicalization of menopause as a social construct that has been adapted and changed over time and suggests that by conceptualizing menopause this way, medical researchers are in search of an intervention, hormonal or otherwise, to prevent or cure a health problem.

After synthetic estrogen was developed in 1938, physicians agreed that menopausal women should be managed by physicians and that medical intervention was a given. Medicine thereby defined menopause as a disease, rather than as a cause of disease, which the physicians of the nineteenth century had believed. In 1966, Robert A. Wilson, author of *Feminine Forever*, suggested that readers "think of menopause as a deficiency disease . . . similar to diabetes: caused by a lack of insulin or estrogen" [25].

In 1975, papers in the *New England Journal of Medicine* linked estrogen use with endometrial cancer [26–28], causing a 40 percent decline in the number of estrogen prescriptions, which had risen since the publication of *Feminine Forever*. This decline led medical researchers and pharmaceutical companies to put forth an effort to "rehabilitate" estrogen therapy by demonstrating that the benefits of use outweighed the risks [29]. During the mid-1970s progestogen, a progesterone-like substance, was added to the therapeutic regime to combat the carcinogenic effects of estrogen on the endometrium. The term *hormone replacement therapy* (HRT) replaced *estrogen replacement therapy* (ERT) to designate the added protection against the problem of unopposed estrogen stimulating growth of the uterine lining.

Since the 1980s, menopause has been investigated as a cause of chronic diseases formerly associated with aging [22]. Health researchers and physicians have rationalized use of hormone therapy as a prevention strategy for heart disease and osteoporosis. MacPherson suggests that, in contrast, nurses have maintained more distance from the medicalization of menopause as a social construct. She urges nurses to remain skeptical about the neutrality and objectivity of menopause research, which has commonly used clinical samples unrepresentative of healthy midlife women [22].

Today, medical institutions, pharmaceutical companies, and the mass media provide an abundance of information, both to health care providers and to women encountering the menopause transition. A blitz of input from scientific, technological and medical sources, however, may actually cut women off from traditional sources of information [30]. When women rely only on experts, they are left with no role models for dealing with life-stage transitions [31]. Under such conditions, women can become more vulnerable to messages from medical institutions or pharmaceutical companies whose main interest may be more in the profit margin than in women's health and well-being. New forums need to be developed to allow women a place and time for sharing their midlife experiences and for passing these on to the next generation.

The only universal "change" is the cessation of menstruation. This results from anovulation, which itself results from a depleted supply of follicles. Lock suggests that the assumption that menopause is a universal experience at *any* level should be subjected to serious questioning and that it is essential to allow women to define their own menopausal status [32]. She cautions that the definitions of climacteric symptoms are culturally determined to a great degree and generalizing from the experiences of one group of women to other groups can lead in unproductive directions and muddy understanding of the menopause transition. Until recently, it was

assumed that medical knowledge was culturally independent because of its scientific origin [3]. However, the extent to which biomedicine is a cultural product is now acknowledged [33]. Some authors define the changes accompanying menopause rather narrowly, to include only vasomotor symptoms and vaginal dryness, while others attribute many experiential, behavioral, and somatic problems as well as psychological symptoms to falling estrogen levels [3]. It has been claimed that because life expectancy has increased in the past 100 years, the existence of postmenopausal women is a recent observation. Thus the endocrine deficiency model has been developed for this new group of women who now live past menopause, leading to the prescription of hormone therapy as an immunization against heart disease and osteoporosis. In the past such diseases were ascribed to problems of aging rather than menopause. Contrary anthropologic evidence from 100,000 years ago, however, shows that many females who survived childhood and childbearing lived to well beyond menopause [34]. Menopause has not yet been subjected to the same medicalization as childbirth because most women do not seek medical help for this life change [35]. Health care providers must be wary of the attempt to define women as an expanding market for drugs, cosmetics, and plastic surgery. Care must be taken so that various populations of postmenopausal women are not considered equally at risk for heart disease, osteoporosis, or other late-onset chronic diseases. At this time recommendations for wholesale treatment of women with hormone replacement are not supported by current science.

In contrast to clinical medical research literature, the social science and epidemiology research literature emphasize that most women go through menopause with little or no disturbance and usually do not seek help at this time [15]. The discrepancies between the social science literature and the medical literature can be explained in part by the use of two different populations. Clinical trials have for the most part used clinical populations. Social scientists like McKinlay and McKinlay in the Massachusetts Women's Health Study, on the other hand, draw their samples from the whole population [5]. Lock [15] explains that these competing explanations of menopause contribute to the fragmentation of a complex and poorly understood event because the various arguments are rooted in certain unexamined assumptions and values. Symptoms must be placed in the context of a woman's culture, and the inherent biases of the researchers must be recognized.

Hormone Therapy

After 1975, standard postmenopausal treatment with hormones included the addition of progestins to offer protection against the risk of estrogen's effects upon the endometrium. Pharmaceutical companies and the medical establishment began to shift their resources to the discovery and promotion of other benefits of exogenous hormones—for example, prevention of diseases such as osteoporosis and cardiovascular disease [31]. Prior to that time, women usually decided to use hormone therapy for short-term symptom relief of menopausal discomforts such as hot flashes or vaginal dryness. With new information about the protective effects of exogenous estrogen on the skeletal system in the prevention of osteoporosis and on the cardiac system, women were advised to use hormones as a prophylaxis against diseases, osteoporosis, and heart disease, which were formerly associated with aging, not menopause. During the 1980s and 1990s, women were advised to begin hormones at the onset of menopause to obtain protection for diseases that may or may not affect them many decades in the future. In 1994, the incidence of hormone use was estimated: 16 percent African-American or Latina [36], 22 percent in premenopausal women [37], 32 percent in postmenopausal women [38], and 6 percent in women over the age of 65 [39]. The mean duration of use is less than one year [40, 41]. It is evident that women are not using HRT for the long run; women still consider short-term symptom control the main reason for hormone use [42]. Prior to results in July 2002 of the Women's Health Initiative, women had been sometimes made to feel guilty or neglectful if they did not choose hormone therapy in order to protect themselves against osteoporosis and heart disease.

This attitude is engendered by the fact that medical research and its scientific base are seen as universally correct. In fact, most research on hormone use in midlife women has been on clinical populations (i.e., women seeking care), which give biased results. Women in these studies frequently have been screened out prior to the trials if they have histories of cardiac disease or other factors that potentially confound the results. This can lead to study populations being generally healthier than control groups [43]. Women who have used HRT in the past have been found to be thinner and to have higher high-density lipoprotein (HDL), both of which can contribute to lower rates of heart disease [44]. In many cases, women who participate in clin-

ical trials tend to interface with the medical establishment more than the general population and therefore are potentially either more symptomatic or have greater access to medical care when compared to women who are not studied. Thus the two groups can be very dissimilar, and generalizing from the study groups to the general population is not only useless, it can be harmful when potential side effects from medical interventions are not considered in equal light. Risk factors such as lifestyle, poverty, and chronic disease can put women at risk for heart disease to a greater degree than menopause or hormone status [45]. Furthermore, research funding is usually greater for studies that may lead to profits from intervention; studies on options such as making lifestyle changes often have to struggle for any funding whatsoever.

The Women's Health Initiative (WHI) is a randomized controlled primary prevention trial (planned duration, 8.5 years) in which 16,608 postmenopausal women age 50 to 79 with an intact uterus at baseline were recruited by 40 U.S. clinical centers between 1993 and 1998. In May 2002 the WHI was stopped because of unacceptable increased risks for breast cancer, coronary heart disease, stroke, and pulmonary embolism. The authors suggested that clinicians stop prescribing estrogen plus progestin for long-term prevention because of the increased risks. When menopause is defined as a "deficiency disease," menopause as a disease legitimizes and condones the use of risk/benefit, usually used to assess risks versus harms in sick people, for well individuals [250]. When treating women with a disease, the risk-benefit ratio is changed because the risks become acceptable in light of the disease process. Just like the need to see pregnancy and birth as normal physiological processes, it is the role of the midwife to support women through a natural menopause without causing harm. The results from the WHI provide strong evidence that the risks do not justify use for long-term protection, even though the absolute risks are low [46].

Lifestyle changes have been undervalued by women and providers yet they can afford relief for short-term physical or psychosocial changes, provide protection against osteoporosis, and provide protection against cardiovascular disease.

Midwives need to understand their own biases and prejudices for or against hormone therapy during the menopausal years. As with midwifery care for women of other ages, its provision during the climacteric needs to be individualized by the midwife. Women bring their own biases to health care that must be acknowledged. Fears of breast cancer or of "unnatural" interventions are legitimate reasons for making health decisions. Prescriptions for menopausal hormone treatments often go unfilled at pharmacies because women's worries, concerns, or questions have not been adequately addressed. The two most common reasons found for not filling prescriptions or for discontinuance of hormone use include fear of cancer and vaginal bleeding [47], both of which should be addressed prior to initiation of HRT.

Endocrinology

From the standpoint of the ovary, menopause is not a sudden event. It is instead the cumulative result of many events, some of which begin in fetal life [48] and are followed by others that continue through adolescence, pregnancy, and menopause. The loss of follicles occurring at a steady rate until near menopause is primarily due to atresia, not ovulation, since most women start with 2 to 6 million follicles during fetal life but will ovulate only 480 times during their reproductive years [49].

When women are in their forties, anovulation becomes more characteristic [2]. Beginning six to seven years preceding this development, women often experience increasing menstrual cycle length [50]. The development of fewer follicles accompanies this phenomenon, until eventually the supply is depleted [49]. Menstrual cycle change is marked by elevated follicle-stimulating hormone (FSH) levels and decreased levels of inhibin but normal levels of estradiol and luteinizing hormone (LH) [51]. Estradiol levels do not gradually wane in the perimenopause years but remain in the normal range until follicular growth and development halt [2]. Women can have elevated FSH levels of >30 mIU/L despite continued menstrual cycles, with occasional corpus luteum formation. Consequently, the perimenopausal woman still needs to protect herself from undesired pregnancy. As cycles become irregular, vaginal bleeding occurs at the end of an inadequate luteal phase or after a peak of estradiol without ovulation or corpus luteum development [2].

During the climacteric, several changes occur: (1) in the ovary itself, (2) in the endocrine milieu, (3) in receptor tissues throughout the body (for example, in the cardiovascular system or the skeletal system), and (4) in what the woman herself perceives,

both physically, such as hot flashes, or psychologically, such as new perspectives on her life. The ovaries and the endocrine system change over time. The number of follicles diminishes and the ovaries become more resistant to the action of FSH. The ovaries also produce decreased quantities of estrogen, androgen, and progesterone. Loss of the negative feedback from ovarian estrogen production means that gonadotropin production is no longer inhibited; hence FSH and LH rise markedly, with FSH higher than LH. Secretion of the ovarian glycoprotein inhibin (which selectively inhibits FSH) also decreases; the decrease eventually results in sustained elevation of FSH. Elevated levels stabilize at about 12 months for FSH and 6 months for LH.

Although the ovary is considerably changed both in physical appearance and function after the menopause, functional cysts can occur up to ten years postmenopause. Perhaps more important is that despite the absence of functional follicles, both the remaining corticostromal cells and the hilar cells are steroidogenic—that is, they contribute to androgen production [52]. Thus the ovaries are far from inert and continue to provide significant amounts of androstenedione and testosterone for several years [53]. These hormones contribute to a woman's muscle strength and sexual drive, making them important to the quality of life for postmenopausal women.

There are three main human estrogens: (1) estriol, (2) estrone, and (3) estradiol. Estriol, a weak estrogen is secreted from the placenta and is also metabolized from estrone. Estradiol, the most potent of the three, makes up 95 percent of the circulatory estrogen in premenopausal women [54, 55]. It is excreted by the dominant follicle and the corpus luteum. Estrone, the estrogen associated with the postmenopause, is derived principally from the metabolism of estradiol and from the conversion of androstenedione in adipose tissue. It accounts for most of the circulating estrogen after menopause, and is derived with increasing efficiency with advancing years from the adrenal glands and fat cells.

Postmenopausal women have serum estradiol levels below 15 pg/mL (pica grams/milliliter) and mean estrone levels between 30 and 70 pg/mL [56, 59]. Most of the estradiol and estrone in postmenopausal women is produced by the peripheral conversion of androstenedione to estrone rather than by direct secretion of estrone by the ovary or adrenal glands [60, 61]. Ninety-five percent of postmenopausal androstenedione production occurs in the adrenal gland and 5 percent in the ovaries. Yet the ovarian stroma continue to produce androstenedione and testosterone under the influence of LH. These hormones along with androstenedione produced by the adrenal glands are converted to estrone in peripheral adipose tissue. Thus the body weight of the postmenopausal woman contributes to her postmenopausal estrogen level and increased conversion occurs with increasing weight [58, 62].

After menopause the circulating levels of androstenedione are about one-half that seen before menopause [58]. In contrast, testosterone levels do not fall, and furthermore, with the disappearance of follicles and estrogen production, the elevated gonadotropins, FSH and LH, drive the remaining stromal tissue in the ovary to a level of increased testosterone secretion [2]. However, the total amount of androgens produced is lower in the postmenopausal woman because of decreased conversion from androstenedione in adipose tissue.

Despite the discontinuation of estrogen production by the ovaries, postmenopausal women can have significant estrogen levels as a result of conversion of androstenedione and testosterone to estrogen [2]. This correlates with body weight, probably due to the ability of fat to aromatize androgens. At the same time there is a decrease in the levels of sex hormone binding globulin (SHBG), which results in increased free estrogen concentrations. However, the marked change in the androgen/estrogen ratio secondary to the decline in estrogen productions causes mild hirsutism in some women.

Changes of Perimenopause and Aging

Bleeding Pattern Changes

Since the change in women from reproductive to postreproductive life is a gradual process spanning many years, changes in menstrual function change gradually as well. The most common pattern is a gradual decrease in both amount and duration of the menstrual flow, leading to spotting and then to cessation [63]. A few women will experience more frequent or heavier periods; this is usually a reflection of continued follicular estrogen production with or without ovulation. However, it may also be indicative of organic disease, such as atypical endometrial hyperplasia or endometrial carcinoma. Only 10 percent of women will have sudden amenorrhea [5]; 70 percent experience oligomenorrhea

(intervals of 36 to 90 days) or hypomenorrhea (regular menses but decreased amounts); 18 percent report menorrhagia (bleeding irregularly between cycles), and hypermenorrhea (excessive bleeding) [64]. Consequently, women have little idea of what to expect as they approach the climacteric.

Although midwives need to consider pathological conditions in their differential diagnoses, normal physiological changes must be considered with equal emphasis, since for most women menstrual changes are normal. However, only rarely will vaginal bleeding, reflecting ovarian follicular activity, recur after one year of amenorrhea. Uterine bleeding after prolonged amenorrhea (more than 12 months) is suggestive of organic disease and investigation of its cause is necessary.

Hot Flashes

In most Western countries, as well as the United States, the most common physical change that women describe is the "hot flash," which is reported to occur in anywhere from 25 to 85 percent of the women passing through the climacteric [65]. Kronenberg defines hot flashes subjectively as recurrent, transient periods of flushing, sweating, and a sensation of heat, often accompanied by palpitations and a feeling of anxiety, and sometimes followed by chills. These symptoms are also variously called *hot flushes*, *night sweats*, and *vasomotor symptoms*. Women may experience hot flashes for short periods of time to many years. The highest prevalence is in the first two years post menopause. For some women, these occurrences can be persistent and disruptive problems. Women who have undergone surgically induced menopause have a higher incidence of hot flashes, at least for the first year, than do women having naturally occurring menopause [66, 67]. The frequency of hot flashes may vary from several per year to many a day although as many as 70 percent may experience daily hot flashes for some period of time [68].

In the Massachusetts Women's Health Study, the incidence of hot flashes varied from 10 percent during the perimenopausal period to about 50 percent just after the menopause, waning to about 20 percent by four years after the end of menses [69]. The hot flash is not always related to changes in estrogen levels and can be associated with psychosomatic or other organic causes [2].

Suggestions for living with hot flashes include many common-sense means. Women who recognize precipitating factors—such as hot drinks or meals, alcohol, emotional upset, hot weather, or a hot room—can more effectively manage the incidence or severity of hot flashes. Changes in lifestyle, including daily exercise and self-calming techniques such as yoga, meditation, or prayer, can also be helpful, as can maintaining ideal weight. Underweight women can suffer because of the association between low body mass and decreased endogenous estrogen production. Obese women can suffer heat intolerance due to extra layers of adipose tissue. Dressing in layers in breathable clothing such as cottons and keeping the thermostat down are also helpful coping options.

Drugs including estrogen and progestin preparations are often prescribed for relief of hot flashes. For many women who choose not to use hormones or for whom they are contraindicated, other pharmaceutical preparations are available. Bellergal (a combination of phenobarbital, ergotamine, and belladonna) can cause side effects such as dry mouth, constipation, rapid pulse, and hypertension, and can be habit forming. Another preparation is Clonidine (Catapres), which is primarily used to treat hypertension. Side effects include dry mouth, hypotension, and sleepiness. Other products used to treat hot flashes include vitamin E (400 IU once or twice a day), ginseng tea, black cohosh, dong quai, and chaste tree [70]. Evidence from several human studies demonstrate that dietary phytoestrogens can produce mild estrogenic effects in postmenopausal women, including reduction in hot flashes and other signs of menopause. Over the past decade, however, it has become apparent that no single action can explain the many effects of phytoestrogens [71]. Dietary phytoestrogen supplementation may benefit some women in alleviating menopausal discomforts, but it is difficult to make recommendations to patients based on the conflicting research and unclear actions of phytoestrogens [72]. The main food sources for phytoestrogens include soybean products, cereals, grasses, legumes, fennel, anise, carrots, flaxseeds, sprouts, and many fruits and vegetables [73].

Black cohosh has been widely studied in Germany for use in the treatment of hot flashes [70]. It functions as an estrogen substitute and suppresses LH. It can be found in a standardized extract called Remifemin, which contains a specific amount of the active ingredient taken in 20 mg tablets, twice daily.

Sleep Disturbances

Endogenous estrogen supports sleep and temperature regulation and other central nervous system ef-

fects. Sleep problems associated with the menopause may be related to either hot flashes or a sleep-breathing disorder [74]. Sleep-breathing disorders are rare in premenopausal women and are found less frequently in women than men. The protection women have against sleep breathing disorders may be due to hormonal factors since these worsen after menopause. The menopausal woman with complaints of severe hot flashes is at risk for sleep disturbance, while the obese, loudly snoring or excessively sleepy menopausal woman is at risk for a sleep-breathing disorder.

Other factors not specifically related to menopause are also liable to account for sleep disturbance in menopausal women [74]. Irregular sleep schedules can contribute to problems. Even though women who do not work and whose children are grown may not be obliged to get out of bed at a particular time, they should arise at the same time daily. Arising late in the morning may also prompt depression. Any naps should be taken at the same time. In-bed times should be governed by total sleep hours since longer in-bed times provoke broken, light sleep. Avoidance of substances that act on the central nervous system is important. Caffeine's duration of action is 12–20 hours; alcohol increases middle-of-the-night waking; and nicotine lessens sleep quality. Other offenders include nasal decongestants, stimulating antidepressants, beta-blockers, antibronchospastics, chronic use of sedatives, and steroids [74].

Sleep problems that are accompanied by diminished enthusiasm and capacity to enjoy, energy loss, appetite disturbance, increased somatic complaints, and poorly diagnosable physical problems may be symptoms of major depression and may be wrongly attributed to the psychological meanings of loss in menopause [74]. Major depression must be considered as an alternative differential diagnosis. In fact, almost any chronic disease—e.g., hyperthyroidism, seizure disorders, and autoimmune disorders—has the potential to disrupt sleep and diminish sleep quality as does arthritic pain and medication side effects.

Some women report that they awaken frequently with hot flashes, sweating, or feelings of panic or restlessness. These phenomena occur with varying frequency even in the same woman and can cause severe daytime fatigue, irritability, and inability to concentrate due to sleep deprivation. For some women, night sweats are the most problematic part of the menopausal transition. For a woman with severe sleep disruption, alteration in psychological and mental functioning can occur, and she is likely to have trouble with daily activities the next day.

Avoidance of caffeine, alcohol, and stressful activities prior to bedtime may help. Daily exercise, a regular bedtime, a warm bath in the evening, or having a glass of milk or yogurt just before sleep also can be helpful. Serotonin is synthesized from tryptophan, an essential amino acid that has been shown to promote restful sleep. Good sources of tryptophan are milk and chamomile tea. Valerian root is used in traditional medicine for hot flashes when related to sleep. Because of its bitter taste, it is more palatable when taken in capsule form. Estrogen therapy has also been found to greatly improve sleep patterns. Taking oral estrogen preparations at night can often lead to significant improvement in sleep disturbances and have a positive cascade effect on a woman's subjective quality of life. Fortunately, most often, severe sleep changes resolve after a period of six to twelve months.

Atrophic Changes

Because estrogen functions as the major growth factor of the female reproductive tract, there are changes in the appearance of all the reproductive organs. Women demonstrate great variability in the degree of sensitivity to these changes [75]. Studies looking at the gynourinary system during the climacteric suffer from lack of defined variables [76]. For example, many women who claim to suffer with incontinence may experience it only at certain times such as when coughing with bronchitis. Incontinence is also related to parity, obesity, hysterectomy, and a family history of diabetes and may have only limited association with menopause itself.

Long-term effects of decreased estrogen levels include thinning of the epithelium of the vagina and cervix; the capillary bed becomes more visible as diffuse or patchy reddening. In some women, local bacterial infection is likely to produce vaginal burning or pruritis and leukorrhea. Eventually, further atrophy of the epithelium leads to an increasingly sparse capillary bed leading to a smooth, shiny, pale surface. The cervix usually decreases in size with a reduction in mucus production that can lead to dyspareunia. Reduction of the uterine endometrium and myometrium leads to shrinkage in the size of small to moderate size myomas. Also, adenomyosis and endometriosis usually become asymptomatic after menopause. Once follicular activity is finished, hormonal stimulation of the endometrium also halts. The tissue becomes atrophic and inactive

both inside the uterus and at endometrial sites outside of the uterus.

Since the ovaries also become smaller in the postmenopausal woman, palpating them on bimanual exam becomes more difficult. If ovaries are palpated during the pelvic exam, an ovarian neoplasm must be ruled out [63].

The urinary tract also shows changes after menopause. Some women experience atrophic cystitis, characterized by urinary urgency, frequency, and incontinence usually without dysuria or pyuria. Most postmenopausal women experience some atrophic changes of the genitourinary tract. Symptoms can include dryness or itching of the vulva and vagina or dyspareunia. When symptoms are extreme, they can affect the woman's quality of life. Cystocele, rectocele, or uterine prolapse are experienced by some women but are more related to parity, pelvic architecture, and aging than the result of reduced estrogen levels [2].

Use of hormone therapy, either topically or systemically, often affords relief of vulvar and vaginal pain or itching. Use of vaginal moisturizers (Replens) or water-based lubricants (Astroglide or A & D Ointment) can also be helpful. Since arousal time is slower with aging for both women and men, increased opportunity for foreplay is a helpful recommendation. Sexual activity itself improves blood supply to the pelvis and the vaginal tissues; consequently, sexually active older women often have less atrophy than other women.

To relieve potential problems related to decreased moisture throughout the body (the skin, mucous membranes) as well as the reproductive system, women can humidify their homes and ensure that they drink at least eight glasses of fluid each day. Vitamin E liquid or suppositories might be used for additional lubrication. Water-based lubricants or moisturizing gels may also be helpful to relieve dryness, itching, or dyspareunia. Women should be reminded not to use oil-based products (such as baby oil or Vaseline), which can coat the vaginal lining and prevent release of endogenous secretions. These are different from vitamin E oil or massage oil, which are vegetable oil based, not petroleum based. Oil-based lubricants can, however, cause condom breakage and should be avoided entirely if condoms are being used. Other suggestions include avoidance of antihistamines and other over-the-counter drugs that might have a drying effect. Avoidance of douches, sprays, and colored or perfumed toilet paper and soaps can also have a significant positive effect in reducing itchiness or excessive dryness.

Whereas some of the changes occurring in the reproductive system are directly or indirectly related to the change in hormonal milieu, others are most likely related to the effects of aging than menopause. Two examples are loss of fat deposits and the loss of elastic tissue causing wrinkling in the vulvar area. Use of hormones will not reverse these changes.

Psychophysiological Changes

For many decades, menopause has been associated with psychological problems. Information on the psychological aspects of menopause has highlighted morbidity, pathology, and medical treatments [77]. Much of what were considered valid descriptions of menopause were found to rely upon reports from anecdotal situations or from care-seeking populations (i.e., women who present to clinics or practices). Findings from these women's experiences are different from population-based studies such as the Massachusetts Women's Health Study [78]. Patient-based samples can be biased in terms of education, socioeconomic status, and other health problems such as depression. Much of what has been reported has been considered to be the result of estrogen deprivation; these findings have been generalized to the larger population of healthy women as a whole. Longitudinal studies, on the other hand, indicate that the increase in symptom reporting and problems of middle age often reflect social and personal circumstances rather than endocrine changes of menopause [35, 79, 80]. Surveys of the general population, rather than of women attending menopause clinics, contradict assertions that menopause has a negative effect on mental health [81]. Women who seek medical help for menopausal symptoms differ in many ways from women of the same age and menopausal status who do not seek help, and are more likely to report distress [82, 83]. No increased incidence in major depression has been found to be associated with menopause [84], although McKinlay, McKinlay, and Brambilla [82], who also found no association between natural menopause and depression, did find an association between depression and surgical menopause.

Dennerstein, Smith, and Morse conducted one of the few studies that addressed psychological well-being instead of using illness measures [77]. The authors found that menopausal status is not related to well-being in any of its dimensions. In contrast, endocrinologists postulate that ovarian hormones may be responsible for the difference in

rates of depression in women as compared to men [63]. The occurrence of depressive illness at times when there are extreme changes in the hormone levels—during the climacteric, after pregnancy, and in association with the ever-changing effects of the menstrual cycle—suggest that it is the *change* in the levels of hormones (probably the decline) that is more important, rather than the absolute values. Smith and Judd [63] assert that this hypothesis is further supported by the fact that women show relatively low incidences of depression at times of stable hormone levels—for example, during the high levels found in pregnancy or the low levels found in postmenopausal women [63]. Recent data imply that estrogens share many neuropharmacological actions in common with clinically effective antidepressants [85, 86]. However, antidepressants are more effective than treatment with estrogens for mood disorders, postpartum depression, premenstrual depression, and climacteric depression [84].

The triad of psychological symptoms often cited in connection with menopause—depressed mood, insomnia, and decreased sexual interest—has provided the basis for the attribution of a depressive syndrome in perimenopausal women [87]. Yet, there are differences between true insomnia and the sleep changes associated with severe night sweats. Loss of libido can be influenced by a number of factors, including increased depression or anxiety. Finally, many life factors can increase the risk of depressed mood. Examples include death or illness of family members, children leaving or returning home, health problems that include the onset of chronic disease, and the prospects of aging in a society which places little value in its elders. Many of the early reports of improvements in psychological symptoms as a result of estrogen therapy are attributed to the "domino effect" of treating hot flashes and what the reduction of hot flashes does to improve other symptoms.

Weight Changes

Menopause is often blamed for weight gain in middle-aged women. However, it should be remembered that both men and women have a tendency to gain weight in their middle years. Moreover, each woman has her own unique body shape and size and energy level, which Western women often fruitlessly try to change in an effort to adhere to society's "ideal thinness." Many women suffer from feeling overweight when they actually are not. Women benefit from attention paid to an excellent diet that is healthy and meets necessary requirements, rather than attempting to lose weight by avoiding healthful foods that are thought to be fattening.

While still menstruating, women have the seesaw effect of the two hormones, estrogen in the follicular phase and progesterone in the luteal phase. If a woman experiences a weight gain of a few pounds prior to her menses from the progesterone effect, she looks forward to losing them again after its onset. After menopause, women lose the cyclic effect of the hormones and must balance food intake with exercise. This means eating wisely (whole grains, vegetables, fruits, and skim milk products and avoiding fats, sugars, refined flours, and rich meats) and actively walking, bending, and engaging in other forms of exercise. Weight gain during menopause is thought to be the norm; however, few studies have simultaneously considered both age and menopausal status in relation to weight gain. Longitudinal studies of weight suggest no relationship of change in weight with menopause after adjusting for age [88, 89]. In many societies, where healthy lifestyle practices are the norm, women are often thinner after menopause rather than fatter.

Based on longitudinal studies, as women enter the menopausal transition, some body changes affecting fat deposits occur, including breast enlargement, thickening around the waist, fat deposits on the upper spine, and replacement of muscle tissue by fatty tissue. More studies are needed that take into account infrequently considered factors such as ethnicity, baseline weight, use of HRT, smoking behavior, and socioeconomic status. Since it takes less energy to maintain fat cells than muscle tissue, caloric intake should be reduced by 10 to 15 percent from age 20 to 60 just to maintain the same weight.

Recommendations for increased exercise and a *healthy* diet that includes watching caloric and fat intake (if these are a problem) should be made to women as they grow older. Exercise has the added effects of increasing muscle tone, strengthening bone, stimulating metabolism, and relieving some mood alterations.

Aside from not smoking, maintaining ideal weight is the most important health measure for reducing coronary heart disease [90]. Maintaining ideal weight helps lower the level of low-density lipoprotein (LDL) and increase the level of high-density lipoprotein (HDL) [91]. Conversely, it is important to stress to women going through menopause and in their older years that they should avoid being excessively thin because of the possible

increase in hot flashes and the increased risk of osteoporosis. Hypothyroidism plays no role in obesity; rather the weight gain associated with hypothyroidism is the result of the fluid accumulation of myxedema [92].

Skin Changes

Most skin changes women notice at menopause are the result of photoaging (sun damage) and, secondarily, intrinsic aging [93]. Other changes include dryness, increased sweating, sagging, altered barrier function, thinning, and decreased wound healing, all of which may contribute to psychological distress or altered body image. Prevention of sun damage over the lifetime by the use of protective clothing or sunscreen with a sun protective factor (SPF) of at least 15 is the best prescription to ward off the affects of photoaging. Prescription preparations such as tretinoin cream (Avita, Renova, Retin-A) offer some improvements to sun-damaged skin by reducing fine wrinkles, tactile roughness, and hyperpigmentation. Use of such preparations can cause dryness and peeling which can be managed with moisturizing creams or by using the preparations less frequently.

Dry skin with accompanying pruritis is a common problem caused by the loss of an effective water barrier to prevent evaporation of water from the epidermis. Ordinarily, sebum provides protection from water loss but its production diminishes at menopause. Both the dryness and the resultant itching can be alleviated to some degree by controlling the humidity in the environment and use of mild soaps (Dove, Caress, Oil of Olay) and moisturizers. Emollients with 10 to 20 percent urea (Uremol) or lactic acid (Lachydrin) will do the most to hydrate the skin. For severe pruitis, symptomatic relief can be found by use of soothing (menthol or phenol) or anti-inflammatory (hydrocortisone) agents. Antihistamines such as hydroxizine (Atarax) or Benadryl can be used in more problematic cases.

Hair changes that are seen in the climacteric include graying, baldness, and increased facial hair. By age fifty, 50 percent of the population will have gray hair [93]. Balding, although much more rare, is cause for distress in the women who experience it. Women usually develop diffuse parietal thinning of scalp hair with retention of the frontal hairline. Topical minoxidil (Rogaine) is now approved for use in women with androgenic alopecia and is generally safe and well tolerated. For excessive facial hair, commercial preparations such as bleaches and chemical hair removers are available. Other options include shaving, waxing, plucking, and electrolysis. Although electrolysis is considered permanent, regrowth can be as high as 60 percent after a single treatment [93].

Nail growth slows between early and late adulthood by 30 to 50 percent [94]. Brittle nails are the result of longitudinal ridging, separation of the distal nail plate, and loss of water content of the nail plates [95]. Treatment includes trauma prevention, avoidance of excessive use of nail polish, soaking in oil, and moisturizing phospholipid cream (Complex-15). Improvement in brittle nails with a daily oral dose of 2.5 mg of biotin has been reported [96].

Skin tags (fibroepitheliomas) are benign, soft, brown, pedunculated polyps usually found on eyelids and the neck. Other benign lesions commonly found include seborrheic keratosis, sharply defined, flat, light or dark brown papules usually found on the trunk; and DeMorgan's spots (cherry angiomas), red dome-shaped papules found mainly on the trunk. Acne rosacea, an inflammatory condition of the sebaceous glands, has an increased incidence with age and can be treated with topical antibiotics such as benzoyl peroxide, erythromycin, and metronidazole (Metrogel).

When examining the skin of a person of any age, malignancies must be considered in order to facilitate early diagnosis and treatment. Basal cell carcinoma, which accounts for more than 75 percent of all skin cancers, presents variously as a flesh colored papule, or a superficial erythematous plaque, or a pigmented or ulcerative papule, plaque, or nodule. This slow-growing cancer almost never metastasizes but can invade surrounding tissues and destroy bone and cartilage if left untreated [97]. Basal cell carcinoma usually develops on the face, ears, neck, scalp, hands, or arms.

Squamous cell carcinoma, which has a 95 percent survival rate, accounts for another 20 percent of skin cancers. Individuals with a history of treatment for psoriasis or acne with ultraviolet light, as well as those with exposure to paraffin, tar, or coal are at increased risk. Women with albinism and vitiligo also are at higher risk [98]. Actinic keratoses are tan, scaly, erythematous, gritty lesions that can be a precursor to squamous cell carcinoma and should be examined for changes on a regular basis.

All pigmented lesions should be examined with the consideration of possible melanoma. Suspicion should rise when a woman presents with a new mole or an existing one that has recently changed in size, shape, or color. Variegated color, irregularity

of the border, and/or inflammatory signs of a lesion should alert the midwife to the possibility of melanoma. Prognosis depends in large part on tumor thickness.

Sexuality

Satisfactory sexual functioning is an integral part of a woman's health and well-being at any age. Myths abound about sex and aging. Stereotypes in Western culture often serve to limit useful communication about sex and take a toll upon the self-concept of women in sexual matters as they move through the menopausal transition. For many years, it was assumed that as women grew older their sexual interest and responsiveness waned. According to the Kinsey report in the early 1950s, women reach their sexual peak, in terms of both activity and enjoyment, about the age of 35 [99]. Nachtigall [100] reports, however, that although there is a decrease in sexual activity after age 35, it is either because of "burnout" or male disinterest. The majority of women who experience natural menopause do not report declines in sexual desire, erotic pleasure, or orgasm [101], and sexual potential declines less in women than men with aging [102].

The myth that older people are not interested in sex springs from the connections that are made in our society between attractiveness and youth, and of sexuality with romantic love or fertility [100, 103]. Sex can be enjoyed for a variety of reasons including feeling feminine, reducing tension, improving sleep, as an outlet for emotions, and for feelings of intimacy. A newer illusion to which many women and practitioners succumb is that since women have reduced estrogen levels it is to be expected that sexual activity will necessarily become uncomfortable, a burden, or at least unpleasant. This goes along with the idea that women once past their childbearing potential lose their desire and desirability. For many couples, sex continues to improve with aging and lifestyle changes for both men and women. With more leisure time, the children gone, and responsibilities changing, sex can become a wonderful adventure.

Arousal time is increased for both women and men with aging. Increased time for foreplay is often required. Sexual responses have a similar "slowing" as do other physiological processes throughout the body. It is important to remind women and their partners that changes are not always catastrophes but, rather, can lead to unpredictable pleasures.

There is extensive evidence that estrogen replacement can be beneficial for problems of postmenopausal vaginal dryness and dyspareunia by reversing atrophic vaginitis [104]. Estrogen's effect on libido is unclear [105]. Androgen therapy, however, is considered safe and effective for lowered libido when taken in appropriate dose levels for women undergoing a natural menopause [106]. The risks and benefits of using any hormone replacement must be discussed with each woman to develop an optimal plan for her.

In order to provide a holistic and comprehensive approach to treating sexual changes during the climacteric, it is important to consider significant issues in a woman's life, including her health status, physical and social environment, past experiences, expectations, and cultural milieu [107]. Consideration should also be given to the quality of each woman's relationships, the sexual performance of her partner, and age-related changes in self-image [108]. For many women, the worst aspect of the climacteric is the lack of information and uncertainty about changes. Midwives can make an impact by supplying information, effective counseling around common changes, and offering personalized treatment options for women experiencing negative changes in their sexual lives. The majority of providers do not routinely ask questions regarding sexual health and women often do not feel comfortable initiating questions about the topic. A 1990 survey of more than 1000 primary care providers showed that only 10 percent routinely obtained a sexual history and only about 10 percent of patients were assertive enough to ask questions about their sexuality [109]. Many providers do not want to be too intrusive when asking personal questions, although 90 percent of patients feel that a sexual history is an entirely appropriate and necessary part of a health evaluation. Questions should address sexual adjustment, problems, and information needs. Open-ended questions about sex may lead to the woman's interest in discussing her questions or problems in the sexual realm. She should be asked about vaginal changes, including moisture or dryness, itching or pain, as well as more direct questions about anything she wants to ask or discuss about her sex life or sexuality. If a woman has had a hysterectomy or mastectomy, she may have additional queries, and time must be taken to inquire about these in relation to sexual adjustment. Anxiety or depression can cause problems with arousal phase disorders. Medications such as antidepressants and antihypertensives may also contribute to sexual dysfunction.

Another consideration for older women is the lack of available sexual partners due to divorce or death. For some women this means exploring other relationships with new partners or satisfying their sexual needs alone with masturbation or fantasy. In some circumstances, the lack of sexual partners means a life of a reduced level of sexual activity.

Caring for women's sexual concerns should include explaining the physiology of aging as it relates to sexuality and correcting problems when possible. It is helpful to explain the psychology of aging and its "norms"; and that women are capable of "different" and sometimes improved sexuality. Offering alternate, noncoital activities either with or without a partner is helpful. Referring women of any age for sex therapy when appropriate should be considered, especially when there is long-standing sexual dysfunction, current or past abuse, or an acute psychological event. Finally, it must be considered that for some women a decreased sexual interest may not be perceived as a problem at all so no intervention is necessary.

Changes in Thyroid Function

Thyroid dysfunction becomes more common as women age. While it is not cost effective to screen younger women for thyroid problems, it appears to be cost effective as women approach the age of 60 [110]. As many as 8 to 12 percent of older women have overt hypothyroidism [111]. Diagnosis of thyroid disease as women age may be complicated because of a lack of classic symptoms. Often women present with symptoms that mimic other chronic problems, such as depression, congestive heart failure, or early dementia [110]. For example, women with hyperthyroidism may complain of lethargy or confusion and may resemble women with hypothyroidism. Women with hypothyroidism may be ataxic or confused or present with hoarseness from thyroid enlargement. Medications may alter thyroid function as well. It is important for the midwife to have a high index of suspicion to diagnose and treat thyroid disease early in the older woman.

Breast Cancer

Adenocarcinoma of the breast is the most common cancer and the second leading cause of cancer death among American women [112]. There is mounting evidence from epidemiologic studies indicating a positive relationship between (1) estrogen levels, (2) markers of estrogen exposure such as early menarche and late menopause, and (3) the use of exogenous estrogens after menopause and an increased risk of breast cancer [113]. Experts suggest that estrogen plays an important role in the pathogenesis of breast cancer [114]. The period from menarche to menopause marks the lifetime exposure of women to significant levels of reproductive hormones. For every one-year increase in age at time of menopause, the risk of breast cancer increases by about 3 percent [115]. Timing of pregnancies also affects risk: late pregnancies are associated with increased risk, while early pregnancies are protective. It is theorized that a woman's first pregnancy is associated with terminal differentiation of breast cells and that the cell cycle is longer after a woman's first pregnancy, allowing more time for DNA repair [116]. Such reproductive milestones as markers of estrogen exposure are now thought to influence the rate of breast cell growth and the accumulation of DNA damage [113]. Seemingly, postmenopausal women with elevated estrogen levels have the highest risk of breast cancer [117, 118]. Obesity, for example, is positively related to hormone levels, reflecting the biologic function of fat cells to metabolize androgens to estrogens in postmenopausal women [119, 120]. Premenopausal obesity is also positively associated with increased risk of breast cancer mortality in most case-control and prospective studies [121]. The relationship between postmenopausal obesity and breast cancer is less clear. Body mass index (BMI) has been positively associated with postmenopausal breast cancer in case control studies [122, 123], but prospective studies generally show a relatively weak association, if any [124–126]. Conversely, thin women have both lower estrogen levels and lower age-specific risk for postmenopausal breast cancer [127]. Having a first-degree relative (mother or sister) with breast cancer is also considered a risk factor for breast cancer and should be included in a health history.

The association between hormone therapy and breast cancer concerns most women. Colditz and colleagues performed a review of the literature to determine the strength of the evidence suggesting that endogenous estrogen and postmenopausal replacement play a role in the development of breast cancer. A causal relationship was found based on the criteria of consistency, dose-response pattern, biologic plausibility, temporality, strength of association, and coherence [113]. The authors report the magnitude of the increase in breast cancer risk per year of hormone use to be comparable to that asso-

ciated with delaying menopause by a year. They theorize that hormones may act to promote the late stages of carcinogenesis and facilitate the proliferation of malignant cells [113].

Since all women are potentially at risk for breast cancer, midwives must consider carefully the possibility of the woman developing breast cancer when assisting her to make informed decisions about hormone therapy. When helping a woman along the decision-making path, risks such as cardiovascular disease and osteoporosis as well as factors such as severity of hot flashes or sleep loss must be considered and balanced with the risk of breast cancer. The risk of breast cancer for each year of replacement use increases 2.3 percent (95% confidence interval [CI]=1.1%–3.6%, p=.0002); the findings do not vary significantly between studies [128]. How varying formulations and prescribing regimens influence women's risk remains uncertain. Additionally, many of the older studies that examined the association between breast cancer risk and hormone use were on "ever users" who generally used HRT for short-term relief of symptoms.

The WHI was stopped primarily because of the increased risk of invasive breast cancer for women taking the combination of estrogen and progestin. This was the first randomized, controlled trial that confirmed that the combined HRT (CEE plus MPA) does increase the risk of breast cancer and to quantify the degree of risk [129]. There was a 26 percent increase observed in the estrogen plus progestin group for invasive breast cancer (hazard ratio [HR] 1.26, 95% confidence interval [CI] 1.00–1.59). There was no difference between treatment and placebo groups for noninvasive (in situ) breast cancers. After an average follow-up of about five years, the adverse effect on breast cancer had crossed the predetermined safety boundary and the study was halted.

Even before the WHI results were made public, Colditz proposed that risk for breast cancer has been underestimated due to methodologic biases of observational studies [113]. He suggests that women with menopause symptoms have lower estrogen levels at menopause than women without symptoms—that is, they are more likely to report hot flashes and thus choose to take HRT. Thus women who take hormones may be at lower risk of breast cancer at the time of menopause leading to an underestimation of true breast cancer risk with HRT. Colditz and others suggest that previous analyses have not controlled for age at menopause with sufficient rigor to remove bias in estimates of risk of HRT use and breast cancer [128]. Women who enter menopause at a younger age are at substantially decreased risk of breast cancer, yet they are more likely to use HRT and to do so for a longer duration. Moreover, users of HRT are at lower risk on average of breast cancer at the start of menopause, than nonusers of the same age once other risk factors are controlled for. Many epidemiologic studies are confounded by factors including data showing that women taking hormones for longer duration will have had earlier menopause (and so be at lower risk for breast cancer) than the women taking hormones for a shorter duration. This may have led researchers and clinicians to underestimate the adverse effect of hormones on breast cancer risk [113]. Colditz suggests that the association is stronger between estrogen levels and the risk of breast cancer than that between cholesterol levels and heart disease. Conversely, other factors such as higher rates of mammography in women using HRT can lead to a higher reported incidence of breast cancer. Women who use hormones are often in higher socioeconomic circumstances and more likely to consume alcohol, both of which have increased association with breast cancer [43, 130]. Such factors may lead to overestimating the underlying relationship between hormone use and breast cancer [131].

Hormone Replacement and Risk of Breast Cancer

Certain characteristics of women who use hormones are known. Women who experience symptoms at menopause have lower levels of circulating estradiol [132–134]. Thin women are more likely to use hormone therapy [132] and to report hot flashes [134]. Bone density is lower in women when they begin to take hormones than in women who choose not to use hormones [135]. All of these point to the fact that women at lower risk of breast cancer are more likely to use hormones [113]. Upon recalculation of the potential association of risk for breast cancer with HRT use, investigators in 1997 attributed a profound impact to incomplete analytic control for time since menopause in previous reports of epidemiologic data [128]. They noted an increase in the risk of breast cancer associated with duration of use was 0.8 percent per year (p = .10) if no correction was made, compared with an increase in risk of 2.3 percent per year (p = .0002) when full statistical control was used. In this reanalysis of 51 epidemiologic studies, of more than 52,000 women with breast cancer and more than 100,000 women without breast cancer, the authors estimated that

for every 1000 women who begin to take postmenopausal hormones at age 50 and who take them for 10 years, there are six more cases of breast cancer than expected; for 15 years of use, there are 12 additional cases.

In the mid-1970s progesterone was added to estrogen regimens to protect against endometrial cancer. It was proposed that progesterone offered similar protection against breast cancer [136]; however, accumulating evidence has not supported this view [128] and it is more likely that progesterone increases the breast cancer risk above that associated with estrogen alone [137, 138]. What is not known is whether sustained progestin levels with continuous administration of progestins as part of continuous, combined HRT (daily estrogen and daily progestin) may move breast cells into a phase of reduced division. The answer awaits more experience and trials of continuous combined HRT use. Continuous combined HRT has been used only in recent years. Data on risks for breast cancer with continuous combined HRT use is sparse, and long-term, prospective, controlled trials are needed before we can have clinical clarity.

Breast Cancer Survivors and HRT

It is assumed because of the relationship between estrogen and breast cancer that HRT will promote breast cancer, hasten recurrences, and increase metastases. Women who survive breast cancer are often left with debilitating symptoms of estrogen withdrawal or health problems such as osteoporosis, because of the consensus that HRT should be avoided in women with breast cancer. A challenging question to providers is how to alleviate menopause symptoms such as hot flashes when up to 60 percent of women undergoing adjuvant breast cancer therapy suffer these side effects [139–141]. At the present time, hormone therapy is by and large avoided for fear of stimulating disease recurrence.

DeSaia and colleagues conducted a cohort study published in 1996 comparing breast cancer patients who received HRT with matched comparison patients who did not receive HRT [142]. The results showed no difference in survival time or disease-free time in the two groups. In 1999 Natrajan and colleagues followed 76 women with breast cancer, 50 who had used ERT for up to 32 years, some of whom had also used androgens, progestins, or tamoxifen [143]. The authors found no increase in recurrences or mortality rates and a possible decrease in recurrences with progestins. The study was retrospective and nonrandomized, the study groups were small, and the HRT used was variable. Both studies point to the need for data from prospective randomized trials. Before recommending HRT for the patient having a history of breast cancer, a full explanation of risks, benefits, and controversies must be shared with the individual woman.

No Consensus on the Breast Cancer Question

Why had there been no consensus regarding HRT and breast cancer prior to the Women's Health Initiative? Speroff points out that when the impact of an association is large, it is relatively easy to demonstrate an association with case-control studies or cohort (observational) studies [144]. In addition, observational studies cannot overcome their inherent biases and confounding factors unless the studied effect is large. Compounding the dilemma is the fact that most trials involving hormone replacement therapy were conducted when estrogen was used without progestins. While observational studies show little uniformity and consistency about the association between breast cancer and HRT, the results from the Women's Health Initiative will likely influence the opinions of health care providers when it comes to prescribing HRT for long-term protection, particularly because of the confirmed risk of breast cancer with its use.

In any event, instructions for breast self-examination, clinical breast assessment, and routine annual screening mammography should be part of the health care for all women over age 50. McCool reports that older women view breast self-examinations as difficult, despite the decrease in complexity of the breast (ending menstrual cycle changes, atrophy of the mammary glands and ducts, and decrease in fibrocystic structures), and also because of embarrassment, lack of confidence, and disbelief in the potential for detecting abnormal findings [145]. Midwives can make a profound difference in breast care in older women. Midwives should take advantage of every opportunity for breast health education—self-breast exam, and screening tests—mammography, and clinical breast exam. Some providers fail aging women, believing that such steps are not crucial to health care provision [145]. Yet midwives can make a difference by taking older women's health needs seriously. Midlife women are very concerned about breast health and disease. It is often what brings them to seek care. Until a consensus is reached regarding the new information from the WHI, women will still need help to sift through the confusing information and recommendations to which they have been exposed.

When caring for a woman who is concerned about the relationship between hormone use and breast cancer, the midwife needs to help her to weigh the advantages and the risks of use. The midwife can ask her how frightened she is regarding any increase in breast cancer risk and if the benefits of hormone use for symptom control outweigh these risks. Whether her decision is made within the context of "scientific evidence" or her own ideas and feelings about breast cancer risk, it is a valid decision that must be honored.

Cardiovascular Disease

Cardiovascular disease, including coronary heart disease, cerebral vascular disease, hypertension, and peripheral vascular disease, is the most common cause of death in the United States for both men and women, with some 500,000 women dying from it each year [146]. Risk factors for both men and women include hypertension, smoking, diabetes mellitus, and obesity. However, prior to menopause women enjoy protection against heart disease provided by estrogen; consequently they lag behind men in the incidence of coronary heart disease by ten years, and for myocardial infarction and sudden death, by twenty years [147]. Whether menopause per se is responsible for this increased risk which women experience as they pass through it is unclear [148] yet remains the most important question. Most studies on menopause in the literature focus on the biological process and exclude the broader psychosocial contexts of women's lives [149]. Women who undergo early menopause or bilateral oophorectomy prior to menopause have been shown to have an increased risk of heart disease [147]. However, the most important risk factors for heart disease—diabetes, obesity, smoking, and high cholesterol—are often established well before menopause. Moreover, there is evidence that cardiovascular disease is present in terms of myocardial infarcts in women's fourth and fifth decades before menopause [150]. Reported rates of cardiovascular disease mortality in women from many countries indicate smooth, exponential trends with age, similar to those in men. Longitudinal data from a population-based study suggests that age-related factors such as body mass and exercise are much more strongly related to cardiovascular risk than is menopause status [151].

Risks may be related to a number of factors including changes in lipids and lipoproteins. Total cholesterol, low-density (LDL) cholesterol, apolipoprotein A-I, apolipoprotein B, and triglycerides are significantly higher in postmenopausal than premenopausal women of similar age, whereas high-density (HDL) cholesterol is decreased [152]. Postmenopausal women as well as men are also more prone to hypertension as they grow older. Since most studies on heart disease have been with male subjects, extrapolating results and making recommendations about treatment require caution. Postmenopausal hormone treatment is recommended as a legitimate component of preventive health care against heart disease for women, but this must be considered within the context of lifestyle factors such as smoking cessation, good diet, regular exercise, blood pressure reduction, and other interventions on which excellent epidemiologic data are available. There is a growing scientific basis that supports preventive medicine and health promotion efforts as a valuable component of effective health care; their value should be emphasized, not minimized.

Much of the enthusiasm to recommend hormone use to women stems from the strong link from observational studies between menopause and an increased incidence of cardiovascular disease. Such studies suggest that postmenopausal hormone replacement therapy reduces cardiovascular disease risk by about half [153]. Estrogen use in women has been shown to be effective in lipid lowering which is believed to predict reductions in the risk of cardiovascular heart disease (CHD) so that lipid lowering can be used as a surrogate endpoint for CHD. Studies published in the last decade show positive effects of hormone therapy on cardiovascular risk factors as well [154, 155] but these need to be reexamined in light of the results of the Women's Health Initiative.

At the same time, there is growing evidence that thrombotic phenomena play an important role in acute coronary syndromes [156]. Both unopposed estrogen replacement therapy (ERT) and hormone replacement therapy (HRT) increase the risk of venous thrombosis [157–161], but some studies also show that estrogen may slow the progression of existing coronary artery disease in postmenopausal women [162]. However, many of these studies suffer from the limitations of small patient numbers and demographic differences between treatment groups; women who take estrogen are on average better educated, have higher incomes, and better access to health care and are healthier prior to use [43, 163]. The conflicting evidence presented con-

cerning the cardiovascular benefits of hormone use, along with increased risk of breast and endometrial cancer and venous thromboembolism, has created concern among health care providers about whether use of hormones is essentially beneficial or putting women at risk [164].

The Heart and Estrogen/Progestin Replacement Study (HERS) of 2763 women published in 1998 was the first large-scale randomized clinical trial in older postmenopausal women with established heart disease to test the efficacy and safety of hormone replacement therapy on clinical cardiovascular outcomes [157]. Participants were followed for 4.1 years for the main end point of nonfatal myocardial infarction (MI) or cardiovascular death. At the end of the study, no significant differences were seen between the two groups. The results revealed that, while the risk for coronary heart disease was reduced in the third through fifth years, the reduction was offset by an unexpected 50 percent increase in risk for CHD in the first year of use. This null effect has shaken the foundation on which recommendations for widespread use of estrogen replacement were built.

HERS illustrates the importance of trials that use clinical end points to establish the overall effects of a treatment. Herrington points out that the HERS results demonstrate how incomplete our understanding of estrogen action and the pathogenesis of coronary heart disease remains [165]. The author suggests that HERS does not support initiation of conjugated equine estrogens (CEE) combined with medroxyprogesterone acetate (MPA) in older women with confirmed heart disease. For women with CHD already on ERT for a year or more, the consensus panel for the American Heart Association suggests that it is reasonable to continue therapy while awaiting the results of a HERS follow-up study and other ongoing trials of therapy with clinical end points [166]. The statement points out that while the results of the HERS trial pertain to women with established heart disease the results *may not apply to women without underlying vascular disease*.

The epidemiologic study most often quoted by experts and the lay press, the Nurses' Health Study, began in 1976 when 121,700 female nurses between the ages of 30 and 55 were mailed a questionnaire about use of hormone therapy and medical history, including cardiovascular disease and risk factors. These data were updated biannually and in 1980 questions on diet and physical activity were added. In 1996, a 16-year follow-up of 59,337 women was published and looked for the first time at any association between heart disease and adding progestins to hormone replacement. Current hormone users had a lower risk of death (relative risk, 0.631, 95% CI, 0.56–0.70) than nonusers. However, the apparent protection decreased with long-term use as the risk of breast cancer increased after more than ten years [167]. The authors concluded that the addition of progestin to estrogen does not appear to attenuate the protective effects of hormone therapy in relatively young postmenopausal women but must be evaluated within the context of possible risks such as breast cancer. Women who benefited the most from hormone use were those who had the most risk factors for heart disease, while those with few risk factors had little decrease in risk of heart disease with hormone use. This study found no increasing benefit with increasing duration of use; in contrast, the benefits were attenuated after ten or more years of current hormone use. At the same time the risk of breast cancer mortality in the hormone-using population was elevated by 43 percent after ten years of hormone use [167].

In the Postmenopausal Estrogen/Progestin Intervention (PEPI) trial [168] published in 1995, 875 women were randomly assigned to receive placebo, oral estrogen alone, or one of three estrogen-progestin regimens [169]. HDL cholesterol levels were increased and LDL cholesterol levels were decreased in all the treatment groups. The decreases in LDL cholesterol levels were similar for all regimens but the HDL cholesterol levels were significantly less elevated in the women who took estrogen with medroxyprogesterone (MPA) compared to those who took estrogen alone. In a more recent analysis of the PEPI data, it was reported that conjugated equine estrogen (CEE) therapy with or without progestins leads to long-term stable average decreases in lipoproteins of 20 to 30 percent for women who adhere to its use [170]. Other studies have also shown an inverse association between estrogen plus progestin regimens and cardiovascular disease [171–174].

Stroke

The association between hormone therapy and stroke had been unclear until the WHI results pointed to a significant increased risk with combined HRT. Previously, the Leisure World Study published in 1991 showed a relative risk of 0.3 among current estrogen users as compared with women who had never used estrogen ($p<0.05$)

[175]. Falkeborn and colleagues reported that the relative risk of stroke was 0.72 among women taking estrogen and 0.61 for women using combined therapy [171]. In the Nurses' Health Study, Grodstein and colleagues reported no decrease in the incidence of stroke among hormone users whether or not the women used estrogen alone or in combination with a progestin [176]. An increased risk associated with high doses of estrogen had also been suggested. The WHI data showed a 41 percent (HR 1.41, 95% CI 1.07–1.85) increased risk of stroke for women using combined HRT compared to the placebo group [129].

The biological potency of postmenopausal hormone therapy is equivalent to 20 to 25 percent of that found in modern oral contraceptives [177]. Until recently it was believed that low dose estrogen treatment was not associated with any increased risk for deep vein thrombosis (DVT) or embolism. However, data from observational studies published from 1996 to 1998 have suggested that hormone therapy increases risk for both [158, 161, 178]. The WHI showed an increased risk (HR 2.13, 95% CI 1.39–3.25) for pulmonary embolism. Women using combined HRT also had twofold greater rates on VTE [129].

Until recently, because of the known adverse effects of oral contraceptives, the use of HRT was considered contraindicated in women who had hypertension [179]. Consequently, there are few data regarding the association between HRT and hypertension. The PEPI study results, however, were reassuring in that blood pressures did not rise in women receiving estrogen when compared to those receiving placebo [169]. In the WHI, data showed no increase in blood pressure values with HRT use. Indirect evidence shows that HRT protects women from increased blood pressure [179]. While most women will not have adverse effects on blood pressure from HRT use once therapy is initiated, blood pressure should be monitored every 6 to 12 months. If hypertension arises, it is unlikely to be the result of HRT use, except in rare instances [179]. In most cases antihypertensive therapy may be initiated without discontinuance of HRT.

After the HERS study, the WHI is only the second randomized controlled study to call into question the protective effects of HRT on the risk of heart disease. The increased risk demonstrated by the WHI will likely completely change how women and providers view the use of HRT. While women using HRT had lower LDL levels (–12.7 percent) and higher HDL levels (+7.3%) at one year into the study, the ratio of women experiencing CHD events was increased by 29% for women using the combined HRT [129].

Osteoporosis

The skeleton consists of 80 percent cortical bone, while trabecular bone (the bone of the spinal column and the ends of the long bones) makes up the rest. Osteoporosis is characterized by a reduction in bone quantity occurring primarily in the trabecular bone and is most noticeable in the vertebrae and the distal radius. Bone mass is accumulated throughout childhood and early adulthood, peaking in the late twenties to early thirties. Osteoporosis, affecting approximately 28 million Americans and costing about $14 billion a year, is characterized by bone fragility such that fractures can occur with little trauma, including normal activities of living [180]. The risk of fracture resulting from osteoporosis depends upon two factors: the bone mass achieved at maturity and the subsequent rate of bone loss. In the first 10 to 15 years following menopause, women have accelerated loss of bone, after which the rate of bone loss is considerably diminished but persists. Other contributing factors include reduced bone mass, poor bone architecture, accumulating damage from wear and tear on the skeleton, and low calcium intake [181]. Lack of exercise and poor balance both contribute to the incidence of osteoporosis fractures because individuals with poor proprioception are at higher risk for falls. Hip fractures resulting from osteoporosis begin 10 to 15 years following menopause with complications that have great personal and public health consequences. The morbidity and mortality associated with osteoporosis are related to fractures. The disease takes decades to develop and is difficult to treat, and therefore public health strategy has been placed on prevention.

Osteoporosis is epidemic in the United States, partly due to an increase in the life expectancy but also due to factors such as more sedentary lifestyles, lower parity, and effects of smoking and changes in diet [182]. While osteoporosis affects one in three postmenopausal women, not all will require intervention. There are no definitive methods to predict who will develop osteoporosis severe enough to be a health risk—that is, experience painful symptoms or reach the fracture threshold. Significant health problems resulting from osteoporosis include frac-

tures of the hip, upper femur, forearm, ribs, and compression fractures of the spine. The 1990 figures from the National Osteoporosis Foundation show that osteoporosis is responsible for 1.5 million fractures per year and that more than 20 million women are affected. More than 275,000 hip fractures occur annually in the United States at a cost of more than $10 billion per year, affecting women two to three times more than men. The mortality rate associated with hip fractures is between 5 and 20 percent within the 12 months following the fracture, with as many as 15 to 25% of women with hip fractures becoming permanently disabled. These incidences often translate into chronic complications: many of the women affected require help with daily activities, and up to 15 or 25 percent require institutionalization.

Clinical profiles of those who are most affected are sometimes helpful but do not present a clear picture of the woman who is at risk for osteoporosis. Chronological age, body mass, smoking, exercise, and other lifestyle factors may play a larger role than does menopause [148]. Reliable estimates of the impact of bone density and prior rates of loss on fractures are not available, in part because fractures occur 15 years or more after menopause. The risk of falling related to factors such as poor vision, obstacles in living areas, and side effects from medications appears to contribute predictive information to later fracture, independent of bone density [183–185]. Heredity probably also plays an important role in premenopausal bone density [186–188]. Yet Bradsher and McKinlay point out, "Available information on cultural variations in bone density and risk of hip fracture reveals the contradictions that underscore, first, the inability of bone density and rate of loss to predict fracture and, second, the multiple risk factors likely to predict fracture." [148, p. 205] Some factors that have been reported to have an effect on accelerated bone loss include smoking, lack of parity, later age at menarche, lower body weight, and lower age at first pregnancy [187].

Osteoporosis Screening

Bone density measurements and in particular dual-energy x-ray absorptiometry (DXA) have revolutionized the field of osteoporosis management. Despite its limitations, bone density measurements are still the best way to identify individuals at risk for osteoporosis. Suggestions regarding who should use DXA are quite broad. The National Osteoporosis Foundation 1998 Practice Guidelines (revised in 1999) recommend bone mineral density (BMD) testing in women considering treatment who are aged 65 years or older, and in younger postmenopausal women considering treatment who have one or more risk factors for osteoporotic fracture other than menopause [189]. The clinical challenge is to identify those most at risk for fracture while limiting unnecessary testing in women with normal BMD who have a low risk for fracture. Since most women have one or more risk factors, the question then becomes who not to test.

DXA Interpretation Every reduction of 1 standard deviation in bone density equates to a 2 to $2^1/_2$ fold increase in the likelihood of fracture [190]. The "Z" score relates the measure of bone mineral density figure to the mean value expected for a healthy normal subject matched for age, sex, and race. This score expresses the difference between a woman's bone mineral density and the age-matched mean in units for the population standard deviation. The "T" score is similar but indicates the difference between the individual's BMD and the ideal peak bone mass achieved by a young adult. Bone density measurements are standard deviations (SDs) below the mean of what would be normal for a younger woman. All bone density numbers are on the negative side of 0. According to the World Health Organization, a "T" score at the hip, spine, or forearm greater than or equal to 2.5 defines osteoporosis (a reduction in the mass of bone per unit volume enough to lead to fractures with little or no trauma). The number 2.5 indicates 2.5 standard deviations (SDs) below the mean for a young adult woman. A score between 2.5 and 1 (2.5 to 1 SDs less than the mean for a young woman) denotes osteopenia (a radiologic term indicating a reduced amount of bone that encompasses both osteomalacia—reduced mineralization in bone—and osteoporosis). A score of 1 (1 SD less than the mean for a young woman) is regarded as normal. No one ever has a "T" score on the positive side of 0 because all midlife and aging women have lost bone mass.

While bone density measurements are good at assessment of fracture risk, they do little to identify the woman who will sustain a fracture [191]. Suggestions for which women should be tested are quite broad. Since most women have 1 or more risk factors the question still remains who to test. Many experts do not recommend widespread screening for osteoporosis because precise identification of high-risk women does not emerge from the avail-

able evidence and because the efficacy of long-term treatment for prevention has come under scrutiny [192]. The main treatments are hormone replacement and bisphosphonates. Most women are unprepared to take hormones for the time required for protection. The bisphosphonates have undesirable side effects, must be taken while fasting, and are relatively expensive. Furthermore, there is no experience with long-term treatment. Ultrasonography may become an effective means of predicting risk of fracture [193, 194] but its worth in clinical screening has not yet been established [195].

Whether or not to use DXA for an individual woman depends on factors such as whether or not she is interested in treatment if the results show her to be at risk. If a woman is undecided about what interventions she will elect (hormone use, bisphosphonates, exercise, and other lifestyle changes), measuring bone density will help her understand her individual risks and will often clarify the issues for her. Other reasons to measure bone density include assessing response to therapy and to aid in treatment decisions.

Pharmacologic Treatment

Protection against osteoporosis has been the least controversial reason for use of hormone replacement therapy up to this point. The role of estrogen decline in bone loss has been largely inferred through the demonstrated beneficial effect of exogenous hormones in clinical trials [148]. However, the relationship between HRT and fracture prevention is open to question [196, 197]. In the past, HRT has been the standard of care for prevention of osteoporosis [197]. HRT was thought to have a stabilizing influence on loss of bone mass from both trabecular and cortical bone in women with established osteoporosis, which reduces fracture rates. Support for use of HRT comes from observational studies that consistently suggest that postmenopausal therapy reduces the risk of hip and other types of fractures [196]. Observational studies, however, are susceptible to selection bias and confounding. This is exaggerated if the women who use hormones are healthier, wealthier, and more active than nonusers. Consequently, even if observational studies are qualitatively correct, they may overestimate the degree of risk reduction attributed to HRT [196]. Although randomized trials have consistently shown that estrogen prevents postmenopausal bone loss, *bone density is an imperfect predictor of reduction in risk for fractures*. Fracture prevention remains the most common reason to prescribe HRT in women over age 60 years [198] because the data on skeletal protection have been the most accepted rationale for its use. Ideally, though, clinical practice should be based on evidence from large randomized blinded trials using fracture as the outcome measure [196]. Although the data from the WHI showed estrogen plus progestin reduced the observed hip and clinical vertebral fracture rate by one-third (both nominally significant), the authors considered this benefit not worth the risks incurred for heart disease and breast cancer [129].

It has been thought that the lowest dose adequate to produce bone effects is 0.625 mg conjugated equine estrogens (CEE) or its equivalent [199]. Several studies have shown a smaller bone-sparing effect of doses lower than 0.065 mg CEE [200–202]. Addition of a progestin along with 0.3 mg daily dose of CEE is reported to be bone sparing as well [203–205]. Recommended daily dosages for protection against osteoporosis include 0.625 mg conjugated estrogens, 1.25 mg piperazine estrone sulfate, 1 mg micronized estradiol, or 0.05 mg of transdermal estradiol.

Questions remain regarding the best timing for initiating HRT to protect against fracture, when it is too late to provide protection, and how long therapy must be continued to retain protection. The 1995 Study of Osteoporotic Fractures [206] showed that women who initiated therapy within five years of menopause and used HRT for more than ten years had the greatest reduction for risk of hip fracture. On the other hand, long-term users who had initiated therapy after five years of menopause had no significant reduction in the risk for all nonspinal fractures even though the mean length of use was 16 years. Current use was effective in reducing hip fractures among the oldest women, supporting the theory that estrogen can be used to prevent hip fractures in this age group. However, bone protection was not found in women older than age 75 in the 1993 Framingham Study with estrogen use for seven or more years [207]. In the 1997 Rancho Bernardo cohort, the bone mineral density for current users who began HRT after age 60 was similar to that of women who had begun earlier [208]. More recently the HERS study suggests that the effect of HRT on fractures for women starting therapy after the age of 60 may be reduced [197]. Case control studies suggest that at least five years of use are required to gain protection against fractures [209–212]. Although it is generally agreed that estrogen replacement confers

protection against the immediate loss of bone after menopause, once estrogen is stopped, bone loss is considerable and occurs quickly so that estrogen therapy must be used continuously to provide protection [213]. While the current use of estrogen may reduce the risk of osteoporotic fractures [214], as many as 30 years of HRT use is necessary to obtain this protective effect throughout a woman's lifetime. The authors of the WHI conclude that although fracture risk is reduced by HRT use, the attendant risks of breast cancer and CVD over time should be considered, and alternative therapies for prevention and treatment should be employed for prevention and treatment of fracture [129].

Other factors must be taken into account when contemplating use of HRT over an extended period of time. Estimates of compliance with long-term use of estrogen are low. In one study, fewer than 25 percent of women reported that they still used HRT two years after initiation of treatment [215]. There are also many contraindications to taking estrogen, as well as women who decline use for their own reasons. While long-term use may confer protection to the skeleton and the circulatory system, it is the duration of use that is implicated in worrisome increases in breast cancer. At this time, long-term evidence is not available for this practice. Since women in their fifties do not have osteoporosis and their risk of fracture is low, the benefit of long-term treatment with estrogen to prevent bone loss and fractures may not exceed the risks [196].

Alternative treatment options that retard bone resorption in individuals with osteoporosis include bisphosphonates such as alendronate (Fosamax) and risedronate (Actonel). These drugs are the most potent treatment for osteoporosis based on BMD and fracture studies [216, 217]. Bisphosphonates are indicated for short-term reduction in fracture risk. However, bisphosphonates cause inflammation and ulceration of the upper gastrointestinal tract. Chronic use may be associated with diarrhea and abdominal pain [218]. To aid absorption, these drugs are taken with a full glass of water upon awakening, before breakfast. The individual must remain in an upright position for at least 30 minutes following ingestion to avoid esophageal ulceration. Oral bisphosphonates are poorly absorbed (1 to 10 percent of a given dose); consequently, women should be told to avoid taking them with calcium supplements, food, or milk products that can further significantly inhibit absorption [219]. Alendronate (Fosamax) is approved at 2.5 mg daily [217] for osteoporosis prevention and 5 mg daily for osteoporosis treatment [220]. The best protection is seen in patients with the greatest short-term fracture risk, such as patients with "T" scores greater than 2.5 or preexisting vertebral fractures [221]. Risedronate sodium (Actonel) is also approved by the FDA at 5 mg for both prevention and treatment of osteoporosis.

Selective estrogen receptor modulators (SERMs) are antiestrogens that possess agonist action on bone, lipids, and lipoproteins and antagonistic action in the endometrium and the breast. Thus in theory these drugs may preserve bone density and reduce the risk of osteoporotic fracture and coronary heart disease and at the same time lower the risk of endometrial and breast neoplasms [222]. The FDA has approved 60 mg of raloxifene (Evista), a SERM, daily for prevention of osteoporosis. Some women prefer raloxifene to estrogen with its side effects and risks. Unlike tamoxifen (for breast cancer recurrence protection), raloxifene does not exert stimulatory activity on the endometrium [223]. Raloxifene may be appropriate for use in women who are interested in breast cancer risk reduction. Raloxifene seems to be causally related to deep vein thrombosis (DVT) and pulmonary embolism with an incidence of 1 percent in dose levels of 60 mg and 120 mg similar to women using HRT [224]. The Multiple Outcomes of Raloxifene Evaluation (MORE) study, a recent large examination of raloxifene treatment for *established* osteoporosis, has shown that bone density significantly increased in the spine and hip and the risk of new vertebral fracture was reduced by 40 percent [224]. Raloxifene produces some improvements in lipid profiles but not to the extent found with estrogen. Short-term data suggest that raloxifene preserves bone and causes lipid profiles that are less atherogenic [114, 224, 225]. Long-term studies are needed to confirm the effect on fracture protection as well as whether there is any decrease of breast or endometrial cancer. Unfortunately, as many as 20 percent of women who use SERMs will experience classic symptoms of antiestrogens such as hot flashes [225].

Calcitonin (Calcimar, Miacalcin), which directly inhibits osteoclasts and thus can slow bone loss, is the least potent of the options for osteoporosis treatment [221]. Calcitonin is ineffective orally. Injectable calcitonin is the route that offers the best absorption but is inconvenient. Intranasal calcitonin, 200 IU/d, is widely used and is acceptable to patients. Calcitonin has analgesic properties in addition to the anti-bone absorption effect and can be

prescribed for women with severe pain of compression fractures [226]. One study showed the effect of calcitonin on bone mineral density (BMD) and bone markers to be significantly less than that of alendronate and not significantly different from placebo for most skeletal sites [227]. Calcitonin may be suitable for patients with acute vertebral fracture who are bedridden or experiencing serious pain or the woman who needs to avoid bisphosphonates because of risk of esophageal injury or avoid estrogen because of venous thromboembolism.

The Food and Drug Administration (FDA) has approved SERMs, bisphosphonates, and calcitonin for prevention and treatment of osteoporosis. However, no trial has been performed to determine the effect of estrogen on risk of fracture in women with established osteoporosis. Because of this, the FDA approves estrogen for prevention but not for treatment. In a recent meta-analysis of 22 trials [197], the evidence about the efficacy of postmenopausal estrogen for prevention of osteoporotic fractures was weak [196], in comparison to other FDA-approved treatments. Observational studies suggest that ten years or more of estrogen use are required to reduce the risk of fractures, and, at that point, the risk of breast cancer from exposure to estrogen is increased substantially [228]. Additionally, estrogen therapy increases the risk of thromboembolic events [229] and gallbladder disease [157]. The question must be asked whether estrogen reduces risk of fracture as much as treatment with bisphosphonates. Until such time, the first choice for older women should be treatments other than estrogen.

Exercise

Regular exercise might be the only method that may prevent osteoporosis fracture, by preventing both osteoporosis and falls [230]. Physical activity increases bone mass, density, and strength [231]. Exercise in adults seems better at preserving bone than increasing bone mass [232, 233]. However, this bone preserving action of exercise may be important in maintaining bone strength and preventing osteoporotic fractures since only small percentages of bone mass and density preserved result in significant reductions in risk of fracture [234]. Regular sports such as aerobics, tennis, basketball, or weight and power training provide versatile strain distribution throughout the bone structure that best improves bone strength [232]. For older individuals, brisk walking, climbing up and down stairs, dancing, and adult age gymnastics and calisthenics are appropriate [235, 236]. Secondarily, exercise improves gait, balance, coordination, proprioception, reaction time, and muscle strength even in the very elderly and frail. Epidemiologic (case-control and prospective cohort follow-up) studies consistently show that past and current physical activity protects against hip fracture, reducing the risk by up to 50 percent [235–237]. Regular physical activity, especially if started early in life, is cheap, safe, and readily available. It is an acceptable way of improving bone strength and preventing the tendency to fall. Midwives should get women, young and old, moving to protect their bones and accrue all the other benefits that accompany physical activity.

Other factors that can lead to increased risk for fracture include poor visual acuity (due either to wearing inappropriate correction or no correction whatsoever) and cataracts. The aging process affects all bodily functions. Consequently, it is unknown whether correcting visual acuity will decrease fracture rates since impaired vision may be a marker for aging of other systems as well [235–237].

Diet

A systematic review in 1990 concluded that calcium supplementation has a positive influence on the skeletal system at all ages, particularly in childhood, adolescence, and the perimenopause [238]. The role of calcium and vitamin D in the elderly is not so clear-cut. For example, there may be an association between long-term treatment with vitamin D and increased vascular calcification [239]. Although calcium and vitamin D probably play an important role in bone metabolism and fracture risk, it is feasible that other nutrients may also have value in influencing fracture risk [240]. Rather than focus on individual nutrients, an alternative way to investigate the effect of diet on disease is to study the effect of food patterns and food groups. It has been suggested that a diet rich in fruits and vegetables and other nutrients may be associated with higher bone mass [241, 242]. Dietary habits could exert their influence through the nutrients contained in the foods (vitamins, minerals) or through other components in the foods such as antioxidants or phytoestrogens [240].

Perimenopausal women in the United States generally have a daily dietary intake of calcium of about 500 mg. In order to maintain a zero calcium balance, these women require supplementation

with 1000 mg [92]. These effects are best realized when women also make other healthy lifestyle changes, such as frequent weight-bearing exercise that strengthens the skeleton.

The Perimenopausal Visit

Very often, the woman who presents to a woman's midlife clinic or practice is still having menses. Typically, she has been an active participant in her own previous health care decisions whether regarding childbirth, contraception, or other matters, and she desires information, recommendations, options, and support for her health decisions. Frequently, the woman in her late thirties or forties is experiencing hot flashes, cycle variations, or other changes about which she has questions or concerns. For many women their lack of knowledge about what to expect is disconcerting, and what women are told to expect is often conflicting. This may lead to anxiety in some women, who are frightened that something is wrong. For the woman who experiences irregular menses in the perimenopause, the fear of cancer or other pathology can be greatly out of proportion to actual risk. The midwife can offer information in order to help women sort out their own risks or benefits and make the best decisions about health care and lifestyle practices.

History

As well as the routine history and health questions asked of women of any age, the midwife needs to obtain historical information related to changes and specific risk factors associated with the following:

1. reproductive tract
2. urinary tract
3. breasts
4. vasomotor system (hot flashes, night sweats)
5. skeletal system
6. cardiovascular system
7. psychological changes

Instead of signs of reduced estrogen, some women present during the perimenopause with symptoms of estrogen excess, including uterine bleeding, bloating, growth of uterine fibroids, and endometriosis, any of which should be investigated. Assessment of the midlife woman should also focus on early detection of any of the major chronic diseases of midlife, including hypertension, heart disease, diabetes mellitus, and cancer. Finally, each of the following should be investigated before making a management plan:

1. impairments of vision
2. impairments of hearing
3. dental health
4. nutritional status
5. physical activities or limitations
6. injury prevention: seat belts, avoidance of drinking and driving
7. environmental risks
8. occupational, sexual, marital, relationship, and parental problems
9. use of cigarettes, alcohol, and other substances
10. contraceptive needs
11. immunization status

Midwives should help low-income or underinsured women find resources to explore and prioritize these health care needs, especially in the context of the changing managed health care milieu.

Perimenopause Physical Exam

Examination of the woman going through the changes of the climacteric is an opportunity for appropriate historical inquiries, risk assessment, identification of unreported illnesses, and reinforcement of preventive health measures. For example, when examining the mouth, the midwife has the opportunity to discuss many topics including dental checkups, nutrition, family interactions around meals, and food preparation.

The initial or annual examination should include the following:

1. *Height:* Most women have not had their height measured in decades and often have lost an inch or more. Measuring height provides an opportunity to discuss posture, body mechanics, exercise, and osteoporosis.
2. *Skin:* The skin should be evaluated for integrity, lesions, and changes in moles. The incidence of skin cancers increases with aging and many women have no other providers who assess their skin.
3. *Mouth, teeth, gums:* The incidence of periodontal and other oral diseases increases with age.
4. *Pelvic examination:* A pelvic examination should be conducted with attention paid to the expected changes that accompany aging as well as to any changes the woman has brought to your attention. Use of a Pederson speculum is usually optimal for postmenopausal women because of atrophic changes that may have occurred in the vagina.

5. *Rectum:* The rectum should be examined for masses and fissures.

Laboratory and Other Tests

Which tests the midwife performs or orders depends on the symptoms with which the woman presents, the cost effectiveness of the tests, the risks and benefits involved with the test, and the woman's goals, preferences, and personal risk factors. The following is a list that can be used as a guide, keeping in mind the above criteria.

Tests for Routine Screening, Initial, or Annual Examinations

1. Urinalysis/urine dipstick.
2. Pap smear with maturation index.
3. Mammography: every 1 and 2 years between 40 and 49; annually from age 50 (American Cancer Society; American College of Radiology; American College of Obstetrics and Gynecology).
4. Stool for occult blood.
5. Fasting plasma cholesterol, triglycerides, and lipid profile: every three to five years if normal.
6. TSH at age 45 and then every other year [92]. There is an increased incidence in hypothyroidism (Hashimoto's thyroiditis) with aging.

Other Tests (Use varies according to clinical profile and individual risk factors)

1. *Pituitary gonadotropins:* Used to establish menopausal status. FSH levels are typically 4–30 mIU/mL with a pre-ovulatory surge to 50 mIU/mL in the reproductive years; >100 mIU/mL in the postmenopause. FSH rises earlier after the menopause and to higher levels than LH. LH levels are typically 4–30 mIU/mL with pre-ovulatory surge to 100 mIU/mL in the reproductive years; >100 mIU/mL in the postmenopause.
2. *Estrogens:* Used to evaluate menopausal status and the effects of hormone therapy on circulating levels of estradiol. Estradiol levels are typically 50–350 pg/mL (picograms per milliliter) in the reproductive years and 5–25 pg/mL in the postmenopause. Since these latter levels do not overlap with premenopause levels, measurements of <25 pg/mL can be helpful in diagnosis of menopause. Estrone levels are typically 20–70 pg/mL. There is substantial overlap in levels between younger and older women, so measurement of estrone is not helpful as a diagnostic tool.
3. *Fasting and two-hour postprandial glucose levels:* Useful when risk factors are present for diabetes.
4. *Liver function tests:* Done prior to prescribing hormone therapy when liver disease is present or suspected (e.g., because of alcoholism).
5. *Endometrial biopsy:* Appropriate for ruling out endometrial hyperplasia and cancer in a postmenopausal woman who has uterine bleeding after more than a year of amenorrhea. It is also useful in ruling out pathology resulting from exogenous estrogen excess that is seen clinically in unscheduled bleeding with HRT use. An endometrial biopsy is not needed (1) for normal cycle changes accompanying the premenopause, (2) with a normal pelvic exam and no risk factors for endometrial hyperplasia and cancer, or (3) prior to initiation of hormone therapy [2].
6. *Transvaginal ultrasonography:* Used for evaluation of pelvic masses and for unscheduled bleeding to rule out endometrial pathology. The thickness of the postmenopausal endometrium correlates with the presence or absence of pathology such as neoplasia, myomas, or polyps. It also has the advantage of evaluating the ovaries for masses or neoplasia.
7. *Dual energy x-ray absorptiometry (DXA):* Useful when a woman is undecided on which therapeutic plan to follow (HRT, bisphosphonates, exercise, or calcium supplements), and another level of data will help her make a clinical decision about this choice.

Postmenopausal and Older Woman Visit

For the postmenopausal woman who seeks care from the midwife, symptoms have often subsided and a new equilibrium has been established in the various aspects of her life. She may feel better with the transition complete. Results from the Massachusetts Women's Health Study, a longitudinal, population-based study, showed that women's attitudes toward menopause become more positive after they experience the menopause [243]. For the postmenopausal woman who is not having problems, the visit is still important for health promotion, screening, and general surveillance. Gynecology visits with the midwife are an opportunity to get the older woman back into the health care system, maintain continuity of care, arrange referrals as appropriate, and involve her in a preventive health care program. While the chance of illness is higher in this age group, the impact of any therapeutic changes she makes is much greater.

Many of the components of the visit are similar in scope and breadth to the woman in the midst of the climacteric transition. Life expectancy is greater today, largely due to the elimination of premature death from infectious disease. The major determinant of life expectancy at this time is chronic disease, affected by genetics, lifestyle, the environment, and aging itself. Great strides have been made in the treatment of cardiovascular diseases. What the midwife can offer is her knowledge of menopause to educate the individual regarding her genetics, her lifestyle and environment, and the role these factors play in her health, her life expectancy, and her quality of life. An individual woman may not know about her hypertension. By taking a careful history and performing a careful physical exam, the midwife can show the woman exactly how her blood pressure, weight, lifestyle practices, and family history all fit together. The postmenopausal visit is an opportunity to offer specific recommendations that the woman can take home with her. The impact of personal recommendations is a much more powerful message than reading an article or listening to a public service message on television. The midwife can help each woman achieve the best health possible by maintaining physical and cognitive functions as long as possible. Explained in another way, the goal is to maximize "active life expectancy," the duration of functional well-being, and the maintenance of independence in the activities of daily living [244].

Since chronic illnesses are incremental in nature, the best health strategy is to change the rate at which illnesses develop. Disease is now seen as something that can be prevented or postponed rather than treated only with medication [92]. The effect of postponing illness by smoking cessation and eliminating obesity is now known. Aging and the stereotypes that go along with it affect self-determination and feeling in control. When older people are given choices about their lives and the decisions that affect them, there are fewer declines in health and psychological status.

When women are between the ages of 40 and 49 years, gynecology visits yearly are recommended to include breast and pelvic/rectal exams and to order screening mammograms. A complete physical exam, medical history and tests for chronic illnesses, immunizations, counseling for nutrition, physical needs, injury prevention, substance use, and dental prophylaxis should be done at least every five years [92]. For women over age 50, annual tests for hypertension and obesity are recommended. There is insufficient evidence to recommend for or against routine screening for diabetes mellitus in asymptomatic adults [245]. Clinicians may decide to screen persons at high risk for diabetes, however. In a 2001 update, the U.S. Preventive Services Task Force strongly recommended routine screening for lipid disorders in women age 45 and older to include total cholesterol and high-density lipoprotein cholesterol (HDL-C) [246]. Routine screening for ovarian cancer by ultrasound, measurement of tumor markers, or pelvic examination is not recommended by the task force because of insufficient evidence of improved outcomes in asymptomatic women. Although the task force does not recommend routine screening for thyroid disease for asymptomatic adults, it notes that recommendations for such can be made on other grounds. Since thyroid disease can mimic other conditions such as depression, lethargy/confusion, congestive heart failure, atrial fibrillation, and menopause changes, thyroid function tests are recommended every other year after the age of 60 [92].

Routine screening for cervical cancer by Pap smears is recommended for all sexually active women at least every three years [245]. There is insufficient evidence to recommend for or against an upper age limit for Pap testing but recommendations can be made on other grounds to discontinue regular testing after age 65 in women who have had regular previous screenings that have been consistently normal [245]. Pap smears should be done yearly if the woman has a recent history of an abnormal Pap. However, if a woman has never had an abnormal Pap and no other risk factors, she no longer needs to have yearly smears. This is further supported by the fact that the incidence of infection with human papillomavirus (HPV) declines with increasing age irrespective of risk factors [247]. For women who have had a hysterectomy for cancer of the cervix or endometrium, Pap smears should be continued on the same schedule as above. If a woman had a hysterectomy for reasons other than cancer, Pap smear screening of the vaginal wall is no longer necessary after menopause. The woman should be advised that a pelvic exam is still important to detect other problems. Screening for colorectal cancer is recommended for all persons age 50 and older, including annual fecal occult blood testing and sigmoidoscopy every five years [245].

For women between the ages of 60 and 74 years, professional visits should occur every one to two years and include the same points listed for the perimenopausal woman. Additionally, they should

receive immunizations against influenza annually and be vaccinated against pneumonia every three to five years [248].

When a woman is 75 years or older, it is important to try to support her to live independently and avoid institutionalization as long as possible. She should be encouraged to maintain activity, avoid inactivity, and be helped to minimize discomfort from chronic conditions. The midwife needs to pay attention to signs of elder abuse such as bruising or weight loss.

Decisions about health care should be made on patient preferences and the presence of chronic illnesses, not on chronological age alone. Risks of treatment must be weighed against potential benefits. For example, a high-risk procedure might prevent irreversible loss of functional independence, so it might be worth the risk. Prevention interventions also vary with age. A good example is the cholesterol level in elderly women. The strength of the association between cholesterol and heart disease decreases in older women. By age 80 it may not be worth intervening in women with high levels [92]. Finally, some problems may not be easily recognizable in older patients. As discussed in previous sections of this chapter, it is important for the midwife to evaluate for sexual dysfunction, alcoholism, musculoskeletal problems, dementia, incontinence, depression, hearing and visual losses, and predilection to falls.

Assessment

When assessing the midlife or aging woman, the midwife must take into account all the data that have been collected and help the individual woman make health decisions that are in her best interest. Many of these decisions are not clear-cut or easy to make. Midlife women are overwhelmed by information from the media and the medical establishment about how to manage their menopause. Because much of the information these women receive is contradictory, the choice for intervention or nonintervention is not clear and can be associated with ambivalent feelings. The choice at midlife to take responsibility for changes in lifestyle toward more health promotive behaviors is a monumental one for many women. These women need information, clarification, and support for their decisions, and they should not be made to feel guilty about their choices. The decision to take hormones for troublesome physical changes or for prevention of future diseases also causes anxiety for many women. The midwife needs to be able to personally tailor the evaluation and management decisions to a woman's particular needs, risks, and opinions. This means putting the data within the context of a woman's culture and her peer group, taking into account her fears, family, and personal histories. Designing a course of action requires time, skill in listening to the woman, and being up-to-date on both the lay (feminist and traditional) and scientific literature. This is especially important because they are so often in conflict. To accomplish this daunting task, the midwife needs first to acknowledge her own biases; then she must identify areas in which the woman wants the midwife's help and determine if the woman has any fears about the climacteric or possible interventions. When these are identified, the midwife can sort through the woman's concerns and assist with genuine problem solving by giving relevant information and reasonable explanations of the state-of-the-art knowledge regarding menopause.

A test called the *maturation index* (MI) is also recommended for postmenopausal women. It is often included as part of the routine Pap smear, but it may have to be requested. When the cytologist is evaluating the smear, the individual woman's history including age, LMP, hormone use, or postmenopausal without hormone use should be reflected in the estrogen effect seen on the slide. For example, if the cells on the slide of a postmenopausal woman using no hormones reflect a high estrogen effect inconsistent with her history, the cytologist will comment that the estrogen effect does not match the history. Some laboratories report maturation index as a series of three numbers representing the three layers of squamous cells: parabasal, intermediate, and superficial cells in that order expressed in percentages (for example, 5/70/25). This is an expression of estrogenic influence, but it is only a very crude measure of estrogenic status and can be misleading. This examination cannot predict whether or not a woman is experiencing climacteric signs (it is more accurate to ask her), and it cannot be used as a sole guide to hormone therapy. It can be used to determine the dose of estrogen needed to reverse vaginal atrophy. It is also helpful to identify the woman whose maturation index (estrogenicity level) is higher than would be expected for the clinical picture of the woman. For example, in a woman ten years postmenopause, you would expect her vaginal mucosa to have scant estrogen influence. If her MI is elevated, either she is reacting to very low levels

of endogenous estrogen with a greater than usual response or she has an elevated endogenous estrogen level, perhaps from obesity and consequent aromatization of androstenedione to estrone from adipose tissue. This woman may present with postmenopausal bleeding, which would then need to be investigated by endometrial surveillance such as endometrial biopsy, transvaginal ultrasound, or both.

As women reach their sixties, seventies, or eighties, issues such as chronic diseases must be identified. Heart disease, hypertension, stroke and diabetes become more common. Cancers of nearly all kinds occur with greater frequency as women age. Joint and muscle pain, arthritis, and rheumatic disorders have significant impacts on women's daily lives. Changes in vision, hearing, and other sensory losses are associated with aging and their insidious onset may be unrecognized. Memory losses can be insidious as well, recognized by family members before the individual herself. Are these changes indicative of benign senescent forgetfulness or of more ominous conditions such as Alzheimer's disease? Mood disorders such as depression are widely unrecognized in older women who may be suffering from loneliness, depression regarding changes in ability to function both physically and mentally, lack of stimulation, medicinal or alcohol side effects, to name a few causes. Midwives have the opportunity to help identify developing medical problems and to work with women and their families to obtain appropriate evaluation and health care. Whether or not to begin medications such as HRT for fracture prevention or for memory protection at age 70 are the kinds of questions for which there are no answers.

Menopausal Therapeutic Interventions, Preventive Measures, and Health Promotion

Self-Determination in Menopause

Menopause has been experienced and managed by women throughout the ages. Women rely on their own intuition, common sense, family traditions, and each other to make safe passage through each of the developmental stages of life. In the past century, as scientific advances have done much to improve longevity and quality of lives, many women have been gradually losing touch with the processes occurring in their bodies and becoming more dependent upon "medical authority" as the true guide for health decisions. Much has been gained from medical advances, but women often need support to retain as much control over their destinies as is desired. Often women have ideas and feelings about what decisions they should make, yet their ability to listen to their inner voices becomes more and more difficult as time goes on. Just as the medicalization of pregnancy has had certain adverse consequences, medical "management" of the menopause can separate women from their strengths and vitality. Women have reclaimed many of the processes of pregnancy and childbirth, and midwives need to support women as they make choices for self-help when dealing with issues of midlife. Women are calling on health care providers to help them assess both the benefits and risks of action or nonaction. Midwives can help them make their own decisions, without pressure and biases but with empathy and an understanding of the wide personal differences that women bring to the issues of aging, midlife sexuality, menopause, and hormone use [249].

A midwife cannot assume that an acceptable risk for a sick person is an acceptable risk for a healthy woman. While a woman with breast cancer might well risk the side effects of using tamoxifen, it is entirely different to pressure a woman into making a decision to use a treatment with possibly harmful side effects in order to prevent possible future diseases. The unexpected results from the WHI demonstrate that the issue is a complex one that is apt to make both providers and women confused and anxious. Midwives are in an ideal position to provide judicious advice and personally tailored information that offers the balance that women need.

Hormones

Estrogen Replacement Currently, there is little evidence that one estrogen preparation is superior to another; the dose *and* duration and the use of a progestin are more important.

The lowest dose that offers relief of symptoms should be used. The question of whether HRT should be used at all for potential prevention of chronic diseases has been called into question since the WHI has been halted. In the years to come, there will certainly be additional knowledge and recommendations on the use of HRT for prevention of chronic illness that affect women in their later years. In a departure from recommendations over the previous decade, the Writing Group for the WHI recommended in 2002 that HRT not be prescribed at all for long-term use [129]. For any woman suffering with significant menopause symp-

toms in which her quality of life is impaired, the midwife will have to discuss with her whether the use of HRT for a few years is worth the risk.

When the decision is made to use hormones, many confounding factors influence the choice of product, including market forces and the latest research. New products are coming on the market all the time. There is often some trial and error to arrive at a product or regimen that is right for a particular woman. Most prescriptions are written for HRT in pill form but estrogen products are also available in vaginal creams, vaginal rings, and skin patches.

In previous decades, HRT was prescribed three weeks on, one week off to mimic the menstrual cycle. A progestin was added the third week to ten days to protect the endometrium from overgrowth. Withdrawal of both hormones allowed for sloughing of the lining on a regular basis. Women appreciated the "normalcy" of this method because it led to infrequent unscheduled bleeding episodes. Unfortunately, many women developed symptoms such as hot flashes during the week off hormones. To avoid this problem, estrogen was prescribed 365 days a year plus the progestin (to protect the endometrium from unopposed estrogen effect) was prescribed from 10 to 14 days each month. Many women prefer not to get any menses whatsoever after menopause, and most women are upset with unscheduled bleeding. In order to develop an atrophic endometrial lining and stop bleeding altogether, HRT is now often prescribed in a continuous regimen where the woman takes both estrogen and a progestin every day. This may produce unscheduled bleeding during the first months, but by one year most women have developed an atrophic endometrium that does not bleed. Women need to be counseled about this bleeding much in the same way that midwives counsel women using Depo-Provera. Recent additions to the market include combination products that contain both an estrogen and a progestin either continuously or cyclically or in a pulsed fashion (some days estrogen alone while other days a combination of estrogen and a progestin).

Estrogen products are listed in Table 13-1, some of which also include a progestin. The routes of administration and doses vary. The midwife should check in a recent drug reference book for accuracy of this information, remembering always to prescribe a progestin along with an estrogen product for a woman with an intact uterus. For women who have undergone a hysterectomy, no progestin is needed.

Most HRT is prescribed as oral tablets. A proposed physiological advantage of oral administration is that it passes first through the liver. This may account for improvement of lipid profiles [155, 170, 251]. Another advantage to oral administration includes ease of use. In Western culture, medicine is most often administered in this way, so it is acceptable to most women. Remembering to take it on a regular basis can be a problem for some women, especially if the primary reason is for long-term health benefits requiring many years of use. For women using HRT to relieve symptoms, just one night of hot flashes quickly reminds them of a missed dose.

Contraindications to the use of exogenous estrogen in menopausal women include estrogen-sensitive tumors of the reproductive system including the endometrium and breast. For women who have

TABLE 13-1 Estrogens

Conjugated Equine Estrogens (CEE)	Manufacturer	Route	Dose
Premarin	Wyeth-Ayerst	Oral caplets	0.3, 0.625, 0.9, 1.25, 2.5 mg
		Vaginal cream	0.625 mg/g (1 g 1–3 times a week)
PremPro (CEE plus MPA[a])		Oral caplets in blister pack	0.625 mg CEE plus 2.5 mg MPA; 0.625 mg CEE plus 5 mg MPA
Premphase (CEE plus MPA)		Oral caplets in blister pack	0.625 mg CEE for first 14 days of pill pack and 0.625 mg CEE plus 5 mg MPA next 14 days of pill pack

TABLE 13-1 Estrogens *(continued)*

Estradiol (E)	**Manufacturer**	**Route**	**Dose**
Activella (E plus norethindrone)	Pharmacia and Upjohn	Oral tablets	1 mg E plus 0.5 mg norethindrone
Estrace	Bristol-Meyers, Squibb	Oral tablets	0.5 mg, 1.0 mg, 2.0 mg
		Vaginal cream	1 g 1–3 times a week
OrthoPrefest (E plus norgestimate)	Ortho-McNeil	Oral tablets in blister pack (pulsed dosage)	3 days of 1 mg E (pink pills) followed by 3 days of combined 1 mg E plus 0.09 mg norgestimate; repeat
Estring	Pharmacia and Upjohn	Insert vaginal ring for 90 days; reinsert new ring	2 mg
Estraderm	Novartis	Transdermal patch; change twice a week	0.05, 0.1 mg
Climara	Berlex	Transdermal patch; change once a week	0.025, 0.05, 0.075, 0.1 mg
Vivelle	Novartis	Transdermal patch; change twice a week	0.025, 0.0375, 0.005, 0.075, 0.1 mg
Esclim	WomenFirst	Transdermal patch; change twice a week	0.025, 0.0375, 0.05, 0.1 mg
Combipatch (E plus NETA[b])	Aventis	Transdermal patch; change twice a week	0.05 mg E plus 0.14 mg NETA; 0.05 mg E plus 0.25 mg NETA
Alora	Watson	Transdermal patch; change twice a week	0.05, 0.075, 0.1 mg
Esterified Estrogen	**Manufacturer**	**Route**	**Dose**
Estratab	Solvay	Oral tablets	0.3, 0.625, 2.5 mg
Estratest (plus methlytestosterone)	Solvay	Oral tablets	1.25 mg esterified estrogens plus 2.5 mg methyltestosterone
Estratest HS (plus methlytestosterone)	Solvay	Oral tablets	0.625 mg esterified estrogens plus 1.25 mg methyltestosterone
Estropipate	**Manufacturer**	**Route**	**Dose**
Ogen	Pharmacia and Upjohn	Oral tablets (also available in vaginal cream)	0.625, 1.25, 2.5 mg
Ortho-Est	WomenFirst	Oral tablets	0.625, 1.25 mg
Ethinyl Estradiol (EE)	**Manufacturer**	**Route**	**Dose**
FemHRT (EE plus NETA)	Pfizer	Oral tablets	5 mcg EE plus 1 mg NETA
Estinyl	Schering	Oral tablets	0.02, 0.05, 0.5 mg
Synthetic Conjugated Estrogen	**Manufacturer**	**Route**	**Dose**
Cenestin	Duramed/Solvay	Oral tablets	0.625, 0.9, 1.25 mg

[a] Medroxyprogesterone acetate.
[b] Norethindrone acetate.

had a hysterectomy for endometrial cancer that is estrogen and progesterone receptor negative, immediate hormone therapy can be instituted; with receptor positive tumors, it is recommended to wait five years before starting hormone treatment to ensure no recurrence of the disease [2]. The breast cancer risk confirmed in the WHI certainly must be taken into account when deciding if the risk of treatment is worth the benefits as well as the increases in the risk of cardiovascular incidents, stroke, and thromboembolism. For women who have impaired liver function or acute current vascular disease, including embolus and thrombosis, hormone replacement is contraindicated. For women with migraines, the daily regimen of hormones may reduce the incidence of headaches by eliminating cyclic changes. Hypertension, diabetes, and varicose veins are not contraindications to hormone therapy in the perimenopausal period. Generally, fibroid tumors do not grow under the stimulation of hormone therapy; however, their surveillance by pelvic exam must be continued.

Progestins In 1976 the pathologic effect of unopposed estrogen on the uterine lining became known. Since that time progestins have been prescribed to offset this. The most commonly prescribed progestin has been medroxyprogesterone acetate (MPA), which is prescribed under the brand names Provera, Cycrin, and Amen. However, newer products have been introduced because many women who use MPA experience adverse side effects including breast tenderness, bloating, and depression or irritability. For decades, the standard dose for MPA was 10 mg. However, doses of 5 mg and 2.5 mg have also shown to be protective against pathologic changes in the endometrium when given daily or for 12 to 14 days a month. Days of exposure to a progestin have been shown to be more important than dose in protection of the lining.

Progestin products, some of which also contain estrogen, are listed in Table 13-2. The routes of administration and doses vary. The midwife should check in a recent drug reference book for accuracy of this information, remembering always to prescribe a progestin along with an estrogen product for a woman with an intact uterus. For women who have undergone a hysterectomy no progestin is needed.

Common practice now includes HRT prescribed as a continuous daily combination of both estrogen and a progestin. It is simpler to prescribe and for the woman to remember to take. For 80 percent of women, this way of prescribing leads to an atrophic endometrial lining and cessation of bleeding after one year. Breakthrough bleeding may be experienced by 40 to 60 percent of women during the first six months of continuous therapy. Management of such bleeding requires supporting the woman and providing explanations. Preparatory education and follow-up telephone support can often ease the situation. Although it may indeed be nothing more than a problem of missed pills, unscheduled bleeding with sequential dosing or bleeding after more than a year of amenorrhea with continuous dosing requires investigation with a pelvic exam and endometrial biopsy or transvaginal ultrasound to rule out pathology. The midwife trained to do endometrial biopsies passes a small instrument called a suction curette through the cervix to obtain a small amount of endometrial tissue. The biopsy determines the presence of proliferative endometrium, atrophic endometrium, hyperplasia, or neoplasia. It has been common practice for clinicians to perform biopsies prior to initiation of HRT to rule out pathology. However, it is not necessary to biopsy the endometrium prior to initiating hormone treatment [2] since abnormalities in asymptomatic women are very rare [252]. In order to limit pretreatment biopsies, only those women who are at risk for conditions associated with chronic estrogen exposure (obesity, dysfunctional uterine bleeding, anovulation or infertility, hirsutism, hepatic disease, and metabolic problems) should have biopsies prior to HRT use. Women on continuous combined therapy frequently experience early breakthrough bleeding during the first year of therapy. Women on sequential combined therapy have withdrawal bleeding, which is perceived as a period. Women who experience variation from either of these expected bleeding patterns need to be assessed.

Since progestins are not tolerated well by some women, they might elect to take unopposed estrogen. Women need to be informed or reminded of the increased risk of endometrial cancer accompanying this choice. Endometrial surveillance by biopsy or ultrasound at least once a year can be used to monitor women who decide to take unopposed estrogen.

Many women are particularly sensitive to medroxyprogesterone acetate (MPA), which is the progestin most commonly prescribed. Other progestin products now on the market include norethindrone, norethindrone acetate (NETA), norgestimate, and natural micronized progesterone. Some women experience fewer side effects from these alternatives. These options are listed in Table 13-2.

TABLE 13-2 Progestins

Medroxyprogesterone Acetate (MPA)	**Manufacturer**	**Route**	**Dose**
Provera	Pharmacia and Upjohn	Oral tablets	2.5, 5, 10 mg
Cycrin	ESI Lederle Generics	Oral tablets	2.5, 5, 10 mg
Amen	Carnrick Laboratories	Oral tablets	10 mg
PremPro (CEE[a] plus MPA)	Wyeth-Ayerst	Oral caplets in blister pack	0.625 mg CEE plus 2.5 mg MPA; 0.625 mg CEE plus 5 mg MPA
Premphase (CEE plus MPA)	Wyeth-Ayerst	Oral caplets in blister pack	0.625 mg CEE for first 14 days of pill pack and 0.625 mg CEE plus 5 mg MPA next 14 days of pill pack
Micronized Progesterone	**Manufacturer**	**Route**	**Dose**
Prometrium	Solvay	Oral tablets	100 mg BID for 12 consecutive days each cycle
Norethindrone	**Manufacturer**	**Route**	**Dose**
Activella	Pharmacia and Upjohn	Oral tablets	1 mg E[b] plus 0.5 mg norethindrone
Norethindrone Acetate (NETA)	**Manufacturer**	**Route**	**Dose**
Combipatch	Aventis/Novartis	Transdermal patch	0.05 mg E plus 0.14 mg NETA; 0.05 mg EE[c] plus 0.25 NETA
FemHRT	Pfizer	Oral tablets	5 mcg EE plus 1 mg NETA
Norgestimate	**Manufacturer**	**Route**	**Dose**
OrthoPrefest	Ortho-McNeil	Oral tablets in blister pack (pulsed dosage)	3 days of 1 mg E (pink pills) followed by 3 days of combined 1 mg E plus 0.09 mg norgestimate

[a] Conjugated equine estrogens.
[b] Estradiol.
[c] Ethinyl estradiol.

It has been well established that testosterone is an important determinant of female sexuality and that low circulating levels of testosterone are associated with diminished libido [107]. Estrogen replacement improves vasomotor symptoms, such as vaginal dryness and general well-being, which can affect sexuality; it has no direct effect on libido. The addition of testosterone to a hormone replacement regimen can result in improvement in several aspects of sexuality in a postmenopausal woman [106]. Unfortunately, dose guidelines have not been established for these products. Androgen replacement may be indicated when a woman has undergone a surgical menopause, or menopause induced by chemotherapy or radiation, or has low serum testosterone levels. Use of androgen replacement may be appropriate when use of ERT/HRT has not been effective in treating sexual issues and reduced libido cannot be attributed to other factors [253]. These benefits must be weighed against virilizing effects and possible adverse changes in lipid profiles. Testosterone replacement, however, appears to be safe as long as dosages are restricted to the normal physiologic range so that the benefits are achieved

without the risks [107]. Contraindications include current or previous breast cancer, uncontrolled hyperlipidemia, liver disease, acne, or hirsutism [254]. Products on the U.S. market include fluoxymesterone (Halotestin/Upjohn) which comes in doses of 2, 5, and 10 mg. Estratest and Estratest HS include methyltestosterone in doses of 2.5 mg and 1.25 mg, respectively.

Sleep Remedies

Avoidance of caffeine, alcohol, and stressful activities prior to bedtime may help. Daily exercise, a regular bedtime, a warm bath in the evening, or having a glass of milk or yogurt just before sleep can also be helpful.

For women who suffer sleep disturbances related to hot flashes, several preparations may be helpful [255, 256]. Serotonin is synthesized from tryptophan, an essential amino acid that has been shown to promote restful sleep. Good sources of tryptophan are milk and chamomile tea. Valerian root is used in traditional medicine for hot flashes when related to sleep. Because of its bitter taste, it is more palatable when taken in capsule form. Estrogen therapy has also been found to greatly improve sleep patterns [257]. Taking oral estrogen preparations at night can often lead to significant improvement in sleep disturbances and have a positive cascade effect on a woman's subjective quality of life. Fortunately, severe sleep changes most often resolve after a period of six to twelve months.

Calcium Supplementation

The best source of calcium for optimal nutritional benefits is supplied by foods incorporated into a balanced diet. Low-fat or nonfat dairy products are the best sources but fortified foods and calcium supplements can help achieve the target goal of 1500 mg daily plus 400 to 800 IU of vitamin D [258]. The National Osteoporosis Foundation recommends pharmacological treatment of all postmenopausal women with "T" scores below 2.0 and those with "T" scores below 1.5 plus risk factors for osteoporosis [258]. For the same level of BMD, the fracture risk is much greater in older than younger women [234]. While older women with low bone mineral density (BMD) and a history of osteoporotic fracture should be treated pharmacologically, the management is much less clear for other patients [221].

In the United States, the most common supplement is calcium carbonate, the active ingredient in Os-Cal, Caltrate, Tums, and the generic oyster shell preparations. Some reports have claimed that calcium citrate has better absorption [259], but most show that absorbability of calcium carbonate is very nearly the same [260].

The calcium dose should be administered in divided doses with meals because this is the normal way nutrients enter the body. Bedtime is an optimal time to take calcium to allow absorption during the sleeping hours. Side effects of calcium supplementation can include constipation and flatulence. Vitamin D deficiencies are found in women over the age of 70 so supplements are recommended for elderly populations [261]. The same holds true for women who live in climates with long cloudy winters with little opportunity for sun exposure [262].

The Menopause as Opportunity

The climacteric is a time, similar to pregnancy, when women often present to the health care system for help with changes, to gain knowledge of the processes occurring, and for routine health care. Midwives who care for women at midlife have the opportunity to offer preventive care, health screening, disease identification and treatment, maintenance of continuity of care, appropriate referrals, and supervision of cost-effective care. Menopause is a time to engage women in the health care system. In doing so it is possible to prolong the period of optimal physical, mental, and social activity, and to minimize handicaps and discomfort from the onset of chronic conditions [92]. Midwives can develop an individualized preventive health program for every midlife woman they care for. As primary care practitioners, midwives have an opportunity to provide leadership in the delivery of holistic, women-centered health care to women as they age and to influence society to accept more responsibility for the humane treatment of its aging population.

Finally, women of *all* ages hold the wonder and mystery of the universe. As health care providers to women, midwives can offer support to, and hold genuine appreciation of, the journey that women traverse from the climacteric through old age and celebrate each woman's strengths, struggles, decisions, and accomplishments. It is the women and what they give back to midwives that make participating in health care so golden.

References

1. Hammond, C. B. Menopause and hormone replacement therapy: an overview. *Obstet. Gynecol.* 87(2S):S2, 1996.
2. Speroff, L., Glass, R. H., and Kase, N. G. *Clinical Gynecologic Endocrinology and Infertility*, 6th ed. Philadelphia, PA: Lippincott Williams and Wilkins, 1999.
3. Lock, M. Contested meanings of the menopause. *Lancet* 337(8752):1270, 1991.
4. Gilligan, C. *In a Different Voice: Psychological Theory and Women's Development*. Cambridge, MA: Harvard University Press, 1982.
5. McKinlay, S. M., and McKinlay, J. B. Aging in a "healthy" population. *Soc. Sc. Med.* 23(5):531–535, 1986.
6. Whelan, E. A., Sandler, D. P., McConnaughey, D. R., and Weinberg, C. R. Menstrual and reproductive characteristics and age at natural menopause. *Am. J. Epidemiol.* 131(4):625, 1990.
7. Brambilla, D. J., and McKinlay, S. M. A prospective study of factors affecting age at menopause. *J. Clin. Epidemiol.* 42(11):1031, 1989.
8. Coulam, C. B, Adamson, S. C., and Annegers, J. F. Incidence of premature ovarian failure. *Obstet. Gynecol.* 67(4):604, 1986.
9. Siddle, N., Sarrel, P., and Whitehead, M. I. The effect of hysterectomy on the age at ovarian failure: identification of a subgroup of women with premature loss of ovarian function and literature review. *Fertil. Sterility* 47(1):94, 1987.
10. Testa, G., Chiaffarino, F., Vegetti, W., et al. Case-control study on risk factors for premature ovarian failure. *Gynecol. Obstet. Invest.* 51(1):40, 2001.
11. Neugarten, B. L., and Kraines, R. J. Menopausal symptoms in women of varying ages. *Psychosom. Med.* 27:266, 1965.
12. Notman, M. T. Menopause and adult development. In Flint, M., Kronenberg F., and Utian W. (Eds.) *Annals of the New York Academy of Sciences*. New York: New York Academy of Sciences, 1990, p. 149.
13. Benedek, T. The climacterisms as a developmental phase. *Psychosom. Q.* 19:1, 1950.
14. Bart, P., and Grossman, M. The woman patient. In Notman, M., and Nadelson, C. (Eds.) *Menopause*. New York: Plenum, 1990, p. 337.
15. Lock, M. Menopause: lessons from anthropology. *Psychosom. Med.* 60(4):410, 1998.
16. McKinlay, S. M., and McKinlay, J. B. Selected studies of the menopause. *J. Biosoc. Sci.* 5(4):533, 1973.
17. Kaufert, P. A., and Syrotuik, J. Symptom reporting in the menopause. *Soc. Sci. Med.* 15(3):173, 1981.
18. Kaufert, P. A., Gilbert, P., and Hassard, T. Researching the symptoms of menopause: an exercise in methodology. *Maturitas* 10(2):117, 1988.
19. Lock, M. Ambiguities of aging: Japanese experience and perceptions of aging. *Cult. Med. Psychiatry* 10(1):23, 1986.
20. Flint, M. The menopause: reward or punishment? *Psychomatics* 16(4):161, 1975.
21. Smith-Rosenberg, C. Puberty to menopause: the cycle of femininity in nineteenth-century America. *Feminist Stud.* 1:58, 1973.
22. MacPherson, K. I. Nurse-researchers respond to the medicalization of menopause. In Flint, M., Kronenberg, F., and Utian, W. (Eds.) *Annals of the New York Academy of Sciences*. New York: New York Academy of Sciences, 1990, p. 180.
23. Bell, S. E. Sociological perspectives on the medicalization of menopause. *Annals of the New York Academy of Sciences*, June 13, 1990, p. 173.
24. Zola, I. D. Medicine as an institution of social control. *Sociol. Rev.* 20:487, 1972.
25. Wilson, R. A. *Feminine Forever*. New York: M. Evans/J. B. Lippincott, 1966.
26. Ziel, H. K., and Finkle, W. D. Increased risk of endometrial carcinoma among users of conjugated estrogens. *N. Eng. J. Med.* 293(23):1167, 1975.
27. Weiss, N. S., Szekely, D. R., and Austin, D. F. Increasing incidence of endometrial cancer in the United States. *N. Eng. J. Med.* 294(23):1259, 1976.
28. Mack, T. M., Pike, M. C., Henderson, B. E., et al. Estrogens and endometrial cancer in a retirement community. *N. Eng. J. Med.* 294(23):1262, 1976.
29. Kaufert, P., and McKinlay, S. Estrogen replacement therapy: the production of medical knowledge and the emergence of policy. In Lewin E., Oleson Y. V. (Eds.) *Women, Health, and Healing*. New York: Tavistock, 1985, p. 113.
30. Ehrenreich, F., and English, D. *For Her Own Good: 150 Years of Experts' Advice to Women*. New York: Doubleday/Anchor, 1978.
31. Doress-Worters, P. B., and Laskin Siegal, D. Experiencing our change of life: menopause. In

Doress-Worters, P. B., and Laskin Siegal, D. (Eds.) *The New Ourselves Growing Older*. New York: Simon and Schuster, 1994, p. 118.

32. Lock, M. Cultural construction of the menopausal syndrome: the Japanese case. *Maturitas* 10(4):317, 1988.

33. Wright, P., and Treacher, A. *The Problem of Medical Knowledge: Examining the Social Construction of Medicine*. Edinburgh, Scotland: University of Edinburgh University Press, 1982.

34. Weiss, K. M. Evolutionary perspectives on aging. In Amoss, P. T., and Harrell, S. (Eds.) *Other Ways of Growing Old*. Stanford, CA: Stanford University Press, 1981. p. 31.

35. Kaufert, P. A., and Lock, M. Medicalization of women's third age. *J. Psychosom. Obstet. Gynecol.* 18(2):81, 1997.

36. Ganesan, K., Teklehaimanot, S., and Norris, K. Estrogen replacement therapy use in minority postmenopausal women. *Ethnicity Dis.* 10(2):257, 2000.

37. Bastian, L. A., Couchman, G. M., Rimer, B. K., McBride, C. M., Feaganes, J. R., and Siegler, I. C. Perceptions of menopausal stage and patterns of hormone replacement therapy use. *J. Womens Health* 6(4):467, 1997.

38. Harris, R. B., Laws, A., Reddy, V. M., King, A., and Haskell, W. L. Are women using postmenopausal estrogen? A community survey. *Am. J. Public Health* 80(1):1266, 1990.

39. Handa, V. L., Landerman, R., Hanlon, J. T., Harris, T., and Cohen, H. J. Do older women use estrogen replacement? Data from the Duke Established Populations for Epidemiologic Studies of the Elderly (EPESE). *J. Am. Geriatr. Soc.* 44(1):1, 1996.

40. Ravnikar, V. A. Compliance with hormone therapy. *Am. J. Obstet. Gynecol.* 156(5):1332, 1987.

41. Samsioe, G. Hormone replacement therapy: aspects of bleeding problems and compliance. *Int. J. Fertil. Menopausal Stud.* 41(1):11, 1996.

42. Rothert, M., Rovner, D., Holmes, M., et al. Women's use of information regarding hormone replacement therapy. *Res. Nurs. Health* 13(6):355, 1990.

43. Matthews, K. A., Kuller, L. H., Wing, R. R., Meilahn, E. N., and Plantinga, P. Prior to use of estrogen replacement therapy, are users healthier than nonusers? *Am. J. Epidemiol.* 143(10):971, 1996.

44. Rosenberg, L., Palmer, J. R., and Shapiro, S. A case-control study of myocardial infarction in relation to use of estrogen supplements. *Am. J. Epidemiol.* 137(1):54, 1993.

45. Rousseau, M. E., and McCool, W. F. The menopausal experience of African American women: overview and suggestions for research. *Health Care Women Int.* 18(3):233, 1997.

46. Fletcher, S. W., and Colditz, G. A. Failure of estrogen plus progestin therapy for prevention. *JAMA* 288(3): 366–368, 2002.

47. Speroff, T., Dawson, N. V., Speroff, L., and Haber, R. J. A risk-benefit analysis of elective bilateral oophorectomy: effect of changes in compliance with estrogen therapy on outcome. *Am. J. Obstet. Gynecol.* 164(1 Pt. 1):165, 1991.

48. Longcope, C. The endocrinology of the menopause. In Lobo, R. A. (Ed.) *Treatment of the Postmenopausal Woman*. New York: Raven, 1994, p. 47.

49. Richardson, S. J., Senikas, V., and Nelson, J. F. Follicular depletion during the menopausal transition: evidence for accelerated loss and ultimate exhaustion. *J. Clin. Endocrinol. Metab.* 65(6):1231, 1987.

50. Treloar, A. E., Boynton, R. E., Behn, B. G., and Borown, B. W. Variation of the human menstrual cycle through reproductive life. *Int. J. Fertil.* 12(1):77, 1970.

51. Buckler, H. M., Evans, C. A., Mamtora, H., Burger, H. G., and Anderson, D. C. Gonadotropin, steroid and inhibin levels in women with incipient ovarian failure during anovulatory and ovulatory "rebound" cycles. *J. Clin. Endocrinol. Metab.* 72(1):116, 1991.

52. Chang, R. J., Plouffe, L., and Schaffer, K. Physiology of the menopause. In Lorrain J., Plouffe, L. J., Ravnikar V., Speroff L., and Watts, N. (Eds.) *Comprehensive Management of the Menopause*. New York: Springer-Verlag, 1993, p. 3.

53. Procope, B. J. Urinary excretion of oestrogens and the oestrogenic effect in vaginal smears in post-menopausal women with uterine bleeding. *Acta Obstet. Gynecolog. Scan.* 49(3):242, 1970.

54. Baird, D. T., and Fraser, I. S. Blood production and ovarian secretion rates of estradiol-17 beta and estrone in women throughout the menstrual cycle. *J. Clin. Endocrinol. Metab.* 38(6):1009, 1974.

55. Lloyd, C. W., Lobotsky, J., Weisz, J., et al. Concentration of unconjugated estrogens, and rogens and gestagens in ovarian and peripheral venous plasma of women: the normal menstrual cycle. *J. Clin. Endocrinol. Metab.* 32(2):155, 1971.

56. Judd, H. L., Judd, G. E., Lucas, W. F., and Yen, S. S. C. Endocrine function of the postmenopausal ovary: concentration of androgens and estrogens in ovarian and peripheral vein blood. *J. Clin. Endocrinol. Metab.* 39(6):1020, 1974.

57. Judd, H. L. Hormonal dynamics associated with the menopause. *Clin. Obstet. Gynecol.* 19(4):775–788, 1976.

58. Meldrum, D. R., Davidson, B. J., Tataryn, I. V., and Judd, H. L. Changes in circulating steroids with aging in postmenopausal women. *Obstet. Gynecol.* 57(5):624, 1981.

59. Cauley, J. A., Gutai, J. P., Kuller, L. H., LeDonne, D., and Powell, L. H. The epidemiology of serum sex hormones in postmenopausal women. *Am. J. Epidemiol.* 129(6):1120–1131, 1989.

60. Grodin, J. M., Siiteri, P. K., and MacDonald, P. C. Source of estrogen production in postmenopausal women. *J. Clin. Endocrinol. Metab.* 36(2):201–214, 1973.

61. Judd, H. L., Shamonki, I. M., Frumar, A. M., and Lagasse, L. D. Origin of serum estradiol in postmenopausal women. *Obstet. Gynecol.* 59(6):680–686, 1982.

62. Cauley, J. A., Gutai, J. P., Kuller, L. H., LeDonne, D., and Powell, J. G. The epidemiology of serum sex hormones in postmenopausal women. *Am. J. Epidemiol.* 129(6):1120–1131, 1989.

63. Smith, K. E., and Judd, H. L. Menopause and postmenopause. In DeCherney A. H., and Pernoll, M. L. (Eds.) *Current Obstetric and Gynecologic Diagnosis and Treatment*. Norwalk, CT: Appleton and Lange, 1994, pp. 1030–1050.

64. Seltzer, V. L., Benjamin, F., and Deutsch, S., Perimenopausal bleeding patterns and pathologic findings. *J. Am. Med. Womens Assoc.* 45(4):132–134, 1990.

65. Kronenberg, F. Hot flashes: epidemiology and physiology. In Flint, M., Kronenberg, F., and Utian, W. (Eds.) *The Annals of the New York Academy of Sciences*. New York: New York Academy of Sciences, 1990, p. 52–56.

66. Utian, W. H. The true clinical features of postmenopause and oophorectomy, and their response to oestrogen therapy. *S. Afr. Med. J.* 46(23):732–737, 1972.

67. Sherman, B. M., Wallace, R. B., Bean, J. A., Chang, Y., and Schlabaugh, L. The relationship of menopausal hot flushes to medical and reproductive experience. *J. Gerontol.* 36(3):306–309, 1981.

68. McKinlay, S. M., and Jefferys, M. The menopausal syndrome. *Br. J. Prev. Soc. Med.* 28(2):108–115, 1974.

69. McKinlay, S. M., Bifano, N. L., and McKinlay, J. B. Smoking and age at menopause in women. *Ann. Intern. Med.* 103(3):350–356, 1985.

70. Blumenthal, M., Busse, W. R., Goldberg, A., et al. (Eds.) *The Complete German Commission E Monographs—Therapeutic Guide to Herbal Medicines*. Austin, TX: Botanical Council/ Integrative Medical Communications, 1998.

71. Copp, H. M. *Phytoestrogen and menopause: what do we know?* Master's thesis. New Haven, CT: Yale University, 2001.

72. Murkies, A. L., Wilcox, G., and Davis, S. R. Clinical review 92: phytoestrogens. *J. Clin. Endocrinol. Metab.* 83(2):297–303, 1998.

73. Warren, M. P., and Ramos, R. H. Alternative therapies to hormone replacement therapy. In Lobo, R. A., Kelsey, J. L., and Marcus, R. (Eds.) *Menopause: Biology and Pathobiology*. San Diego, CA: Academic Press, 2000, pp. 459–480.

74. Regestein, Q. Menopausal aspects of sleep disturbance. In Lorraine, J., Plouffe, L. J., Ravnikar, V., Speroff, L., and Watts, N. (Eds.) *Comprehensive Management of the Menopause*. New York: Springer-Verlag, 1993, pp. 358–366.

75. Samsioe, G. The gynourinary system. In Lobo, R. A., Kelsey, J. L., and Marcus, R. (Eds.) *Menopause, Biology and Pathobiology*. San Diego, CA: Academic Press, 2000, pp. 327–338.

76. Samsioe, G., Heraib, F., Lidfeldt, J., et al. Urogenital symptoms in women aged 50–59 years. Women's Health in Lund Area (WHILSA) Study Group. *Gynecol. Endocrinol.* 13(2):113–117, 1999.

77. Dennerstein, L., Smith, A. M., and Morse, C., Psychological well-being, mid-life and the menopause. *Maturitas* 20(1):1–11, 1994.

78. Avis, N. E. The Massachusetts Women's Health Study: an epidemiologic investigation of the menopause. *J. Am. Womens Med. Assoc.* 50(2):45–63, 1995.

79. Koster, A. Change of life anticipations, attitudes and experiences among middle-aged Danish women. *Health Care Women Int.* 12(1):1–13, 1991.

80. Matthews, K. A., Wing, R. R., Kuller, L. H., et al. Influences of natural menopause on psychological characteristics and symptoms of middle-aged health women. *J. Consult. Clin. Psychol.* 58(3):345–351, 1990.

81. Ballinger, S. Stress as a factor in lowered estrogen levels in the early postmenopause. In Flint, M., Kronenberg, F., and Utian, W. (Eds.) *Multidisciplinary Perspective on Menopause*. New York: New York Academy of Sciences, 1990, pp. 95–113.

82. McKinlay, J. B., McKinlay, S. M., and Brambilla, D. J. Health status and utilization behavior associated with menopause. *Am. J. Epidemiol.* 125(1):110, 1987.

83. Morse, C. A., Smith, A., Dennerstein, L., Green, A., Hopper, J., and Burger, H. The treatment-seeking woman at menopause. *Maturitas* 18(3):161–173, 1994.

84. Kaufert, P. A., Gilbert, P., and Tate, R. The Manitoba Project: a re-examination of the link between menopause and depression. *Maturitas* 14(2):143–155, 1992.

85. Studd, J. Oestrogens and depression. *Br. J. Hosp. Med.* 48(5):211–213, 1992.

86. Spinelli, M. G. Antepartum and postpartum depression. *J. Gender-Specific Med.* 1(2):33–36, 2000.

87. Rausch, J. L. Psychobiological aspects of the menopause. In Plouffe, L. J., Ravnikar, V. L. S., and Watts, N. (Eds.) *Comprehensive Management of the Menopause*. New York: Springer-Verlag, 1993, pp. 318–326.

88. Wing, R. R., Matthews, K. A., Kuller, L. H., Meilahn, E. N., and Plantinga, P. L. Weight gain at the time of menopause. *Arch. Intern. Med.* 151(1):97–102, 1991.

89. Lindquist, O. Intraindividual changes of blood pressure, serum lipids, and body weight in relation to menstrual status: results from a prospective population study of women in Goteborg, Sweden. *Prev. Med.* 11(2):162–172, 1982.

90. Kannel, W. B., Cupples, L. A., Ramaswami, R., Stokes, J. III, Kreger, B. E., and Higgins, M. Regional obesity and risk of cardiovascular disease: the Framingham Study. *J. Clin. Epidemiol.* 44(2):183–190, 1991.

91. Weisweiler, P. Plasma lipoproteins and lipase and lecithin: cholesterol acyltransferase activities in obese subjects before and after weight reduction. *J. Clin. Endocrinol. Metab.* 65(5):969–973, 1987.

92. Byyny, R. L., and Speroff, L. *A Clinical Guide for the Care of Older Women*. 2nd ed. Baltimore, MD: Williams and Wilkins, 1996.

93. Cote, J. Skin care and abnormal lesions. In Lorrain, J., Plouffe, L., Ravnikar, V., Speroff, L., and Watts, N. (Eds.) *Comprehensive Management of the Menopause*. New York: Springer-Verlag, 1993, pp. 351–357.

94. Orentreich, N., Markofshy, J., and Vogelman, J. H. The effect of aging on the rate of linear nail growth. *J. Invest. Dermatol.* 73(1):126–130, 1979.

95. Kechijian, P. Brittle fingernails. *Dermatol. Clin.* 3(3):421–429, 1985.

96. Colombo, V. E. Treatment of brittle fingernails and onychoschizia. *J. Am Acad. Dermatol.* 23(6):1127–1132, 1990.

97. Lapka, D. V. Skin cancer. *RN* 63(7):32–40, 2000.

98. Goldman, G. D. Squamous cell cancer: a practical approach. *Semin. Cutan. Med. Surg.* 17(2):80, 1998.

99. Kinsey, A. C. *Sexual Behavior in the Human Female, by the Staff of the Institute for Sex Research*. Philadelphia, PA: Saunders, 1953.

100. Nachtigall, L. E. Sexual function in the menopause and postmenopause. In Lobo, R. A. (Ed.) *Treatment of the Postmenopausal Woman: Basic and Clinical Aspects*. New York: Raven, 1994, pp. 301–306.

101. Dennerstein, L., Dudley, E. C., Hopper, J. L., and Burger, H. Sexuality, hormones and the menopausal transition. *Maturitas* 26(2):83–93, 1997.

102. Pariser, S. F., and Neidermier, J. A. Sex and the mature woman. *J. Womens Health* 7(7):849–859, 1998.

103. Bachman, G. A., Burd, I. D., and Ebert, G. A. Menopausal sexuality. In Lobo, R. A., Kelsey, J. L., and Marcus, R. (Eds.) *Menopause: Biology and Pathobiology*. San Diego, CA: Academic Press, 2000, pp. 383–393.

104. Greendale, G. A., Lee, N. P., and Arriola, E. R. The menopause. *Lancet* 353(9152):571–580, 1999.

105. Sarrel, P., Dobay, B., and Wiita, B. Estrogen and estrogen-androgen replacement in postmenopausal women dissatisfied with estrogen-only therapy. Sexual behavior and neuroendocrine responses. *J. Reprod. Med.* 43(10):847–856, 1998.

106. Sherwin, B. B., and Gelfand, M. M. The role of androgen in the maintenance of sexual functioning in oophorectomized women. *Psychosom. Med.* 49(4):397–409, 1987.

107. Davis, S. R. Androgen treatment in women. *Med. J. Aust.* 170(11):545–549, 1999.

108. Gordon, L. R. *A Provider's Guide to the Assessment and Treatment of Sexual Health Throughout the Climacteric*, Master's Thesis. New Haven, CT: Yale University, 2001.

109. Lewis, C. E. Sexual practices: are physicians addressing the issues? *J. Gen. Intern. Med.* 5(5 suppl.):S78–81, 1990.

110. Hueston, W. J. Thyroid disease. In: Rosenfeld J. A. (Ed.) *Women's Health in Primary Care.* Baltimore, MD: Williams and Wilkins, 1997, pp. 617–631.

111. Francis, T., and Wartofsky, L. Common thyroid disorders in the elderly. *Postgrad. Med.* 92(3):225–230, 1992.

112. Landis, S. H., Murray, T., Bolden, S., and Wingo, P. A. Cancer statistics. *CA Cancer J. Clin.* 48(3):6–29, 1998.

113. Colditz, G. A. Relationship between estrogen levels, use of hormone replacement therapy, and breast cancer. *J. Natl. Cancer Inst.* 90(11):814–823, 1998.

114. Cummings, S. R., Eckert, S., Drueger, K. A., et al. The effect of raloxifene on breast cancer in postmenopausal women: results from the MORE Randomized Trial. *JAMA* 281(23):2189–2197, 1999.

115. Rosner, B., and Colditz, G. A. Nurses' Health Study: log-incidence mathematical model of breast cancer incidence. *J. Natl. Cancer Inst.* 88(6):359–364, 1996.

116. Colditz, G. A., and Frazier, A. L. Models of breast cancer show that risk is set by events of early life: prevention efforts must shift focus. *Cancer Epidemiol. Biomarkers Prev.* 4(5):567–571, 1995.

117. Cauley, J. A., Lucas, F. L., Kuller, L. H., Stone, K., Browner, W., and Cummings, S. R. Elevated serum estradiol and testosterone concentrations are associated with a high risk for breast cancer. *Ann. Intern. Med.* 130(4):270–277, 1999.

118. Hankinson, S. E., Willett, W. C., Manson, J. E., et al., Plasma sex steroid hormone levels and risk of breast cancer in postmenopausal women. *J. Natl. Cancer Inst.* 90(17):1292–1299, 1998.

119. Hankinson, S. E., Willett, W. C., Manson, J. E., et al. Alcohol, height, and adiposity in relation to estrogen and prolactin levels in postmenopausal women. *J. Natl. Cancer Inst.* 87(17):1297–1302, 1995.

120. Thomas, H. V., Key, T. J., Allen, D. S., et al. Re: reversal of relation between body mass and endogenous estrogen concentrations with menopausal status. *J. Natl. Cancer Inst.* 89(5):396–398, 1997.

121. Willett, W. C., Browne, M. L., Bain, C. Relative weight and risk of breast cancer among premenopausal women. *Am. J. Epidemiol.* 122(5):731–739, 1985.

122. Ziegler, R. G., Hoover, R. N., Nomura, A. M., et al. Relative weight, weight change, height, and breast cancer risk in Asian-American women. *J. Natl. Cancer Inst.* 88(10):650–660, 1996.

123. Negri, E., La Vecchia, C. L., Bruzzi, P., et al. Risk factors for breast cancer: pooled results from three Italian case-control studies. *Am. J. Epidemiol.* 128(6):1207–1215, 1988.

124. London, S. J., Colditz, G. A., Stampfer, M. J., Willett, W. C., Rosner, B., and Speizer, F. E. Prospective study of relative weight, height, and risk of breast cancer. *JAMA* 262(20):2853–2858, 1989.

125. Ballard-Barbash, R., Schatzkin, A., Carter, C. L., et al. Body fat distribution and breast cancer in the Framingham Study. *J. Natl. Cancer Inst.* 82(4):286–290, 1990.

126. Tretli, S. Height and weight in relation to breast cancer morbidity and mortality. A prospective study of 570,000 women in Norway. *Int. J. Cancer* 44(1):23–30, 1989.

127. Huang, Z., Hankinson, S. E., Colditz, G. A., et al. Dual effects of weight and weight gain on breast cancer. *JAMA* 278(17):1407–1411, 1997.

128. Anonymous. Breast cancer and hormone replacement therapy. Combined reanalysis of data from 51 epidemiologic studies involving 52,705 women with breast cancer and 108,411 women without breast cancer. Collaborative Group on Hormonal Factors in Breast Cancer. *Lancet* 350(9084):1047–1059, 1997.

129. Writing Group for the Women's Health Initiative Investigators. Risks and benefits of estrogen plus progestin in healthy postmenopausal women: principal results from the Women's Health Initiative randomized controlled trial. *JAMA* 288(3):321–333, 2002.

130. Langenberg, P., Kjerulff, K. H., and Stolley, P. D. Hormone replacement and menopausal symptoms following hysterectomy. *Am. J. Epidemiol.* 146(10):870–880, 1997.

131. Barrett-Connor, E. Postmenopausal estrogen and the risk of breast cancer. *Ann. Epidemiol.* 4(3):177–180, 1994.

132. Longcope, C., Crawford, S., and McKinlay, S. Endogenous estrogens: relationship between estrone, estradiol, non-protein bound estradiol, and hot flashes and lipids. *Menopause* 3:77–84, 1996.

133. Mango, D., Scirpa, P., Battaglia, F., and Bini, E. Plasma androstenedione and oestrone levels in the climacteric syndrome. *Maturitas* 5(4):245–250, 1984.

134. Erlik, Y., Meldrum, D. R., Judd, H. L. Estrogen levels in postmenopausal women with hot flashes. *Obstet. Gynecol.* 59(4):403–407, 1982.

135. Bauer, D. C., Browner, W. S., Cauley, J. A., Orwoll, E. S., Scott, J. C., and Black, D. M. Factors associated with appendicular bone mass in older women. The Study of Osteoporotic Fractures Research Group. *Ann. Intern. Med.* 118(9):657–665, 1993.

136. Gambrell, R. D. J., Maier, R. C., and Sanders, B. I. Decreased incidence of breast cancer in postmenopausal estrogen-progestogen users. *Obstet. Gynecol.* 62(4):435–443, 1983.

137. Bergkvist, L., Adami, H.-O., Persson, I., Hoover, R., and Schairer, C. The risk of breast cancer after estrogen and estrogen progestin replacement. *N. Eng. J. Med.* 321:293–297, 1989.

138. Colditz, G. A., Egan, K. M., and Stampfer, M. J. Hormone replacement therapy and risk of breast cancer: results from epidemiologic studies. *Am. J. Obstet. Gynecol.* 168:1473–1480, 1993.

139. Carpenter, J. S., Andrykowski, M. A., Cordova, M., et al. Hot flashes in postmenopausal women treated for breast carcinoma: prevalence, severity, correlates, management and relation to quality of life. *Cancer* 82(9):1682–1691 (May 1) 1998.

140. Canney, P. A., and Hatton, M. Q. The prevalence of menopausal symptoms in patients treated for breast cancer. *Clin. Oncol.* 6(5):297–299, 1994.

141. Couzi, R. J., Helzlsouer, K. J., and Fetting, J. H. Prevalence of menopausal symptoms among women with a history of breast cancer and attitudes toward estrogen replacement therapy. *J. Clin. Oncol.* 13(11):2737–2744, 1995.

142. DiSaia, P. J., Grosen, E. A., Kurosaki, T., Gildea, M., Cowan, B., and Anton-Culver, H. Hormone replacement therapy in breast cancer survivors: a cohort study. *Am. J. Obstet. Gynecol.* 174(5):1495–1498, 1996.

143. Natrajan, P. K., Soumakis, K., Gambrell, D. R. Estrogen replacement therapy in women with previous breast cancer. *Am. J. Obstet. Gynecol.* 181(2):288–295, 1999.

144. Speroff, L. Postmenopausal hormone therapy and the risk of breast cancer. *Maturitas* 32(3):123–129, 1999.

145. McCool, W. F., Stone-Condry, M., and Bradford, H. M. Breast health care. A review. *J. Nurse-Midwifery* 43(6):406, 1998.

146. Wenger, N. K., Speroff, L., and Packard, B. Cardiovascular health and disease in women. *N. Eng. J. Med.* 329(4):247–256, 1993.

147. Kannel, W. B. Metabolic risk factors for coronary heart disease in women: perspective from the Framingham Study. *Am. Heart J.* 114(2):413–419, 1987.

148. Bradsher, J. E., and McKinlay, S. M. Distinguishing the effects of age from those of menopause. In Lobo, R. A., Kelsey, J. L., and Marcus, R. (Eds.) *Menopause: Biology and Pathobiology*. San Diego, CA: Academic Press, 2000, pp. 203–211.

149. Rostosky, S. S., Travis, C. B. Menopause research and the dominance of the biomedical model. *Psychol. Womens Q.* 20:285–312, 1996.

150. McKinlay, J. B. Some contributions from the social system to gender inequalities in heart disease. *J. Health Soc. Behav.* 37(1):1–26, 1996.

151. Crawford, S. L., McKinlay, J. B., and McKinlay, S. M. *Is the Midlife Increase in Coronary Heart Disease in Women Attributable to Menopause or Normal Aging?* Paper delivered at the annual meeting of the American Public Health Association/ Epidemiology Section, San Diego, 1995.

152. Matthews, K. A., Meilahn, E. N., Kuller, L. H., Kelsey, S. F., Caggiula, A. W., and Wing, R. R. Menopause and risk factors for coronary heart disease. *N. Eng. J. Med.* 321(10):641–646, 1989.

153. Mosca, L., Manson, J. E., Sutherland, S. E., Langer, R. D., Manolio, T., and Barrett-Connor, E. Cardiovascular disease in women: a statement for health care professionals from the American Heart Association. *Circulation* 96(7):2468–2482, 1997.

154. Andersen, L. F., Gram, J., Skouby, S. O., and Jespersen, J. Effects of hormone replacement therapy on hemostatic cardiovascular risk factors. *Am. J. Obstet. Gynecol.* 180(2):283–289, 1999.

155. Kamali, P., Muller, T., Lang, U., and Clapp, J. F. Cardiovascular responses of perimenopausal women to hormonal replacement therapy. *Am. J. Obstet. Gynecol.* 182(1 (pt. 1):17–22, 2000.

156. Fuster, V., Fallon, J. T., and Nemerson, Y. Coronary thrombosis. *Lancet* 348(suppl. 1):s7–10, 1996.

157. Hulley, S., Grady, D., Bush, T., et al. Randomized trial of estrogen plus progestin for secondary prevention of coronary heart disease in postmenopausal women. *JAMA* 280(7):605–613, 1998.

158. Daly, E., Vessey, M. P., Hawkins, M. M., Carson, J. L., Gough, P., and Marsh, S. Risk of venous thromboembolism in users of hormone replacement therapy. *Lancet* 348(9033):977–980, 1996.

159. Grodstein, F., Stampfer, M. J., and Goldhaber, S. Z. Prospective study of exogenous hormones and risk of pulmonary embolism among users of postmenopausal oestrogens. *Lancet* 348(9033):1668, 1996.

160. Jick, H., Derby, L. E., Myers, M. W., Vasilakis, C., and Newton, K. M. Risk of hospital admission for idiopathic venous thromboembolism among users of postmenopausal oestrogens. *Lancet* 348(9033):981–983, 1996.

161. Gutthann, S. P. Hormone therapy and risk of venous thromboembolism: population based case-control study. *Br. Med. J.* 314(7083):796–800, 1997.

162. Oparil, S. Hormones and vasoprotection. *Hypertension* 33(1S suppl.):170–176, 1999.

163. Barrett-Connor, E., Wiongard, D. L., and Crique, M. H. Postmenopausal estrogen use and heart disease risk factors in the 1980s. *JAMA* 261(14):2095–2100, 1989.

164. Rossouw, J. E. Estrogens for prevention of coronary heart disease; putting the brakes on the bandwagon. *Circulation* 94(11):2982–2985, 1996.

165. Herrington, D. M. The HERS trial results: paradigms lost? *Ann. Intern. Med.* 131(6):463–466, 1999.

166. Mosca, L., Grundy, S. M., Judelson, J., King, K., et al. Guide to preventive cardiology for women. *Circulation* 99(18):2480–2484, 1999.

167. Grodstein, F, Postmenopausal hormone therapy and mortality. *N. Engl. J. Med.* 336(25):1769–1775, 1997.

168. The Writing Group for the PEPI Trial. Effects of estrogen or estrogen/progestin regimens on heart disease risk factors in postmenopausal women. *JAMA* 273(3):199–206, 1995.

169. Anonymous. Effects of estrogen or estrogen/progestin regimens on heart disease risk factors in postmenopausal estrogen/progestin interventions (PEPI) Trial. *JAMA* 273(3):199–208, 1995.

170. Espeland, M. A., Marcovina, S. M., Miller, V., et al. Effect of postmenopausal hormone therapy on lipoprotein(a) concentration. *Circulation* 97(10):979–986, 1998.

171. Falkeborn, M., Persson, I., Adami, H. O., et al. The risk of acute myocardial infarction after oestrogen and oestrogen-progestogen replacement. *Br. J. Obstet. Gynecol.* 99(10):821–828, 1992.

172. Hunt, K., Vessey, M., and McPherson, K. Mortality in a cohort of long-term users of hormone replacement therapy: an updated analysis. *Br. J. Obstet. Gynecol.* 97(12):1080–1086, 1990.

173. Nachtigall, L. E., Nachtigall, R. H., Nachtigall, R. D., and Beckman, E. M. Estrogen replacement therapy II: a prospective study in the relationship to carcinoma and cardiovascular and metabolic problems. *Obstet. Gynecol.* 54(1):74–79, 1979.

174. Psaty, B. M., Heckbert, S. R., Atkins, D., et al. The risk of myocardial infarction associated with the combined use of estrogens and progestins in postmenopausal women. *Arch. Intern. Med.* 154(12):1333–1339, 1994.

175. Henderson, B. E., Paganini-Hill, A., and Ross, R. K. Decreased mortality in users of estrogen replacement therapy. *Arch. Intern. Med.* 151:75–78, 1991.

176. Grodstein, F., Stampfer, M. J., Manson, J. E., et al. Postmenopausal estrogen and progestin use and the risk of cardiovascular disease. *N. Eng. J. Med.* 335(7):453–461, 1996.

177. Grady, D., and Sawaya, G. Postmenopausal hormone therapy increases risk of deep vein thrombosis and pulmonary embolism. *Am. J. Med.* 105(1):41–43, 1998.

178. Varas-Lorenzo, C., Garcia-Rogriguez, L. A., Cattaruzzi, C., Troncon, M. G., Agostinis, L., and Perez-Gutthann, S. Hormone replacement therapy and the risk of hospitalization for venous thromboembolism: a population-based study in Southern Europe. *Am. J. Epidemiol.* 147(4):387–390, 1998.

179. Hayes, S. N., and Taler, S. J. Hypertension in women: current understanding of gender differences. *Mayo Clin. Proc.* 73(2):157–165, 1998.

180. Ray, N. F., Chan, J. K., Thamer, M., and Melton, L. J. I. Medical expenditures for the treatment of osteoporotic fractures in the United States in 1995: report from the National Osteoporosis Foundation. *J. Bone Miner. Res.* 12(1):24-35,1997.

181. Power, M. L., Heaney, R. P., Kalkwart, J. J., et al. The role of calcium in health and disease. *Am. J. Obstet. Gynecol.* 181(6):1560–1569, 1999.

182. Lees, B., Molleson, T., Arnett, T. R., and Stevenson, J. C. Differences in proximal femur bone density over two centuries. *Lancet* 341(8846):673–675, 1993.

183. Prestwood, K. M., Pilbeam, C. C., Burleson, J. A., and Woodiel, F. N. The short-term effects of conjugated estrogen on bone turnover in

older women. *J. Clin. Endocrinol. Metab.* 79(2):366–371, 1994.

184. Melton, L. J., Khosla, S., Atkinson, E. J., O'Fallon, W. M., and Riggs, B. L. Relationship between bone turnover to bone density and fractures. *J. Bone Miner. Res.* 12, 1997.

185. Cummings, S. R. Are patients with hip fractures more osteoporotic? Review of the evidence. *Am. J. Med.* 78(3):487–494, 1985.

186. Slemenda, C., Hui, S. L., Longcope, C., and Johnston, C. C. Sex steroids and bone mass. A study of changes about the time of menopause. *J. Clin. Invest.* 80(5):1261–1269, 1987.

187. Sowers, M. R., Shapiro, B., Gilbraith, M. A., and Jannausch, M. Health and hormonal characteristics of premenopausal women with lower bone mass. *Calcif. Tissue Int.* 47(3):130–135, 1990.

188. Pocock, N. A., Eisman, J. A., Hopper, J. L., Yeates, M. G., Sambrook, P. N., and Eberl, S. Genetic determinants of bone mass in adults. A twin study. *J. Clin. Invest.* 80(3):706–710, 1987.

189. Cadarette, S. M., Jaglal, S. B., Murray, T. M., McIsaac, W. J., Joseph, L., and Brown, J. P. Evaluation of decision rules for referring women for bone densitometry by dual-energy x-ray absorptiometry. *JAMA* 286(1):57–63, 2001.

190. Marshall, D., Johnell, O., and Wedel, H. Meta-analysis of how well measures on bone mineral density predict occurrence of osteoporotic fractures. *Br. Med. J.* 312(7041):1254–1259, 1996.

191. Fogelman, I. Screening for osteoporosis: no point until we have resolved issues about long-term treatment. *Br. Med. J.* 319(7218):1148–1149, 1999.

192. Kazanjian, A., Green, C., and Bassett, K. Bone densitometry: does the emperor have clothes? *Can. Med. Assoc. J.* 160(13):1822–1823, 1999.

193. Barkmann, R., Kantoovich, E., Singal, C., et al. A new method for quantitative ultrasound measurements at multiple skeletal sites: first results of precision and fracture discrimination. *J. Clin. Densitometry* 3(1):1–7, 2000.

194. Toyras, J., Kroger, H., and Jurvelin, J. S. Bone properties as estimated by mineral density, ultrasound attenuation, and velocity. *Bone* 25(6):725–731, 1999.

195. Roux, C., and Dougados, M. Quantitative ultrasound in postmenopausal osteoporosis. *Curr. Opinion Rheumatol.* 12(4):336–345, 2000.

196. Grady, D., and Cummings, S. R. Postmenopausal hormone therapy for prevention of the fractures: How good is the evidence? *JAMA* 285(22):2909–2910, 2001.

197. Torgerson, D. J., and Bell-Syer, S. E. Hormone replacement therapy and prevention of nonvertebral fractures: a meta-analysis of randomized trials. *JAMA* 285(22):2891–2897, 2001.

198. Ettinger, B., Pressman, A., and Silver, P. Effect of age on reasons for initiation and discontinuation of hormone replacement therapy. *Menopause* 6(4):282–289, 1999.

199. Lindsay, R. L., Hart, D. M., and Clark, D. M. The minimum effective dose of estrogen for postmenopausal prevention of bone loss. *Obstet. Gynecol.* 63:759–763, 1984.

200. Genant, H. K., Lucas, J., Weiss, S., Akin, M., Emkey, R., and McNaney-Flint, H. Low-dose esterified estrogen therapy: effects on bone, plasma estradiol concentrations, endometrium, and lipid levels. Estratab/Osteoporosis Study Group. *Arch. Intern. Med.* 157:2609–2615 (December) 1997.

201. Recker, R. R., Davies, K. M., Dowd, R. M., and Heaney, R. P. The effect of low-dose continuous estrogen and progesterone therapy with controlled calcium and vitamin D on bone in elderly women: a randomized, controlled trial. *Ann. Intern. Med.* 130(11):897–904, 1999.

202. Ettinger, B., Genant, H. K., and Cann, C. E. Postmenopausal bone loss is prevented by treatment with low-dose estrogen with calcium. *Ann. Intern. Med.* 106:40–45, 1987.

203. MacLennan, A. H., MacLennan, A., Wenzel, S., Chambers, H. M., and Eckert, K. Continuous low-dose oestrogen and progestogen hormone replacement therapy: a randomised trial. *Med. J. Aust.* 159:102–106, 1993.

204. Gallagher, J. C., Kable, W. T., and Goldgar, D. Effect of progestin therapy on cortical and trabecular bone: comparison with estrogen. *Am. J. Med.* 90:171–178, 1991.

205. Speroff, L., Rowan, J., Symons, J., Genant, H. K., and Wilborn, W. The comparative effect on bone density, endometrium, and lipids of continuous hormones as replacement therapy (CHART Study). *JAMA* 276:1397–1403, 1996.

206. Cauley, J. A., Seeley, D. G., Ensrud, K., Ettinger, B., Black, D., and Cummings, S. R. Estrogen replacement therapy and fractures in older women. *Ann. Intern. Med.* 122(1):9–16, 1995.

207. Felson, D. T., Zhang, Y., Hannon, M. T., Kiel, D. P., Wilson, P. W., and Anderson, J. J. The effect of postmenopausal estrogen therapy on bone density in elderly women. *N. Eng. J. Med.* 329:1141–1146, 1993.

208. Schneider, D. L., Barrett-O'Connor, E. L., and Morton, D. J. Timing of postmenopausal estrogen for optimal bone mineral density. *JAMA* 277:543–547, 1997.

209. Hutchinson, T. A., Polansky, S. M., and Geinstein, A. R. Post-menopausal estrogens protect against fractures of the hip and distal radius. A case control study. *Lancet* 705–709 (October 6) 1979.

210. Kreiger, N., Kelsey, J. L., Holford, T. R. An epidemiologic study of hip fracture in postmenopausal women. *Am. J. Epidemiol.* 116:141–148, 1982.

211. Paganini-Hill, A., Ross, R. K., Gerkins, V. R., Henderson, B. E., Arthur, M., Mack, T. M. Menopausal estrogen therapy and hip fractures. *Ann. Intern. Med.* 95:28–31, 1981.

212. Weiss, N. S., Ure, C. L., Ballard, J. H., Williams, A. R., and Daling, J. R. Decreased risk of fractures of the hip and lower forearm with postmenopausal use of estrogen. *N. Eng. J. Med.* 303:1195–1198, 1980.

213. Watts, N. B. Postmenopausal osteoporosis. *Obstet. Gynecol. Surv.* 54(8):532–538, 1999.

214. Willett, W. C., Colditz, G., and Meir, S. Postmenopausal estrogens—opposed, unopposed, or none of the above. *JAMA* 283(4):534–535, 2000.

215. Torgerson, D. J., Thomas, R. E., Campbell, M. K., and Reid, D. M. Randomized trial of osteoporosis screening: use of hormone replacement therapy and quality-of-life results. *Arch. Intern. Med.* 157(18):2121–2125 (October 13) 1997.

216. Cummings, S. R., Black, D. M., and Thompson, D. E. The effect of alendronate on riskof fracture in women with low bone density but without vertebral fractures; results from the fracture intervention trial. *JAMA* 280(24):2077–2082, 1998.

217. Hosking, D., Chilvers, C. E., Christiansen, C., et al. Prevention of bone loss with alendronate in postmenopausal women under 60 years of age. Early Postmenopausal Intervention Cohort Study Group. *N. Eng. J. Med.* 338(8):485–492, 1998.

218. Lichtenberger, L. M., Romero, J. J., Gibson, G. W., and Blank, M. A. Effect of bisphosphonate on surface hydrophobicity and phosphatidylcholine concentration of rodent gastric mucosa. *Dig. Dis. Sci.* 45(9):1792–1801, 2000.

219. Wade, J. P. Rheumatology: 15. osteoporosis. *Can. Med. Assoc. J.* 165(1):45–50, 2001.

220. Black, D. M., Cummings, S. R., Karpf, D. B., et al. Randomized trial of effect of alendronate on risk of fracture in women with existing vertebral fractures. *Lancet* 348(9041):1535–1541, 1996.

221. Altkorn, D., and Vokes, T. Treatment of postmenopausal osteoporosis. *JAMA* 285(11):1415–1428, 2001.

222. Spencer, C. P., Morris, E. P., and Rymer, J. M. Selective estrogen receptor modulators: women's panacea for the next millennium? *Am. J. Obstet. Gynecol.* 180(3):763–770, 1999.

223. Delmas, P. D., Bjarnason, N. H., Mitlak, B. H., et al. Effects of raloxifene on bone mineral density, serum cholesterol concentrations, and uterine endometrium in postmenopausal women. *N. Eng. J. Med.* 337(23):1641–1647, 1997.

224. Ettinger, B., Black, D. M., Mitlak, B. H., et al. Reduction of vertebral fracture risk in postmenopausal women with osteoporosis treated with raloxifene: results from a 3-year randomized clinical trial. *JAMA* 282(7):637–645, 1999.

225. Draper, M., Flowers, D., Huster, W., Neild, J., Harper, K., and Arnaud, C. A controlled trial of raloxifene HCL: impact on bone turnover and serum lipid profile in healthy postmenopausal women. *J. Bone Miner. Res.* 11(44):835–842, 1996.

226. Gennari, C., Agnusdei, D., and Comporeale, A. Use of calcitonin in the treatment of bone pain associated with osteoporosis. *Calcif. Tissue Int.* 49(suppl. 2):S9–13, 1991.

227. Downs, R. W. J., Bell, N. H., Ettinger, M. P., et al. Comparison of alendronate and intranasal calcitonin for the treatment of osteoporosis in postmenopausal women. *J. Clin. Endocrinol. Metab.* 85(5):1733–1738, 2000.

228. Anonymous. Breast cancer and hormone replacement therapy: collaborative reanalysis of data from 51 studies of 52,705 women with breast cancer and 106,411 women without breast cancer. Collaborative Group on Hormonal Factors in Breast Cancer. *Lancet* 350(9084):1047–1059 (October 11) 1997.

229. Grady, D., Wenger, N. K., Herrington, D., et al. Postmenopausal hormone therapy increases risk for venous thromboembolic disease. The Heart and Estrogen/Progestin Replacement

Study. *Ann. Intern. Med.* 132(9):689–696, 2000.

230. Kannus, P. Preventing osteoporosis, falls, and fractures among elderly people: promotion of lifelong physical activity is essential. *Br. Med. J.* 3183(7178):205–206, 1999.

231. Kannus, P., Haapasalo, H., Sankelo, M., et al. Effect of starting age of physical activity on bone mass in the dominant arm of tennis and squash players. *Ann. Intern. Med.* 123(1):27–31, 1995.

232. Heinonen, A., Kannus, P., Sievanen, H., et al. Randomized controlled trial of effect of high-impact exercise on selected risk factors for osteoporotic fractures. *Lancet* 348-9038(1343–1347), 1996.

233. Lohman, T., Going, S., Pamenter, R., et al. Effects of resistance training on regional and total bone mineral density in premenopausal women: a randomized prospective study. *J. Bone Miner. Res.* 10(7):1015–1024, 1995.

234. Hui, S. L., Slemenda, C., and Johnston, C. C. J. Age and bone mass as predictors of fracture in a prospective study. *J. Clin. Invest.* 81(6):1804–1809, 1988.

235. Joakimsen, R. M., Magnus, J. H., and Fonnebo, V. Physical activity and predisposition for hip fracture. *Osteoporosis Int.* 7(6):503–513, 1997.

236. Slemenda, C. Prevention of hip fractures: risk factor modification. *Am. J. Med.* 103(2A):65S–73S, 1997.

237. Law, M. R., Wald, N. J., and Meade, T. W. Strategies for prevention of osteoporosis and hip fracture. *Br. Med. J.* 303(6800):453–459, 1991.

238. Cumming, R. C. Calcium intake and bone mass: a quantitative review of the evidence. *Calcif. Tissue Int.* 47(4):194–201, 1990.

239. Goldstein, M. R. Long-term therapy for postmenopausal osteoporosis: stronger bones but weaker arteries? *Circulation* 100(4):446–447, 1999.

240. Reid, D. M., and Macdonald, H. M. Nutrition and bone: is there more to it than just calcium and vitamin D? *QJM* 94(2):53–56, 2001.

241. Tucker, K. L., Hannon, M. T., Chen, H., Cupples, L. A., Wilson, P. W., and Kiel, D. P. Potassium, magnesium, and fruit and vegetable intakes are associated with greater bone mineral density in elderly men and women. *Am. J. Clin. Nutr.* 69(4):727–736, 1999.

242. New, S. A., Robins, S. P., Campbell, M. K., et al. Dietary influences on bone mass and bone metabolism: further evidence of a positive link between fruit and vegetable consumption and bone health? *Am. J. Clin. Nutr.* 71(1):142–151, 2000.

243. Avis, N. E., and McKinlay, S. M. A longitudinal analysis of women's attitudes towards menopause. *Maturitas* 13(1):65–79, 1991.

244. Katz, S., Branch, L. G., Branson, M. H., Papsidero, J. A., Beck, J. C., and Greer, D. S. Active life expectancy. *N. Eng. J. Med.* 309(20):1218–1224 (November 17) 1983.

245. U.S. Preventive Services Task Force. *Guide to Clinical Preventive Services*, 2nd ed. Washington, DC: Health Services Technology Assessment Texts (HSTAT), 1996.

246. U.S. Preventive Services Task Force. Screening Update Lipid Disorders in Adults. Accessed 2003 http://text.nlm.nih.gov/

247. Burk, R. D., Kelly, P., Feldman, J., et al. Declining prevalence of cervicovaginal and human papillomavirus infection with age is independent of other risk factors. *Sex. Transm. Dis.* 23(4):33–341, 1996.

248. Noble, J. (Ed.) *Textbook of Primary Care Medicine*, 3rd ed. St. Louis, MO: Mosby, 2001.

249. Greenwood, S. Menopause counselors needed: informed, empathetic, nonpartisan. In Flint, M., Kronenberg, F., and Utian, W. (Eds.) *Annals of the New York Academy of Science*. New York: New York Academy of Science, 1990, p. 376.

250. Voda, A. M. Risks and benefits associated with hormonal and surgical therapies for healthy midlife women. *West. J. Nurs. Res.* 16(5):507–523, 1994.

251. Chen, F., Lee, N., Wang, C., Cherng, W., and Soong, Y. Effects of hormone replacement therapy on cardiovascular risk factors in postmenopausal women. *Fertil. Sterility* 69(2):267–273, 1998.

252. Archer, D. F., McIntyre-Seltman, K., Wilborn, W. W., et al. Endometrial morphology in asymptomatic postmenopausal women. *Am. J. Obstet. Gynecol.* 165(2):317–320, 1991.

253. Davis, S. R. Androgens and female sexuality. *J. Gender-Specific Med.* 3(1):36–40, 2000.

254. Phillips, N. A. Female sexual dysfunction: evaluation and treatment. *Am. Fam. Physician* 62(1):127–136, 141–142 (July 1) 2000.

255. Kuhn, M. A. *Complementary Therapies for Health Care Providers*. Philadelphia, PA: Lippincott, 1999.

256. Fugh-Berman, A. *Alternative Medicine: What Works*. Baltimore, MD: Williams and Wilkins, 1997.

257. Speroff, L. Interventions for the control of symptoms. In Lobo, R. A., Kelsey, J. L., and Marcus, R. (Eds.) *Menopause: Biology and*

Pathobiology. San Diego, CA: Academic Press, 2000, pp. 553–562.

258. Anonymous. *Physicians Guide to Prevention and Treatment of Osteoporosis: National Osteoporosis Foundation*. Belle Mead, NJ: Excerpta Medica, 1999.

259. Nicar, M. J., and Pak, C. Y. Calcium bioavailability from calcium carbonate and calcium citrate. *J. Clin. Endocrinol. Metab.* 61(2):391–393, 1985.

260. Heaney, R. P., Recker, R. R., and Weaver, C. M. Absorbability of calcium sources: the limited role of solubility. *Calcif. Tissue Int.* 46(5):300–304, 1990.

261. Lindsay, R. Prevention and treatment of osteoporosis. *Am. J. Med.* 95(5A):37S–39S, 1993.

262. Dawson-Hughes, B., Dallal, G. E., Krall, E. A., Harris, S. S., Sokoll, L. J., and Falconer, G. Effect of vitamin D supplementation on wintertime and overall bone loss in healthy postmenopausal women. *Ann. Intern. Med.* 115(7):505–512, 1991.

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PART

III

Reproductive Health Care

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CHAPTER

14

Common Diagnoses in Women's Gynecological Health

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The current motto of the American College of Nurse-Midwives—"With women, for a lifetime"—summarizes concisely the vast area of midwifery health care. While the name "midwife" conjures images of pregnancy care and attendance at birth, the fact is that for centuries midwives have been called upon to assist women in health care matters that have extended beyond childbearing. Historically, midwives have helped women with issues regarding menarche, menstruation, and menopause. And this historical role has not only extended throughout the twentieth century but has expanded further with health care practices of the twenty-first century.

The average number of children born to women over a lifetime today in the United States is 2.1 [1]. Many women never experience pregnancy or birth at all. Although exact figures are difficult to document, one recent investigation reported that 17 percent of a large sample of American women had primary or secondary infertility problems, and an additional 16 percent have never attempted conception [2]. Clearly, most women spend most of their lives in a state where gynecological health plays a large role in their well-being. This fact has not been lost on midwifery practice. Within the last decade, practicing CNMs/CMs have reported that 92 percent offer contraception care, 84 percent gynecological care, 71 percent primary care, and over half (53 percent) menopausal care [3]. As noted in the ACNM Philosophy, midwives' focus on "the needs of the individual and family for physical care, emotional and social support" should "extend to include gynecological care of women throughout the life cycle" [4].

As with health care in general, the list of potential problems or issues in the gynecological field approaches an endless number. Gynecology textbooks are thick with diagnoses ranging from difficulties with the brain to malformations of the genitalia. Fortunately, most of these conditions are rare, and better left with specialists who focus on the less-than-common maladies. For most women, and for the practitioners who work with them, the majority of gynecological health concerns are limited to a few general categories. This chapter will focus on the most common diagnoses found in gynecological care. These include issues related to the menstrual cycle, lower abdominal/pelvic pain, pelvic masses, the genitourinary system, and cancer screening/diagnoses. Other matters of adult women's health, including gynecology and primary care, are addressed in Chapters 3, 5–13, and 15. The focus here will be on assisting the midwife to offer comprehensive care to a woman throughout her lifespan, particularly when pregnancy is not the matter at hand.

Issues Concerning the Menstrual Cycle

Amenorrhea

A common change found at some point in most adult women's menstrual cycles is amenorrhea. Throughout an individual's life, the absence of

menses can be due to normal life events such as pregnancy, menopause, or the use of birth control methods. Yet, there are a number of events or conditions that are related to abnormal amenorrhea, and the challenge for the practitioner is to differentiate between normal and abnormal, and discover the cause of the latter.

The term amenorrhea is traditionally thought to be applicable to one of three clinical situations:

1. A young adolescent (14 years of age or younger) who has never experienced menses and who does not yet exhibit any physical signs of secondary sexual characteristics.
2. An adolescent (16 years of age or younger) who has never experienced menses, yet who does exhibit physical signs of secondary sexual characteristics.
3. A menstruating woman who experiences the absence of menses for a period of time ranging from 3 to 6 months [5].

The first two situations have been described as primary amenorrhea, while the third has been labeled as secondary amenorrhea. However, clinical scholars such as Speroff and colleagues [5] have cautioned against the use of these labels because they can lead the practitioner to omit certain diagnostic criteria that may be relevant to the absence of menses no matter when it occurs in an individual's life.

While there are a number of different approaches to understanding, diagnosing, and treating amenorrhea, one that has proven helpful to many clinicians is to think of the causes as occurring in one of four anatomical areas: (1) the outflow area of the genitalia (uterus and vagina), (2) the ovaries, (3) the pituitary gland, and (4) the central nervous system (CNS) [5, 6]. Generally, outflow area problems are obstructive in nature, while ovarian, pituitary, and CNS problems involve disruptions in the hypothalamic-pituitary-ovarian (HPO) axis that controls the neuroendocrine processes required for a normal menstrual cycle. Obstructions can generally be found on physical examination, while other causes usually are ruled out through laboratory analyses and the use of hormone therapy.

The primary step in diagnosing amenorrhea is first to rule out pregnancy. While this may seem obvious, the client's sexual and social history, as well as preconceived assumptions on the part of the clinician, can lull the practitioner into thinking that pregnancy is not a possible or likely determinant of the amenorrheic state (e.g., an adolescent who states she is not sexually active but is actually living in a sexually abusive environment). Discounting the possibility of pregnancy can lead to an expensive and anxiety-provoking amenorrheic workup that could have been avoided with clear and thorough history-taking followed by a simple urine HCG test. Matters such as abuse or sexual experimentation need to be broached before deciding pregnancy is not a possibility.

It is also important to remember that episodes of amenorrhea during the perimenopause are part of normal development. Oftentimes, a woman will begin to experience heavier and more frequent menses during the perimenopause but will eventually have fewer and lighter menses as menopause itself nears. These periods of amenorrhea are normal and usually do not require any intervention beyond a thorough history and discussion with the client about such matters as birth control and concurrent physiological changes associated with menopause.

In addition to assessing for pregnancy and perimenopause, the clinician must inquire about the client's overall health, nutritional and exercise status, recent weight changes, use of medications and/or herbs, and emotional state. These subjective findings should be followed with a confirmatory physical examination (PE). Chronic illness, anorexia nervosa, bulimia, crash dieting, and obesity all have been shown to result in amenorrhea, as have strenuous exercise, physically demanding activities, the use of certain medications and/or herbal preparations, and overall emotional stress (5). Diagnoses such as anorexia, bulimia, or emotional distress may be the outcome of visits for women whose chief complaint was absent or irregular menses. All of these potential causes of amenorrhea involve different types of disruptions along the HPO axis, and resolution usually occurs upon solving or removing the underlying health, nutritional, physical, medicinal/herbal, or emotional problem. However, this is not always a simple task. For example, with a diagnosis of anorexia or emotional distress, the midwife will benefit from consulting with, or referring to, a clinician who has expertise in these areas. Certainly, the specific location of HPO axis disruption can be explored (see below), but usually the amenorrhea will resolve when the client begins to heal from the underlying illness or removes the causative factor.

Once pregnancy, breastfeeding, perimenopausal changes, use of hormonal contraception, general ill health, or nutritional, physical, medicinal/herbal,

and emotional problems have been ruled out, the next step is to measure levels of thyroid-stimulating hormone (TSH) and prolactin. An elevated TSH, often accompanied by an increased prolactin level, is indicative of hypothyroidism, which is readily treated with thyroid hormone replacement therapy. In addition, any type of hyperthyroidism (e.g., Graves' disease) can be the underlying cause of amenorrhea, and depending on the method of treatment, regular menstrual cycles will return upon control of thyroid functioning. Increased levels of prolactin, with normal levels of TSH, are found in hyperprolactinemic and galactorrheic conditions, which are often accompanied by amenorrhea. Causes of hyperprolactinemia and galactorrhea are many, and deciphering the etiology of an individual's symptoms can be arduous (see Speroff and colleagues [5]). Thus in most cases an elevated prolactin level will suggest to the midwife that a more extensive workup is required, often necessitating a referral to a practitioner specializing in endocrinology. Once the condition causing elevated prolactin levels is treated, menses should return.

If thyroid and pituitary functioning appear normal, the next step in diagnosing and treating amenorrhea is to initiate what is commonly known as a progesterone challenge. The purpose of this is twofold: to assess the presence of endogenous estrogen, which is required for healthy buildup of endometrial tissue, and to examine the patency of the genital outflow tract (uterus and vagina). Medroxyprogesterone acetate (Provera) (5–10 mg for 5–10 days) can be given po, or progesterone in oil can be administered IM (200 mg) or po in capsule form (Prometrium) as a single daily dose of 400 mg in the evening for 10 days. As early as two days after the medication is completed, and usually within a week, bleeding may occur, thus establishing the presence of endogenous estrogen and the patency of the outflow tract. The focus of the amenorrhea workup then becomes anovulation, with functioning of the ovaries, pituitary, or CNS requiring evaluation.

If the progesterone challenge results in a continued lack of flow, then the midwife needs to resume assessment for a lack of estrogen or outflow tract obstructions. This is accomplished by administering estrogen and progesterone over 21 days (estradiol [e.g., Estrace] 4.0 mg, or conjugated equine estrogen [e.g., Premarin] 2.5 mg, po for the entire 21 days, with medroxyprogesterone acetate [e.g., Provera] 10 mg po added for the last 5 days). If a menstrual flow occurs after cessation of the medication cycle, then the patency of the outflow tract can be established. If menstrual flow does not occur, then one should strongly suspect an obstruction of the outflow tract, and refer appropriately. It should be noted, however, that such obstructions are quite rare, and if present, are often found on PE. Certainly, if a young adolescent has secondary sexual characteristics, but no established flow, or a previously menstruating woman has a history of an intrauterine procedure (e.g., a dilatation and curettage [D&C] procedure) or infection, then obstruction should be considered. For the most part, amenorrhea will be found to be due to physiological causes at the ovarian, pituitary, or CNS level.

If the patency of the outflow tract has been established, then the midwife can assume that the woman's body is not producing enough estrogen to enable menstruation to occur. Using the previously described approach of diagnosing the cause of amenorrhea from one of four anatomical areas, the disruption of estrogen production is now known to be occurring at either the ovarian, pituitary, or CNS level. Therefore, the next step is to determine the level of gonadotropins to determine whether the lack of estrogen originates in the follicle of the ovary or along the pituitary-CNS axis.

Gonadotropin testing is accomplished by obtaining serum samples in order to assay follicle-stimulating hormone (FSH) and luteinizing hormone (LH) levels. Normal levels range from 5–30 IU/L for FSH and 5–20 IU/L for LH. Any levels outside of these ranges speak to one of a number of possibilities (see Table 14-1). Several factors are important to consider at this point. First, the midwife must remember that both FSH and LH surge approximately two to three times their base levels during a normal midcycle. Also, if the woman had been undergoing an estrogen/progesterone challenge, a delay of 2 weeks before drawing a gonadotropin assay is advisable to avoid artificially elevated values. Finally, at this point in the amenorrhea workup, the midwife may choose to refer the individual to a practitioner specializing in female endocrine disorders. While results of gonadotropin assays can better isolate the source of amenorrhea (high FSH and LH point to ovarian problems; low or normal FSH and LH indicate either pituitary or CNS problems), further differential diagnosis and subsequent treatment are, for the most part, beyond the scope of practice of the primary care clinician.

Obviously, the midwife should be supportive and informative throughout the entire amenorrhea workup. The experience can be frightening to the

TABLE 14-1 Disorders Associated with Amenorrhea

Genital Outflow Track (Uterus and Vagina)	Ovaries	Pituitary Gland	Hypothalamus (CNS)
Asherman's syndrome	Gonadal dysgenesis	Pituitary adenomas	Stress
Müllerian tube anomalies	Polycystic ovaries	Empty sella syndrome	Weight loss, eating disorders
Androgen insensitivity syndrome (testicular feminization)	Turner syndrome		Strenuous exercise
	Mosaicism		Posthormone use for birth control
	Premature ovarian shutdown		
	Side effects from radiation and/or chemotherapy		

individual woman, and the lack of definitive testing can cause frustration. Educating her about the potential causes and their likelihood can do much to alleviate the woman's anxiety. It is important to note that other remedies for amenorrhea have been suggested that are not traditionally prescribed by practitioners of allopathic medicine. For example, herbalists recommend blessed thistle or blue cohosh for the relief of amenorrhea. However, there currently are no published, evidence-based investigations that address the efficacy or safety of using such herbs for this condition.

Dysmenorrhea

Painful menstruation, particularly in the lower abdomen and back and usually of a cramping nature, is known as dysmenorrhea or menorrhalgia and has been reported in the United States to have been experienced by anywhere from 60 percent to 91 percent of women [5]. Dysmenorrhea is most prevalent in the first three years after menarche (primary dysmenorrhea), although it can arise later in any woman's reproductive life (secondary dysmenorrhea). Prior to the 1970s most practitioners viewed dysmenorrhea as being pyschosomatic in origin, and few resources were offered for relief [7]. More recent research has presented a clearer picture as to the nature and treatment of this potentially debilitating condition.

The principal cause of primary dysmenorrhea is the presence of prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$), which originates in the endometrium [5]. $PGF_{2\alpha}$ is necessary for stimulating uterine contractions during menstruation. In adolescents with dysmenorrhea, the amount of $PGF_{2\alpha}$ produced is greater than normal. Limiting the amount of available $PGF_{2\alpha}$ is the primary method of relief. Because combined hormonal contraceptives decrease prostaglandin synthesis, and offer birth control benefits, these drugs are frequently promoted as the first line of control of dysmenorrhea in adolescents [8].

For individuals unable to take hormonal contraceptives for medical or psychosocial reasons, dysmenorrhea can be limited through the use of nonsteroidal antiinflammatory drugs (NSAIDs) [9] and the newer class of drugs known as cyclooxygenase 2 (COX-2) inhibitors (Table 14-2). These medications should be taken for two to three days beginning on the first day of symptoms. Contrary to earlier beliefs, there is no evidence that initiation of medication two to three days prior to menstruation improves control of dysmenorrhea [5]. The benefits of NSAID therapy can take up to six months to be effective, so clients need to be made aware of this before abandoning this approach to dysmenorrhea control. On the other hand, long-

TABLE 14-2 Pharmaceutical Regimens for Treatment of Dysmenorrhea

Generic Drug	Sample Trade Drugs	Dosage*
Ibuprofen	Advil, Motrin, Nuprin	400 mg qid
Naproxen	Aleve, Anaprox, Naprosyn	275 mg qid
Fenamates	Ponstel	250 mg qid
Ketoprofen	Orudis	50 mg tid
Diclofenac	Cataflam	50 mg tid
Cyclooxygenase 2 inhibitors:†		
Celecoxib	Celebrex	200 mg bid
Rofecoxib	Vioxx	50 mg qd
Valdecoxib	Bextra	20 mg bid

* Medications should be initiated on the first day of symptoms and continued for 2 to 3 days.

† Cyclooxygenase 2 (COX-2) inhibitors are the most recent classification of drugs to receive FDA approval for the treatment of dysmenorrhea.

term therapy with such drugs as NSAIDs can have adverse effects on several systems of the body, thus necessitating a look at alternative therapies if dysmenorrhea continues for an extended period of time [10]. While aspirin has also been shown to offer some relief from dysmenorrhea, there is no evidence that acetaminophen is beneficial in eliminating menstrual pain [9].

Several nonpharmaceutical approaches to alleviating dysmenorrhea exist. These include homeopathy (e.g., belladonna and chamomilla), acupuncture, biofeedback, relaxation techniques, massage, exercise, aromatherapy (e.g., rose oil), and the use of certain herbs (e.g., black cohosh, raspberry leaf, shakuyaku-kanzo-to, semen coicus, and chaste berry [11–13]). As is the case with many nonallopathic approaches to care, there exists at this time limited scientific evidence as to the effectiveness of these various modalities. Thus, it benefits the midwife to learn as much as possible about the availability and effectiveness of these mechanisms, especially when a client is making use of a certain modality or asks about the value of doing so.

Secondary dysmenorrhea has been described as painful menstruation that arises later in a woman's life, after she has experienced menstrual cycles not associated with significant pain. However, in its current use the term has come to signify dysmenorrhea caused not by prostaglandins but by anatomical or pathological factors [7]. These factors include endometriosis, uterine myomas, endometrial polyps, uterine cancer, and the presence of pelvic inflammatory disease (PID). The presence of an intrauterine device (IUD) can contribute to dysmenorrhea. Finally, it has been suggested that having had a tubal ligation can subsequently cause painful menstruation [14], theoretically due to postsurgical reduction in blood supply to the ovaries, resulting in hormonal changes that affect menstruation. However, this notion of post–tubal ligation dysmenorrhea has been questioned in the literature [5]. Appropriate evaluation of secondary dysmenorrhea is accomplished through PE, ultrasound, and additional testing dependent on the suspected diagnosis. A potential diagnosis of PID requires the collection of cervical specimens. If endometrial cancer is suspected, an endometrial biopsy and referral are warranted. A suspicion of endometriosis may require referral for a laparoscopy.

Treatment of secondary dysmenorrhea is dependent on diagnosis. Endometrial cancers, benign tumors (myoma), and endometriosis are discussed later in the chapter. If an IUD is thought to be the source of dysmenorrhea, the midwife should discuss with the woman the use of NSAIDs or removal of the IUD. IUD removal should be accompanied with exploration of alternative birth control methods. As with primary dysmenorrhea, the use of NSAIDs or the nonpharmaceutical approaches mentioned above are often the initial therapy (see Table 14-2).

Menorrhagia

Menorrhagia is one of several menstrual states that have traditionally fallen under the label of dysfunctional uterine bleeding (DUB)—the term most often used to describe unusual menstrual patterns whose origins can be traced to alterations in the physiological mechanism of the HPO axis. However, the term DUB can be misleading because not all changes in menstrual flow or rate are necessarily dysfunctional (e.g., menorrhagia and polymenorrhea found at the time of perimenopause). In addition, the broader term of abnormal uterine bleeding (AUB) has been used to describe any form of uterine bleeding not related to normal menstrual bleeding [15], yet this too has the potential to label irregular, albeit healthy, flow as abnormal. Focusing on the woman's specific symptoms and avoiding generalized terms will facilitate prompt diagnosis and management.

Menorrhagia (sometimes referred to as hypermenorrhea) is defined as excessive bleeding, either in amount or duration, at the regular interval of normal menstruation (see Table 14-3). A thorough history will help determine what is a normal flow for the individual woman. However, determining what

TABLE 14-3 Common Definitions Referring to Menstrual Changes

Amenorrhea: Absence of any menses by age 16, or absence of menses in woman who has previously menstruated.
Menorrhagia (Hypermenorrhea): Normal menstrual intervals with excessive flow and/or duration.
Metrorrhagia: Menstruation occurring at irregular intervals, or incidences of spotting or bleeding between periods.
Menometrorrhagia: Excessive/prolonged menses at irregular intervals.
Polymenorrhea: Normal menses at more frequent intervals than normal (i.e., more frequent periods).
Oligomenorrhea: Normal menses at greater than normal intervals (i.e., fewer periods).
Hypomenorrhea: Scant bleeding at normal intervals.

is excessive bleeding can be a difficult task. A common perception has been that the saturation of three to four pads or tampons over a four-hour period at the time of menstruation is excessive [16]. Yet, for some women this can be part of their normal pattern, especially on the first two to three days of flow. Also, one individual's definition of a saturated pad or tampon can be quite different from that of another's [17]. The amount of blood loss considered normal during menses has been described as approximately 30 cc since research conducted in the 1960s, with anything greater than 80 cc deemed abnormal [5]. As pointed out by Engstrom and colleagues [18], this cutoff of 80 cc is the standard measure for defining menorrhagia, yet large numbers of women either overestimate or underestimate the amount of menstrual bleeding that occurs on a monthly basis. And with great diversity in pad/ tampon absorption rates and no standard way for women to determine what is meant by a "saturated" pad, translating monthly blood loss amounts into numbers of pads or tampons is virtually impossible. Newer, more accurate methods of measuring blood loss during menstruation, such as the alkaline hematin laboratory procedure that measures blood loss found on tampons or pads, and the Pictorial Blood Loss Assessment Chart (PBLAC), which estimates blood loss using diagramatic prompts, have been shown to be effective. However, due to cost, inconvenience, or lack of exposure, their use has been limited to research endeavors [18].

Perhaps the surest method of determining whether an individual's flow is potentially harmful is to obtain laboratory values of hemoglobin and hematocrit (H/H) to rule out anemia. The midwife needs to be aware that no matter what the physiological diagnosis turns out to be, if the woman believes that her blood loss is excessive, then the clinician must address this issue from a psychosocial perspective in order to promote the woman's well-being.

After garnering evidence to see if the woman's menstrual flow is excessive, the next step in treating menorrhagia is to discover the origin of the condition. Causes include hormonal changes along the HPO axis, uterine masses, systemic diseases, medication or herbal use, nutritional deficiencies (e.g., vitamin K), and inherited disorders, particularly those leading to bleeding problems (e.g., von Willebrand's disease) [19–21]. A thorough history is key to making a correct diagnosis. In addition to understanding, as much as possible, how much of a flow the woman is experiencing, the midwife should inquire about the menses' duration, color, and character, especially if clotting is involved. Any accompanying physical or psychosocial changes associated with the heavier menstrual flow need inquiry. This is especially true of potential contraceptive causes (IUD, OCs), psychosocial factors (stress, illicit drug use), sexual correlates (STIs, sexual practices), nutrition causes (obesity), and gynecological factors (past surgery, a history of unusual menstrual patterns). The clinician should inquire about the client's knowledge of any similar bleeding patterns or major gynecological conditions experienced by her mother or sisters. Finally the midwife should determine whether any close relatives have a history of hematological disorders, especially related to clotting.

Physical and pelvic examination must include assessment for signs of anemia and bleeding (e.g., bruising or petechiae). The vagina and cervix need to be assessed for masses, lesions, infections, or foreign bodies (e.g., IUD) that could contribute to heavier menses. If a Pap smear has not been performed within the past year, this sample should also be obtained. Bimanual examination includes assessing for ovarian or uterine masses or pain.

A pregnancy test may be appropriate, although the client presenting with a complaint of menorrhagia usually has had this symptom for several cycles, and typically will not describe signs or symptoms of pregnancy. Screens for sexually transmitted infections and chronic vaginitis or cervicitis should be considered. Although they are not part of a routine screen, if endometrial hyperplasia or cancer are suspected, endometrial curettage (also known as endometrial sampling or endometrial biopsy) should be performed (see Chapter 82). This brief, ambulatory care procedure allows for laboratory histological analysis of endometrial tissue without the risks or involvement necessary for the more traditional D&C. While diagnostic information is not immediately available during the procedure, the resulting laboratory report can offer assistance in discovering the source of the client's menorrhagia. Any nondefinitive or positive results should lead to a referral for follow-up testing (e.g., hysteroscopy) or treatment.

As stated previously, laboratory testing should include hemoglobin and hematocrit to gauge whether the bleeding that the woman is reporting is resulting in an anemic state. Obtaining a complete blood count (CBC) also allows for detection of an abnormally low platelet count (thrombocytopenia) accompanying a bleeding disorder (see Table 14-4). It should be noted, however, that several bleeding

TABLE 14-4 Possible Causes of Menorrhagia

Typically Presented As a Onetime Event

- Pregnancy
  - Intrauterine
  - Ectopic
  - Gestational trophoblastic neoplasm (e.g., hydatidiform mole)
- Infections (usually related to PID, use of IUD, or following instrument-based intrauterine procedure)
  - Endometritis
  - Salpingitis

Typically Presented As an Ongoing, Cyclic Pattern

- IUD use
- Neoplasia
  - Ovarian cysts
  - Uterine fibroids (myoma)
  - Adenomyosis (endometrial tissue located within the myometrium)
  - Endometrial hyperplasia
  - Polyps
  - Carcinoma
- Coagulation disorders
  - Inherited (e.g., von Willebrand's disease)
  - Acquired (e.g., idiopathic thrombocytopenic purpura [ITP])
  - Pharmacological (e.g., use of heparin, or even aspirin)
- Liver disorder (e.g., cirrhosis)
  - Impaired metabolism of estrogen
  - Decreased synthesis of fibrinogen and clotting factors
- Endocrine
  - Hypothyroidism

disorders (e.g., von Willebrand's disease) do not result in lowered platelet counts, and require additional laboratory testing. Other useful tests may include a thyroid-stimulating hormone (TSH) level to rule out thyroid disease; prothrombin time (PT) and partial thromboplastin time (PTT) to assess for certain bleeding disorders; and liver function tests (LFTs) to rule out liver disease. A urine HCG test will rule out pregnancy.

Pelvic ultrasound also can be an effective diagnostic tool. As listed in Table 14-4, a common cause of chronic heavy menstrual flow is the presence of uterine myomata (fibroids). While myomata may be palpated on PE, the least distinctive of these masses on bimanual exam—the submucosal fibroids—are those closest to the endometrium. These are the tumors considered most likely to cause menorrhagia [22]. Sonography will detect myomata as well as endometrial polyps (benign growths that can cause menorrhagia), and it will report on the "endometrial stripe," or thickness of the endometrium. Normally, during the follicular (preovulatory) phase of the menstrual cycle, the endometrium grows from a postmenstrual thickness of 1.0 to 2.0 millimeters to a preovulation thickness of 3.5 to 5.0 millimeters. Even though the endometrium can reach a normal thickness of 5.0 to 7.0 millimeters during the subsequent luteal (postovulatory) phase, any evidence of an endometrial stripe greater than 5.0 millimeters on ultrasound suggests the possibility of endometrial hyperplasia or carcinoma, and points to the need for endometrial curettage [5, 23, 24].

Treatment of menorrhagia necessitates first establishing a diagnosis. If excessive bleeding has been reported as a onetime, acute event and the likely diagnosis is either pregnancy or infection, then immediate action is generally required. Appropriate steps must be taken depending on the type of pregnancy (e.g., intrauterine versus ectopic) or infection and the desires of the woman. (Management of bleeding during pregnancy or of ectopic pregnancy is covered in Chapter 24; caring for the woman with endometritis or salpingitis is discussed in Chapters 15 and 44.)

If the menorrhagia is found to be chronic and cyclic, management still depends on the specific cause deemed responsible for the excessive bleeding. If an IUD is in place, the midwife should consider removal to see if the menorrhagia subsides. If the IUD is removed, an alternative form of birth control must be discussed with the client. It should be noted that the most recently FDA-approved IUD—the LNg 20 (Mirena)—is indicated not only for birth control but also for treatment of abnormal menstrual bleeding [25], and it may be considered by the midwife and client as a method of resolving menorrhagia while continuing with an intrauterine form of birth control.

Menorrhagia found to be caused by neoplasia, coagulation disorder, or liver disease requires referral to a specialist, who will usually first treat the woman pharmacologically, followed by surgery if drug therapy is not successful. Menorrhagia caused by endocrine dysfunction is manageable, at least initially, by the primary care practitioner, and usually begins with placing the woman on combined, low dose OCs. While the typical prescription calls for taking OCs in the same manner of women using the pills for birth control, recent evidence points to the success of a regimen in which active OCs are taken for 6 to 12 weeks before inert pills are used to facilitate the shedding of the uterine lining [18, 26].

Additional pharmacologic approaches to treating the woman with menorrhagia include the use of progestins, gonadotropin-releasing hormone (GnRH) agonists, NSAIDs, and Danazol, a synthetic steroid that suppresses HPO axis activity. Progestins can be helpful because they limit endometrial growth and simultaneously enrich any existing endometrial structure, resulting in reduced and less uneven menstrual flow [27]. The midwife can prescribe medroxyprogesterone acetate (e.g., Provera), 10 mg po, qd × 10 days or norethindrone (e.g., Aygestin), 5 mg po, bid × 10 days. With either drug, therapy should begin on day 15 or 16 of the woman's cycle. For individuals who have difficulty with a daily pill schedule, depot medroxyprogesterone acetate (DMPA) (e.g., DepoProvera), 150 mg IM can also be used to reduce menstrual flow, although irregular bleeding frequently occurs until the woman develops amenorrhea.

GnRH agonists (e.g., Lupron) affect the HPO axis, retarding the ovaries' ability to release hormones required for normal functioning of the menstrual cycle. Breaking up the activity required for cyclic menstruation causes the woman to enter a physiologic state most resembling menopause. Not only is menstrual blood loss slowed, but in many cases amenorrhea occurs. However, because of bone mass loss due to a drop in estrogen levels, this approach is limited to women for whom other therapies have been unsuccessful and is best managed by the practitioner specializing in gynecological disorders [27]. At minimum, any treatment using GnRH agonists requires monitoring the woman's bone density status.

Reduction in menorrhagia has also been demonstrated in women prescribed nonsteroidal anti-inflammatory drugs (NSAIDs) due to the ability of these medications to block the synthesis of prostaglandins necessary for cyclic endometrial sloughing [27]. Regimens are similar to those used for treating dysmenorrhea (see Table 14-2), and are used for the first three days of menstruation. Drugs that can be used include ibuprofen (e.g., Advil, Motrin, Nuprin), naproxen sodium (e.g., Aleve, Anaprox, Naprosyn), and mefenamic acid (e.g., Ponstel). However, NSAID therapy does not work for all clients, can cause gastrointestinal bleeding with long-term use, and for some individuals can result in an increase in vaginal bleeding due to inhibition of platelet aggregation and prolonging of bleeding time [18]. Women on OCs also may take NSAIDs at the time of menstruation and may benefit from the combination.

Danazol (e.g., Danocrine), a synthetic steroid, is used for treatment of endometriosis and has been successful in controlling some cases of menorrhagia. It requires daily dosage for 3 to 6 months, given as 100 mg po, bid, during which time a state of amenorrhea is likely to occur. The medication should then be discontinued for a period of time to assess whether the menorrhagia has returned. If so, therapy can be started again. Androgenic side effects, including weight gain, acne, and seborrhea, are common and have led to danazol not being the first choice of treatment for menorrhagia. As with GnRH agonists, this therapy is best managed by the practitioner specializing in gynecological disorders.

While there is some evidence for the treatment of menorrhagia with traditional Chinese medicines and acupuncture [28, 29], and several suggestions for the use of herbal, homeopathic, and aromatherapeutic remedies to help alleviate heavy menses [13, 30, 31], the body of evidence supporting these nonpharmaceutical methods is limited at this time. Based on evidence derived from actual clinical practice rather than scientific investigations, three herbs have been suggested to lessen menstrual bleeding: nettles, shepherd's purse, and yarrow [13]. Likewise, the homeopathic solutions of chamomilla, lachesis, and veratrum album are some of those recommended for relief of menstrual disorders, including heavy bleeding [31], and in the field of aromatherapy, rose oil has been recommended for menorrhagia relief [30]. As with all herbal, homeopathic, and aromatherapy suggestions, because there is usually limited scientific evidence to support their use, the midwife should consult first with a practitioner knowledgeable about amounts and contraindications before recommending any of these potential remedies to clients. Nutritionally, lack of vitamin K has been suspected of contributing systemically to menorrhagia. Improving vitamin K intake, through ingesting of green, leafy vegetables and cereals, could help reduce menorrhagia if this vitamin deficiency is the root cause of heavy bleeding [21]. Finally, it should be noted that the use of ergot derivatives, which are so helpful in controlling postpartum bleeding, appear to have little or no effect in alleviating menorrhagia [27].

In addition to, or in lieu of, the pharmacological and therapeutic remedies described above, surgery may be a necessity for a woman to obtain relief from menorrhagia. The surgeon to whom the woman is referred may first conduct a hysteroscopic examination in order to identify the source of excessive bleeding. Surgical interventions include

dilatation and curettage (D&C); endometrial ablation, using hysteroscopic visualization; and hysterectomy [5]. Of the procedures available, D&C is the one least likely to result in long-term resolution. Obviously, the midwife making a surgical referral should explain to the woman the possible solutions that may be proposed by the gynecologist and should encourage the client to express any anxieties or doubts about this possible step in managing menorrhagia.

Metrorrhagia

When menstruation occurs at irregular intervals, or there are incidences of spotting or bleeding between periods, the term metrorrhagia is used to describe these conditions. Of the various forms of abnormal bleeding patterns, this can be one of the most disconcerting because of the unpredictable timing at which spotting or bleeding occurs. Reestablishing a regular pattern of timing to a woman's menstruation can help her feel in a good state of health and avoid the inconvenience of an erratic menstrual flow.

Discovering the origin of metrorrhagia begins with a thorough history. An attempt should be made to have the woman describe, in as much detail as possible, how the bleeding she presents with is different from what has been normal menstruation for her. Does her experience better fit the description of menorrhagia or polymenorrhea? If the menstrual intervals are fluctuating, is the amount of flow consistent each time with a normal menses? If not, is the bleeding heavier, lighter, or as inconsistent as the timing? Are there any events or actions, such as sexual activity, that seem to accompany the timing of the abnormal bleeding? Have there been any changes in the individual's medical, emotional, or social history that have coincided with the menstrual changes? For example, has the client been diagnosed with a chronic illness? Is she taking any medications? Has she been experiencing any emotional distress lately? Has she had any major life changes recently? Ideally, the client will have kept a daily record, or log, of her bleeding, to establish whether or not there is a set pattern to the metrorrhagia. Usually, such a log comes at the suggestion of the midwife and is not typically available at the visit when the issue of metrorrhagia is first presented.

There are many possible causes of metrorrhagia (see Table 14-5). As with menorrhagia, the midwife should first consider the possibility of pregnancy as being the underlying state associated with the irregular bleeding. One incidence of spotting could have been caused by implantation bleeding in an early pregnancy, while an ongoing irregular pattern of spotting or bleeding suggests a threatened spontaneous abortion, an ectopic pregnancy, or a gestational trophoblastic neoplasm, such as a hydatidiform mole. Plans of action associated with any of these diagnoses are addressed in Chapter 24. If the client is not pregnant and states that the spotting typically occurs once monthly between her menses, the clinician should explore monthly ovulation as the underlying cause of the metrorrhagic state.

Once the diagnosis of pregnancy has been ruled out, the midwife should consider socially related causes. One is the possibility of sexually transmitted diseases (STDs) or other vaginal infections. A severe cervicitis or vaginitis, as well as an ascending infection such as pelvic inflammatory disease (PID), can

TABLE 14-5 Possible Causes of Metrorrhagia

- Pregnancy
  - Intrauterine
  - Ectopic
  - Gestational trophoblastic neoplasm (e.g. hydatidiform mole)
- Infections (usually related to PID, use of IUD, or following instrument-based intrauterine procedure)
  - Endometritis
  - Salpingitis
- IUD use
- Post–tubal ligation (controversial)
- Ovulation
- Hormonal Causes
  - OCPs, Depo, Norplant
  - HRT
  - Medications, herbs
  - Thyroid disorder
- Neoplasia
  - Ovarian cysts
  - Uterine myomata (fibroids)
  - Adenomyosis (endometrial tissue located within the myometrium)
  - Endometrial hyperplasia
  - Polyps
  - Carcinoma
- Coagulation disorders
  - Inherited (e.g., von Willebrand's disease)
  - Acquired (e.g., idiopathic thrombocytopenic purpura [ITP])
  - Pharmacological (e.g., use of heparin, or even aspirin)
- Organ disease
  - E.g., liver or renal failure

result in vaginal, cervical, or uterine bleeding related to the inflammation. Treatment with antibiotics will usually return the woman to a state of health in which the metrorrhagia will discontinue (see Chapter 15). In addition to infection, the clinician should rule out trauma to the genital region as a result of sexual activity or abuse. The former can usually be ascertained with a thorough sexual history and subsequently resolved with teaching the client healthy sexual practices. Abuse requires a much more extensive workup, and should involve consultation or referral to a community center or medical professional experienced in working with victims of assault (e.g., a rape crisis center or a sexual assault nurse examiner [SANE]) [32]. Depending on local laws governing such cases, the midwife may also need to contact a social worker or a law enforcement agent. Most importantly, the midwife should initiate safety and support mechanisms for the woman. Treatment of the abnormal bleeding will focus on ending the abusive situation but could involve referral to a gynecologist if any anatomical damage from the abuse, such as a laceration, appears to require surgery or extensive treatment.

Aside from pregnancy, infection, or trauma, the most likely causes of metrorrhagia are hormonal in nature (Table 14-5). These include the use of contraceptive pharmaceuticals or HRT, side effects of medications or herbal preparations, and HPO axis disorders. With regard to contraception, every individual reacts differently to the standardized doses contained in OCs, hormonal injections (Depo-Provera, Lunelle), contraceptive patches (Evra), vaginal rings (Nuvaring), levonorgestrel implants (Norplant), and progesterone intrauterine devices (i.e., Mirena IUD). (Note that the copper IUD, Para Gard, while containing a mineral rather than a hormone, can also contribute to metrorrhagia [33].) Likewise, in menopausal women on HRT, some spotting is possible. (An important cautionary note: As stated in the discussion of caring for menopausal women [Chapter 13], any postmenopausal genital bleeding, even if the individual is on HRT, requires the practitioner to assess for malignancies.) Finally, many prescriptive medications (e.g., the antibiotic ofloxacin) and herbs (e.g., ginseng) have metrorrhagia as a side effect. As with all health care assessments, it is vital to know what medications and substances the client regularly takes in order to accurately ascertain the cause of abnormal bleeding.

While any disease or interruption along the HPO axis can lead to bleeding disorders, most endocrine disruptions involving the hypothalamus or pituitary gland result in amenorrhea. (Hypothyroidism, which can lead to menorrhagia, is the exception to this [34].) Thus, the presentation of metrorrhagia should suggest to the clinician either organic causes found in the genital organs or bleeding disorders that also can cause menorrhagia (e.g., von Willebrand's disease). Organic causes include polycystic ovaries, cervical polyps or erosion, uterine myomas, adenomyosis, endometriosis, endometrial polyps, and cancer. The diagnostic process for many of these conditions has been described above in the discussion about menorrhagia, while screening for cancer is covered later in this chapter. In addition to a thorough history, a workup should include a complete physical and pelvic examination, with possible endometrial tissue sampling (see Chapter 82); laboratory studies (including a CBC, TSH, PT and PTT, LFTs, and possibly coagulation testing); and in many cases a pelvic ultrasound.

As with menorrhagia, treatment depends on diagnosis. Management of metrorrhagia due to pregnancy, infection, or abuse was discussed above. Metrorrhagia due to hormonal causes usually can be remedied with one of several possible plans. If the bleeding is caused by oral contraceptives, the midwife may change the pill to one with a different hormonal structure. It has been noted that menstrual irregularities, such as metrorrhagia, are the most frequently stated reasons by women for the discontinuation of OCs [35]. If the individual has recently initiated OC use, education usually can remedy the situation. The midwife should first check to see if the woman is taking the pill in the correct manner, since erratic use or missed pills will contribute to untimely spotting. If the pill is being taken correctly, irregular bleeding is most often resolved by the start of the fourth cycle [36]. If metrorrhagia continues, the most likely cause is inadequate endometrial support. Switching the woman to an OC offering greater stimulation and maintenance of the endometrium will resolve this hormone-induced metrorrhagia. The most efficient way in which to gauge and compare the endometrial support offered by the various OCs available is to utilize a clinical reference (e.g., Dickey [36]).

As with the management of menorrhagia, if an IUD is in place, and educating the woman about postinsertion bleeding patterns, and subsequently waiting for resolution, does not meet her needs, the midwife should consider removal of the IUD. As previously noted, continuation of IUD use while re-

solving abnormal bleeding patterns may be accomplished with the insertion of the LNg 20 (Mirena) IUD, recently approved by the FDA for use in the United States. Of course, if the woman decides against continued IUD use, the midwife needs to discuss with her an alternative form of birth control.

It is important to restate that any postmenopausal woman, whether on HRT or not, who experiences menstrual-like bleeding or spotting requires assessment for malignancy. At minimum, a Pap smear and an endometrial biopsy should be performed to rule out cervical and endometrial cancer. If any masses are noted on examination, a pelvic ultrasound to rule out uterine or ovarian tumors is warranted. Indeed, even when no obvious masses are noted on examination, sonography may still be required when no other source of bleeding can be found. For further discussion regarding management issues in a postmenopausal woman with genital bleeding, refer to Chapter 13.

Knowing what medications or herbal preparations an individual may be taking, especially on a routine basis, often can lead the clinician to discovering the source of, and remedying, the metrorrhagic state. Simple removal of a medication or herb is often the solution to the abnormal bleeding. However, this seemingly easy step may not be feasible, depending on the original reason for the woman's taking these medications. In that case, working in conjunction with the medical professional or herbalist who has been caring for the woman will usually lead to developing a plan in which the metrorrhagia is resolved and optimal health is maintained.

As with menorrhagia, if the cause of a client's metrorrhagia is thought to be a neoplasm, coagulation disorder, or chronic disease, referral to a specialist is necessary. While the specialist may initially treat the woman pharmacologically, surgery is also a possibility, depending on the etiology of the problem and the success of medical treatment. The woman should be informed of these possible treatments as preparation for her visit with the specialist.

If the etiology of the metrorrhagia is thought to be hormonal in nature, then exogenous hormones are usually the treatment of choice. Whether to initiate treatment with progestin, estrogen, or a combination of the two has historically depended on the type of bleeding with which the woman presents. In general, oligomenorrhea has been treated first with progestin, while metrorrhagia has been treated initially with estrogen [5]. However, in recent years it has been discovered that combination hormonal contraceptives are very effective in controlling a number of menstrual disorders, including oligomenorrhea and metrorrhagia. Thus, many clinicians use combined OCs as the first line of treatment, especially if the woman is interested in contraception.

To control continual, heavy bleeding, the midwife can prescribe a low dose combination monophasic OC pill, twice a day, for 5 to 7 days. Even if the bleeding stops or subsides within a day or two after initiation of therapy, the pills should still be taken for the remainder of the prescribed length of time [5]. If the bleeding does not end, and trauma has been ruled out, then the presence of pregnancy or a neoplasia should be reconsidered. If the bleeding does cease, then twice daily dose can be stopped after 5 to 7 days, but the woman must be warned that she will now have a heavy withdrawal bleed and strong cramping 2 to 4 days after taking the last twice-a-day dose. This is normal, and the bleeding will typically last at least 5 days. On the fifth day of flow, the woman should then be started on 3 months of routine OC use. With each monthly withdrawal cycle while on the OCs, the individual should experience decreasing amounts of bleeding and cramping.

At the end of the 3-month treatment, if the client desires birth control, the simple course of action is to leave her on the pill she has been using. If birth control is not necessary, or OCs are not her method of choice, then discontinuing OC use should result in the return of regular ovulation and the healthy build-up of endometrium by endogenous estrogen [5]. If spontaneous menses do not occur at this point, then an anovulatory state should be suspected. If pregnancy is ruled out as the cause, then the woman will need progestin therapy to help facilitate the shedding of estrogen-driven endometrial proliferation. This can be accomplished by prescribing medroxyprogesterone acetate (e.g., Provera) tablets, 10 mg po, once daily for 10 days, beginning approximately midcycle each month. Menstrual flow will occur anywhere from 2 to 7 days after the woman takes the last pill [5]. This therapy can be continued monthly to help maintain a cyclic balance between endometrial buildup and shedding. Each individual will need to be assessed for contraindications to exogenous hormone use before initiating this therapy (refer to the discussion of hormonal contraceptive methods in Chapter 20), especially with regard to the use of estrogen and its relation to cardiovascular risks.

If combined hormones or progestin therapy do not result in a regular menstrual flow, or metrorrhagia continues, referral for a more extensive workup must be considered.

For the woman whose complaint is unpredictable spotting during the month, the midwife should suspect low levels of cyclic endogenous estrogen, or greater amounts of progesterone than is normally required to balance with estrogen for a healthy menstrual cycle. This results in poor endometrial buildup that leads to less-than-optimal, intermittent shedding of tissue. While this can be found in a woman not using hormonal forms of birth control, the complaint of spotting also can be heard in individuals using injectable medroxyprogesterone acetate (e.g., DepoProvera), levonorgestrel implants (e.g., Norplant), or combined hormonal contraceptives. The spotting can normally be resolved with the use of estrogen therapy. For the woman not using a hormonal form of birth control, oral estrogen can be prescribed in the forms of conjugated estrogen (e.g., Premarin), 1.25 mg, or estradiol (e.g., Estrace or the pink tablet of Ortho-Prefest), 2.0 mg, given once daily for 7 to 10 days [5]. For the woman not taking any other form of hormonal medication, this course of estrogen will need to be followed with exogenous progesterone in order to initiate a withdrawal bleed. This is most often accomplished through the use of a combination OC, initiated at the same time as the estrogen therapy. Gynecological endocrinologists, such as Speroff and colleagues [5], then recommend continuing the individual on low-dose OC therapy.

As stated previously, when a new user of oral contraceptives is experiencing spotting even after 3 months of therapy, switching her to a pill with greater endometrial support will usually resolve the metrorrhagia. If the woman experiencing intermenstrual spotting has been on OCs for several months or more without bleeding side effects and has only recently experienced the spotting, then the clinician should consider switching her to an OC with greater estrogenic activity [36]. An alternative is to complement her monthly OC use with a therapy of either conjugated estrogen (e.g., Premarin), 1.25 mg, or estradiol (e.g., Estrace or the pink tablet of Ortho-Prefest), 2.0 mg, to be given monthly for 7 days along with the OCs. This same monthly distribution of estrogen can be given to users of injectable medroxyprogesterone acetate (e.g., DepoProvera) or levonorgestrel implants (e.g., Norplant) who are experiencing spotting. Keeping in mind concerns raised with regard to estrogen use and risks of cardiovascular disease and cancer, practitioners should be aware that these suggested estrogenic therapies should be considered short courses of action, not long-term therapy.

Discussions in the literature regarding other therapeutic approaches to metrorrhagia are limited. Most information about the use of traditional Chinese medicines, acupuncture, herbs, homeopathy, aromatherapy, and other modalities is related to menorrhagia and has been discussed earlier in this chapter. Their application to metrorrhagia is unclear, with further evidence needed before specific recommendations can be made. As stated previously regarding approaches to health care involving knowledge of modalities such as Chinese medicines, acupuncture, herbs, homeopathy, and aromatherapy, most of the evidence regarding safety and effectiveness of use is based on clinical practice, not on evidence-based scientific investigations. Thus the midwife should work with a practitioner knowledgeable in the particular modality being suggested to, or requested by, the client, and should keep abreast of the scientific literature regarding evidence-based studies that support or caution use of various modalities of health care.

Any continued bleeding after therapy has been tried, or any acute bleeding putting the individual at risk of systemic illness or compromise, requires referral to the appropriate specialist. Educating the woman as to what type of workup and possible treatment to expect from the specialist can do much to relieve her anxieties regarding the state of her health and possible solutions.

Oligomenorrhea

The term oligomenorrhea refers to infrequent or scanty menstrual flow. While some authors label only infrequent flow, or decreased number of periods, as oligomenorrhea, and refer to scanty but regular menses as hypomenorrhea [20], both conditions are worked-up similarly, and the term oligomenorrhea is frequently used clinically to refer to both forms of diminished menstrual flow. It is important to note that oligomenorrhea is often a reflection of normal development or physiological processes, and is not necessarily a sign of disease or pathology.

The most common times for the occurrence of oligomenorrhea are in the first few years following menarche and/or the decade before menopause. Scant bleeding during these two periods of time is part of normal development, seldom requiring intervention, except in the form of educating the

woman about the normalcy of what is occurring. The most likely cause is anovulation—for the adolescent because a regular pattern of ovulation has yet to occur, and for the perimenopausal woman because she is maturing toward a menopausal state, one in which ovulation no longer occurs. If the midwife is able to rule out other potential states, such as pregnancy or thyroid disease, then the key management tool is education. The adolescent needs to be made aware that a regular menstrual pattern should eventually develop, and if it does not, a thorough assessment will most likely lead to a definitive diagnosis. The perimenopausal woman benefits from understanding the normalcy of this time of her life. Options for long-term health maintenance will need to be reviewed, with a candid discussion required about lifestyle, diet, and the possibility of hormone replacement therapy or some other form of pharmaceutical or herbal regimen.

Another nonpathological cause of oligomenorrhea is the use of, or withdrawal from, hormonal contraception. Using combined hormonal contraceptives, DepoProvera, Norplant, or a hormone-based IUD often reduces the flow or timing of menstruation, and the discontinuation of one of these birth control methods can result in a delay in the return of a regular menstrual pattern. This is particularly true of DepoProvera: after stopping its use, normal menses may take close to a year to resume [37]. Also, if the midwife is caring for a woman who has recently come to the United States from a foreign country, the clinician must inquire about the client's possible use of a hormonal contraceptive that may not be available in this country and that may have influenced her menstrual pattern. In general, there is no harm associated with these cases of oligomenorrhea, and the clinician must simply educate the client as to the safety of this reduced flow. (Obviously, if underlying pathology is suspected, an appropriate assessment workup is warranted.) Even though oligomenorrhea is often not a sign of ill health, the woman's fears and anxieties must still be acknowledged, and she must be supported in adjusting to any physical and lifestyle changes. Finally, for the woman who is experiencing oligomenorrhea after discontinuing hormonal contraception, she may believe that reduced menstrual flow is an indication that she cannot become pregnant. This is not the case, and birth control options must be discussed with the client unless pregnancy is desired.

Other factors can contribute to oligomenorrhea. These include anxiety and stress, chronic disease, certain medications, occupational and environmental hazards, disease states, poor nutrition, strenuous exercise, and significant weight loss. In addition, any malfunction along the HPO axis can result in decreased menstrual flow. Potential diseases and conditions of this regulatory axis include hyperprolactinemia, Cushing's syndrome, and polycystic ovarian syndrome (PCOS). Also, beyond HPO axis problems, disruptions of thyroid or adrenal function can result in oligomenorrhea.

The clinical evaluation required to find the cause of oligomenorrhea resembles those actions taken to discover the reasons for amenorrhea (see above). As with the evaluation of amenorrhea, the initial step in assessing oligomenorrhea is to rule out pregnancy. Depending on timing of the visit in relation to the last normal menses, a urine HCG test usually will allow the clinician to make this diagnosis.

If the woman is not pregnant, the midwife should ask the client about her overall health, nutritional and exercise status, use of medicines and/or herbs, and emotional state. Complementing these questions with a complete physical will enable the clinician to rule out most chronic illnesses, anorexia nervosa, bulimia, crash dieting, obesity, strenuous exercise, physically demanding activities, medicinal/herbal side effects, and overall emotional stress as potential causes of the individual's decreased or scant flow [5]. Typically, resolving an underlying illness or condition will result in more regular menses and flow.

Once pregnancy, normal developmental changes, general ill health, or nutritional, physical, medicinal/herbal, and emotional problems have been ruled out, the next step is to measure levels of TSH and prolactin. Again, as with the assessment of amenorrhea, the midwife is attempting to rule out hypothyroidism, hyperthyroidism, hyperprolactinemia, and galactorrhea, the specific treatments of which should contribute to the resumption of regular menstrual flow. An elevated TSH level suggests primary hypothyroidism and is an indication for treatment with a synthetic thyroid hormone preparation. Levels of TSH below normal could indicate secondary hypothyroidism or hyperthyroidism (e.g., Graves' disease), and will require further testing that typically indicates the need for consult or referral with an endocrinology practitioner. Treatment of any of these potential thyroid conditions should contribute to alleviation of the oligomenorrheic state.

Elevated prolactin levels are an indication of hyperprolactinemia and galactorrhea, the causes of

which are usually prolactinomas, secretory tumors of the pituitary. While the cause may also be idiopathic, the treatment is the same for either etiology [5]. Bromocriptine (e.g., Parlodel) or a dopamine agonist can be prescribed, resulting in more consistent ovulation and subsequent menses. It should be noted that individuals on drug therapy for pituitary problems require close monitoring of prolactin levels and pituitary status, thus suggesting that this care be handled by an endocrine specialist, either directly or through consultation. Also, medications aimed at remedying pituitary deviations from normal often cause a rise in the person's libido and sexual response. Women should be counseled of this possibility before initiating medication.

If hypothyroidism, hyperthyroidism, hyperprolactinemia, and/or galactorrhea are ruled out as underlying causes of oligomenorrhea, then the clinician will follow the same steps followed in the diagnosis of amenorrhea, beginning with a progesterone challenge (refer to section on amenorrhea found earlier in this chapter). Since the individual with oligomenorrhea has already demonstrated that menses does occur, assessing for a patent genital outflow tract is not required. As with the workup of the amenorrheic individual, a progestin challenge is used to assess for the presence of endogenous estrogen needed for the routine monthly buildup of endometrial tissue. If the challenge results in menstrual bleeding within a week of discontinuing the progestin, then the presence of endogenous estrogen is established, and the focus of the workup then becomes anovulation. At this point, abnormal functioning of either the ovaries, pituitary, or CNS is suspected. The assessment of these three areas for healthy functioning follows the same steps used in the workup of amenorrhea. As with amenorrhea, treatment for the woman often involves hormone therapy. Combination OCs can be taken continuously to regulate the timing and amount of menstrual flow, with the added benefit of offering birth control, if so desired. If the individual does not desire birth control, then the woman can take medroxyprogesterone acetate, 10 mg po for 10 days each month, after which she can anticipate withdrawal bleeding.

As with the evaluation of any menstrual irregularity, the midwife must offer the woman knowledge and support throughout the process. Depending on her age and desired fertility, a number of potentially anxiety-provoking issues need to be addressed, such as fears about infertility or cancer. Good communication between the clinician and the woman's other health care providers and/or specialists can do much to support her during the assessment and treatment phases of the oligomenorrheic workup.

Premenstrual Syndrome

One of the more difficult deviations from a healthy state to accurately identify in a woman is the collection of symptoms known as premenstrual syndrome (PMS). Physical, psychological, and behavioral cyclic changes (e.g., bloating, mood changes, appetite changes) that mirror the timing of the menstrual cycle occur in almost all women at some time between menarche and menopause [38]. Attempting to discern when these symptoms collectively form a syndrome, particularly one that necessitates intervention, can be a challenge to the midwife, since there exists no single physical finding or laboratory test that enables one to diagnose PMS. Thus a careful history from the woman regarding her reported symptoms and the timing of them is vital to understanding any complaints from her that seem to be related to her menstrual cycle. This history will aid the woman and her midwife in distinguishing between (1) normal, nonpathological monthly changes, (2) PMS, and (3) the more severe premenstrual dysphoric disorder (PMDD), a state of depression defined in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) as occurring in a pattern reflecting the menstrual cycle [39].

While it is safe to assume that the symptoms of PMS have been experienced by women throughout the evolutionary process, it was not until the middle of the twentieth century that PMS came to be formally defined [40]. Over the last 50 years the definition has varied, but in general, PMS refers to a cluster of physical, psychological, and behavioral symptoms that occur during the late luteal phase of the menstrual cycle and end with the onset of menstruation [41]. It has been estimated that up to 75 percent of women will experience symptoms of PMS at some time in their adult life [39], and that 20 to 40 percent will seek medical help for PMS. The most severe cases generally occur in women ranging in ages from their late 20s until their mid-30s [41]. Well over 100 symptoms have been attributed to PMS, and most are listed in Table 14-6.

PMDD is a condition in which the symptoms of PMS are more severe and cause significant functional impairment [39, 42]. It has been estimated that anywhere from 3 to 9 percent of women suffer from this disorder at some point in their postmenarche, premenopause adult life [41, 43]. As with PMS, this disorder can be difficult to accu-

TABLE 14-6 Symptoms of Premenstrual Syndrome (PMS)

Abdominal bloating	Cystitis	Hostility	Rage
Abdominal cramps	Decreased concentration, efficiency, motivation	Hunger pangs	Rhinitis
Accident proneness		Hypersomnia	Runny eyes
Acne	Depression	Indecision	Sadness
Aggression	Diarrhea	Insomnia	Salt/sweet cravings
Agitation	Dry hair	Irritability	Seizures
Alcohol intolerance	Edema	Joint and muscle pain	Self-inflicted injury
Anger	Epilepsy	Lethargy	Sensitivity to rejection
Anorexia	Exhaustion	Libido changes	Skin rash
Anxiety	Eye problems	Migraines	Social isolation
Assault	Fainting spells	Mood swings	Sore throat
Asthma	Fatigue	Muscle cramps	Stiffness
Backache/pain	Food binges	Nausea	Suicidal ideation
Blackness around eyes	Food cravings	Noise sensitivity	Sweating
Blurred vision	Frequent urination	Oily skin	Tension
Boils	Frustration	Oliguria	Tonsillitis
Breast engorgement	Greasy hair	"Out-of-control" feelings	Tremors
Breast tenderness	Headaches	Palpitations	Urethritis
Bronchitis	Herpes attacks	Panic attacks	Vertigo
Bruising	Hirsutism	Paranoia	Weeping spells
Child abuse	Hives	Paresthesia	Weight gain
Clumsiness	Hoarseness	Poor impulse control	Withdrawal
Confusion			

rately diagnose. Diagnosis involves distinguishing between PMS and PMDD, as well as differentiating PMDD from a concurring state of depression, which exists in over 50 percent of women believed to have PMDD [41]. The American Psychiatric Association [39] offers the definition of PMDD presented in Table 14-7. While PMDD can be viewed as a severe form of PMS, it is important to note that

TABLE 14-7 Criteria for Premenstrual Dysphoric Disorder (PMDD) in the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)*

In order to make a diagnosis of Premenstrual Dysphoric Disorder (PMDD), at least 5 of the following 11 symptoms are required.

- At least one of the following:
  Feeling sad, hopeless, or self-deprecating
  Feeling tense, anxious, or "on edge"
  Marked lability of mood interspersed with frequent tearfulness
  Persistent irritability, anger, and increased interpersonal conflicts
- And 1 to 4 of the following additional symptoms:
  Decreased interest in usual activities, possibly associated with withdrawal from social relationships
  Difficulty concentrating
  Fatigue, lethargy, or lack of energy
  Marked changes in appetite, possibly associated with binge eating or craving certain foods
  Hypersomnia or insomnia
  Feeling of being overwhelmed or out of control
  Physical symptoms, such as breast tenderness or swelling, headaches, sensations of bloating or weight gain, and possibly joint or muscle pain

Any collection of these symptoms may be accompanied by thoughts of suicide.

In order to apply the diagnosis of PMDD, these cyclic symptoms must have occurred "most months" [not clearly defined in the *DSM-IV*] over the last 12 months, and disappear shortly after the onset of menses each month. Typically, the symptoms last from the week prior to menses until mid-menses, and are always absent during the week after menses.

Source: Reprinted with permission from the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, Text Revision. Copyright 2000 American Psychiatric Association.

PMDD focuses on matters of psychological and emotional nature, and that PMS can also encompass physical deviations from normal without the psychological sequelae. Thus a woman could have cyclic physical symptoms (e.g., diarrhea, hirsutism, or skin rash) that are not psychological in nature yet can be quite restrictive in terms of performing the activities of daily living (ADL). This individual would not be diagnosed technically with PMDD, yet could be suffering just as much interruption in ADL as the woman with PMDD. To date, there is no title to attach to this extreme form of "physical PMS," nor is there evidence as to how many individuals actually suffer from this malady.

The etiology of PMS is unknown. Theories originally emphasized psychological factors, but have since ranged from those with a biological emphasis to those suggesting a combination of biological, psychological, and social factors. The hormones estrogen and progesterone have been theorized to play a role in PMS, mainly because of their fluctuating patterns that occur during the menstrual cycle. In addition, estrogen's ability to affect serotonergic neurological function has led some reseachers and clinicians to postulate that PMS involves problems with the serotonin system. While past treatment regimens involving the use of progesterone have not proved effective, there has been recent clinical evidence to support the use of selective serotonin reuptake inhibitors (SSRIs) as treatment for moderate to severe PMS or PMDD [44, 45]. In fact, fluoxetine (Sarafem, Prozac) is an FDA-approved agent for use in treating PMDD [41]. However, SSRI treatment does not work for many women with PMS or PMDD [46], and midwives are cautioned to recognize that simply prescribing an SSRI without looking at all of the symptoms reported by a client is categorizing PMS or PMDD as a biological condition and may lead to overlooking the psychological or social contributing factors that also require attention.

In evaluating a woman who appears to have PMS, the first step is to obtain a thorough history regarding the symptoms. The timing of the symptoms is vital to diagnosing this condition. Because there are so many factors related to PMS (see Table 14-6), the midwife must be sure that the woman does not have a separate condition, with similar symptoms, that is not dependent on her menstrual cycle. For example, hypothyroidism and clinical depression have many of the same symptoms found in PMS. While the symptoms in these other conditions may vary in intensity, they do not do so in a cyclic manner consistent with the timing of the menstrual cycle. Most importantly, the symptoms of PMS consistently disappear with the onset on menses, while the symptoms of other conditions either wane sporadically or do not disappear at all.

The most effective manner in which to obtain a history of symptoms is to do so prospectively. Encouraging a woman to keep a daily log of symptoms along with a charting of her menstrual cycle will give the midwife a more accurate depiction of what is occurring than will asking the woman to attempt to recall the timing of symptoms based on prior experience [46]. Typically, a three-month log should include a daily recording of the menstrual cycle status, any physical or emotional symptoms, any alterations in the individual's ADL, and the woman's diet and exercise routine. This prospective recording will afford the midwife and the woman a significant amount of information for use in ruling out PMS. The information will also be vital in working toward a possible solution.

A physical and pelvic examination will assist in diagnosing PMS because it will help the midwife to rule out other possible causes of the symptoms that the woman is experiencing. For example, a thyroid disorder, a cardiac abnormality, or a pelvic mass could be the source of symptoms thought to be related to PMS and could be discovered on examination. It is important to note, however, that even if a physical cause for a woman's symptoms is found and subsequently treated or controlled, the individual could still be suffering from PMS and may require additional treatment and therapy related to this latter condition.

While laboratory procedures can be useful in ruling out differential causes of symptoms related to PMS, there are no current standard or routine assessment procedures recommended for diagnosing this condition.

If a diagnosis of PMS or PMDD is made, treatment can take various forms, and must be individualized for each client. Management of these conditions starts with an understanding, caring approach that acknowledges the reality of what is happening to the woman who is suffering. It serves the midwife well to know the historical perspective of Western medicine and traditional cultural beliefs regarding premenstrual symptoms. Prior to the mid-twentieth century, symptoms of PMS were not recognized as occurring specifically during the late luteal phase. They were more broadly described as being related to the general process of menstruation and were more closely linked to the actual bleeding

of menses. The symptoms experienced by women were attributed to causes ranging from the work of the devil to psychotic breakdown unique to the female psyche, and women suffering from PMS-like symptoms were considered, as late as the mid-twentieth century, to be "invalids" [40, 42, 47]. With the recognition over the last 50 years of PMS and its accompanying symptoms as a unique disorder, the various stigmas attached to menstrual-related symptoms began to break down. However, from a cultural standpoint, these historical perspectives do not disappear with ease, and even today women with PMS have been reported to view their bodies in a negative light, with feelings of failure and shame having been expressed [48]. Thus the midwife must begin any management of PMS or PMDD with an expression of empathy and support toward the woman, so as to acknowledge not only the symptoms she is experiencing but also the possible cultural stigma that she may be bearing or trying to avoid.

Most of the available scientific literature regarding treatment of PMS and PMDD focuses on the latter. A number of studies have been conducted over the last decade exploring pharmaceutical means of treating PMDD, but little research has been conducted that examines other approaches, such as lifestyle changes, for managing PMDD, and there are no reports in the literature of clinical trials currently testing methods of treating PMS.

There are, however, a number of medical textbooks, self-help publications, and Web-based "PMS" sites that generally promote the same consistent approach to treating PMS [49–51]. This approach involves a multifaceted change in an individual's lifestyle, including diet, daily activity, and reduction in stress. Goals of treatment should include building self-esteem and self-control, stress relief, tempering or eliminating symptoms, and facilitating the body's natural, healthy processes to increase feelings of well-being. Helping a woman to feel in control is critical for a PMS sufferer. Knowing that she has PMS provides a name and a reason for the feelings that may be causing her to feel out of control. Discussion with family and friends and participation in PMS support groups enables the individual to develop ways of coping and to establish channels of communication with close family members for understanding and help during premenstrual days.

Looking for causes of stress and seeking ways of reducing them serve the double function of diminishing the stress actually being experienced by the woman while increasing her feelings of control. Programs of exercise and nutrition specifically designed for the individual woman will help to promote physical and psychological well-being. Nutritionally, the woman should benefit by reducing her premenstrual intake of salt, refined sugars, caffeine (coffee, tea, sodas, and chocolate), and alcohol. She should try to maintain balanced nutritional intake, regular eating times, and increased intake of water (a natural diuretic) throughout her daily life, but especially prior to her menstrual period.

It is important for both the woman and the midwife to recognize that these suggestions are likely to represent a major adjustment to the woman's daily life. Success in treatment of PMS is not likely to occur if all suggested changes are attempted to be made at once. It is best to begin alterations in ADL by learning where the woman is currently with regard to such matters as diet and exercise, and then building slowly from there. Recommendations for change should begin with the most immediate and essential factors contributing to PMS symptoms; when these alterations are ingrained, add other recommendations one at a time. For example, in nutrition, start by having the woman reduce her use of sugars, caffeine, and alcohol; later add complex carbohydrates; and then reduce fats. With exercise, if the woman is sedentary, encouraging a daily short walk at her own pace will be far more likely to bring results than starting her with a more rigorous regimen that requires warm-ups, wind-downs, and calculations of pulse rate. These helpful techniques can be added later, but the first goal should be initiating some form of exercise. Even basic stretching exercises can be useful in promoting a general feeling of well-being and reducing stress. If the individual can afford to hire a personal trainer, or can encourage a friend or family member to assume this role, there is much to be gained by having a personal "coach" encourage the woman to make the changes needed to reduce the symptoms of PMS.

If the symptoms of PMS are severe or if the woman is diagnosed with PMDD, adding psychological therapy and/or medication to the diet and exercise changes mentioned above may be required elements of treatment. There is evidence that cognitive-behavioral therapy can help control the symptoms of PMDD, and that the effect is long lasting [52, 53]. However, most research in the medical literature explores the use of medications for the treatment of PMDD. While GnRH agonists, oral

contraceptives, and benzodiazepines are some of the pharmaceuticals that have been tested, the efficacy of these elements has been mixed at best. The class of medications that has shown the most promise in treating PMDD has been the SSRIs, including fluoxetine, sertraline, paroxetine, and citalopram [41]. Of these, the most effective in clinical trials has been fluoxetine (Sarafem, Prozac) [38, 44, 45]. Of several regimens tested, it is the most effective at the lowest possible dose: 20 mg taken daily, either on an ongoing, continuous basis or for the 14 days of the luteal phase each month, ending with the onset of menses. Because of side effects inherent to the taking of SSRIs, it is recommended that the woman begin with the 14-day per month regimen, and increase to the ongoing, continuous regimen only if little or no relief of symptoms is achieved with the intermittent approach.

While the use of fluoxetine has been tested with subjects diagnosed as having PMDD, the medication has been used clinically with clients suffering from moderate to severe forms of PMS. However, the midwife must use this, and any medication, with caution when managing the care of an individual with PMS. As mentioned previously, SSRI treatment, even with fluoxetine, does not work for a substantial number of women with PMS or PMDD [46]. Midwives must thus avoid the temptation to seek an "easy fix" to this complex problem. Prescribing an SSRI should not keep the midwife from addressing additional factors, such as physical conditions or social situations that contribute to the PMS symptoms and that will receive no relief with the action of an SSRI.

In addition to medications, multiple vitamins, minerals (especially calcium), and a number of complementary therapies have been recommended for use in treating PMS [54–57]. Yet, the availability of research evidence supporting these recommendations is limited. Many of the individual symptoms of PMS have been reported by practitioners of various modalities to be treatable using such techniques as aromatherapy, chiropractic, homeopathy, hypnotherapy, magnet therapy, massage, reflexology, Reiki, and yoga [58]. However, a review of randomized clinical trials, each of which had examined the use of individual complementary modalities specifically addressing the treatment of PMS, led to the conclusion by the reviewers that no current evidence exists for the treatment of PMS using these modalities [59]. The specific techniques examined in these clinical trials included the use of herbal elements (chaste tree, gingko, and evening primrose oil), homeopathy (specific element not mentioned), reflexology, chiropractic, massage, biofeedback, relaxation techniques, and nutritional supplements. The reviewers stated that they were unable to find any randomized clinical trials for the modalities of acupuncture, aromatherapy, Chinese herbs, hypnosis, meditation, therapeutic touch, or yoga. However, an examination of the current literature reveals a number of authors who promote the use of several of the aforementioned modalities and who present evidence to support their recommendations [54, 56, 60, 61]. Thus the midwife is presented with a confusing collection of evidence regarding treatment of PMS using any one of a variety of complementary modalities. The most that the clinician can do is to review with each individual client what potential treatments of PMS exist, explain what evidence, if any, supports each of the treatment modalities, and assist the woman in making a decision about which route of care she desires taking. Again, despite the current confusion in the treatment of PMS, simply having acknowledged to the woman that she indeed does have real symptoms that require addressing is a large first step the midwife can make in helping to improve the client's health and well-being.

Abdominal and Pelvic Pain

Overview

Complaints of abdominal and pelvic pain are common motivations for seeking gynecological care and comprise a significant portion of the energies of women's health care providers. Entire volumes are dedicated to the evaluation and treatment of pelvic pain and interested midwives will find many opportunities to expand their skills in this area. This section will address the most important issues in the evaluation of pelvic pain and the most common causes of the pain.

Many women present for an annual check-up, and upon taking a careful history the midwife discovers that the issue of chronic pain is the underlying reason for the visit. Pain has a significant impact on a woman's quality of life, producing fatigue, tension, or depression, yet she may be reluctant to discuss this for a variety of reasons. Previous providers may have overtly or inadvertently discounted her pain, or she may have been uncomfortable discussing her pain completely. Pelvic pain often rep-

resents or triggers many emotions centered on her sense of self as a woman, her ability to conceive and bear children, or feelings pertaining to her sexuality.

On the other hand, a woman may present with abdominal or pelvic pain complaints after having been seen by one, or many other practitioners who have reached the limits of their skills and have recommended a gynecologic consult. This woman, and perhaps her family members as well, are often angry and frustrated, and they have ever-mounting concerns regarding the source of her pain.

Acute abdominal or pelvic pain also commonly presents as a problem visit in the office or on the phone. Careful screening must accompany the evaluation of acute pain to ensure appropriate management.

One or more visits are often needed for this assessment and at times require a great deal of time and provider energy, both of which may be in short supply in a busy practice [62]. The current emphasis in some practices is on short, focused visits and this may seem incompatible with a high quality, comprehensive approach to a problem; however, as with the assessment of many ambulatory problems, the midwife must be able to adapt visit structure and time to allow for flexibility in the appropriation of office time and resources.

The approach to assessing pain must recognize both the physical and psychological realities of the person experiencing the pain. In order to establish a trusting, mutually satisfying clinical relationship, the midwife must validate the woman's experience and communicate a commitment to a comprehensive exploration of the problem as perceived by the woman [63, 64]. The midwife should also at some point during the visit, explain to the woman that the cause of her pain may have both a physical and a psychological component and that the cause may be elusive and not lend itself to a simple explanation or solution. It is useful to mention that relief often results from dietary changes, activity changes, or a variety of other approaches to her life and lifestyle [65, 66].

When beginning to explore pelvic pain with a woman, the midwife must carefully sort out the often unspoken knowledge that each woman holds as her own reference point for "normal"—her own social, cultural or religious influences on her sense of self as a woman and her unique perception of the various aspects of reproductive function. Her beliefs with regard to what is normal or not will have an inevitable impact on her interpretation of her menstrual cycle, vaginal secretions, and emotional response to any perceived variation in function including pain or discomfort.

Finally, it is important to remember that historically, women have been told that many gynecologically based problems were "all in your head." Some women interpret the suggestion that pain might have a psychological component as an example of this dated and misogynist behavior by the provider. She might also react negatively to the notion that there may be an emotional issue contributing to her physical distress. Despite current advances in the public's understanding and acceptance of mental illness, the stigma is still prevalent and the midwife must proceed sensitively in any discussion of potential referral to mental health treatment or support groups, when they are appropriate. The midwife must often overtly reinforce that the body and the mind are not independent entities, and that comprehensively addressing a problem in one "system" often necessitates a multifaceted approach.

Types of Abdominal/Pelvic Pain

Acute Pain The ability to recognize and accurately manage acute abdominal pain is an important skill in women's health. The midwife must be able to recognize and appropriately evaluate a potential abdominal emergency. The ability to safely care for clients experiencing such an emergency necessitates the existence of a preexisting relationship with surgical and nongynecologic referral systems and providers. It is often the case that in women of childbearing age, an ectopic pregnancy or other serious gynecological problem must be ruled out in order for her to be cared for by the right medical or surgical providers. Consequently, the ability to recognize the signs of an ectopic pregnancy is of primary importance to the midwife. Other causes of acute pain that necessitate prompt diagnosis include appendicitis, pelvic inflammatory disease (PID), and ovarian torsion. Each of these will be addressed individually.

In an emergency situation the midwife may need to enlist support services at her institution in order to address a lack of health insurance, childcare needs, or other issues. If a diagnosis of pregnancy has been made, one must consider issues of confidentiality and the impact this information might have on other persons in this woman's life. The fact that she has been sexually active, or sexually active outside of an acknowledged relationship, may have the potential for devastating consequences and must be handled carefully.

Chronic Pain The woman with chronic pelvic pain may present as a person who has had a long series of encounters with health care providers. She, and the significant others in her life, may have found their contacts with providers less than satisfying or are seeking care from several different providers in search of a particular diagnosis or treatment. The inability of the woman's system of care to meet her perceived needs may lead to inappropriate or overuse of health care resources, including diagnostics and treatment interventions [67, 68]. It is crucial to know if the client has indeed had such an experience so as to be clear about her motivations for this visit and her expectations for your involvement in her care. The woman's history of her previous care is just as important as the history of her pain. On the other hand, the client may have chronic pain that has never been fully articulated or fully explored with a care provider. She has presented for multiple problem visits with vague complaints but has never had her concerns adequately or comprehensively addressed.

Evaluating Pelvic Pain

Midwives are familiar with the use of a systematic and thorough approach to the evaluation of a problem. The collection of data in the evaluation of pain must be particularly thorough in order to reach an accurate conclusion. A helpful tool in the evaluation of any complaint, including pain, is the "OLD CART" system (see Table 14-8). The use of this simple review guides the midwife through a comprehensive evaluation of the problem from the woman's point of view. The system is useful with the modification of several lines of inquiry. In the midwife's exploration of the woman's complaint of pelvic pain the following information must be obtained:

Onset: When did the pain begin? Can the woman identify a particular event or point in time related to the initial recognition of the pain?

Location: Many women refer to any pain below the umbilicus as "abdominal" pain. Assist her in specifically identifying the location of her pain. Many women have an inaccurate perception of where their pelvic organs actually are and may, for instance, think that the uterus is commonly located above the pubic bone. The midwife needs to ascertain if the pain moves or radiates or has a different quality in varying locations.

Duration: Is the pain cyclic or noncyclic? Is it related to her menstrual cycle? Is it related to her bowel function or to sexual activity? Is the onset of the pain related to her diet or diet changes? Is it related to work or athletic activities? Is it related to her emotional state of being or to the onset of emotional stress?

Character: Try to assist the woman in describing her pain if she cannot do so spontaneously. Give her a wide variety of descriptors used for pain such as *sharp/dull*, *gnawing*, *burning*, *achy*.

TABLE 14-8 The "OLD CART" Method of Obtaining a History About Reported Pain

Onset	When did the pain begin? Can the individual identify a particular event or point in time related to the initial recognition of the pain?
Location	Specifically identify the location of the pain. Does the pain move or radiate or have a different quality in varying locations?
Duration	Is the pain cyclic or noncyclic? Is it related to other health factors (e.g., bowel function, physical activity, sexual activity, menstrual cycle)? Is the onset of the pain related to diet or diet changes? Is it related to work activities? Is it related to the individual's emotional state of being or to the onset of emotional stress? How long does the pain last once it begins?
Character	Ask the individual to describe the pain. Offer a wide variety of descriptors used for pain, such as *sharp/dull*, *gnawing*, *burning*, *achy*.
Aggravating factors	What makes the pain worse (e.g., exercise, diet, constipation, diarrhea, urination, physical activity, sexual activity, menses)?
Relieving factors	What relieves the pain (e.g., rest, diet change, bowel movement), and to what degree?
Treatment used	What treatments has the individual used to help alleviate the pain? Were they recommended by other providers or suggested by a family member, friend, book, or Web site? Were medications used, either over-the-counter or prescription, or both? Were any "alternative" treatment modalities used? What was the success or failure of any treatments that were used?

Aggravating factors: Elicit any information regarding what may make the pain worse, such as exercise, sexual activity, constipation, diarrhea, menses, urination, diet.

Relieving factors: Elicit what relieves the pain, and to what degree.

Treatment: Assess what the woman has done to try and relieve the pain and to what degree each intervention was successful. Specifically inquire as to the treatments suggested by other providers and any "alternative" treatment modalities used.

Several questionnaires are available for use in the evaluation of chronic pain [63]. Should the midwife be in a practice where caring for women with chronic pain is common, the use of such data collection instruments is advisable. Many women will answer these questionnaires in detail and provide a wealth of information; however, others who have not considered their pain in any comprehensive manner may need to return for a future visit with a pain diary or history. Finally, it is always important not to forget to ask perhaps the most obvious question: What does the woman think the problem is?

History A thorough history, including menstrual cycle characteristics and sexual activities, will be of use in this evaluation. The midwife should include the woman's assessment of how her pain has affected her quality of life. She may have adapted many of her daily activities, including her work, school, athletics, and sexual activities in response to her pain. The impact of her pain may extend far beyond her physical sensations. If her pain has had an impact on her quality of life, her relationships with her coworkers, family, and friends may have suffered as well. This will have inevitable negative consequences on her emotional well-being. In the case of long-standing pain, evaluation and treatment by a mental health professional may be productive.

In the event that further screening or diagnostic studies or referral for treatment is indicated, it is useful to know whether the woman's ability to obtain further care may be influenced by her socioeconomic or health insurance status. While it is always important for the midwife to be judicious in the choice of testing or treatment, lack of insurance coverage makes these choices even more challenging. A midwife should be familiar with the payment options and eligibility criteria of her referring institutions and laboratories, such as a sliding payment scale based on income, or waived payment for care, often referred to as "charity care." Additionally, many low-income women may be eligible for free or low-cost gynecologic cancer screening or treatment via government or institutionally sponsored programs. Because some women may be reluctant to disclose that they are unable to pay for testing or treatment, the midwife should be cognizant of a woman's insurance coverage status or resources to pay for care. An exploration of the ability of the woman to proceed with the testing or treatment is much more useful at the time when the plan is made rather than at some later time when the midwife realizes that the woman did not return for care and may be at increased risk for disease or disease progression.

Examination Examination of a woman presenting with abdominal or pelvic pain may require a complete exam or may be quite focused depending on the level of previous care and the acuity of the pain. A woman with acute pain, especially when accompanied by fever, tachycardia, significant change in blood pressure, signs of shock, vomiting, or evidence of significant blood loss, must be evaluated for the possibility of immediate referral or consultation. Efficient evaluation, documentation of findings, and consultation are in order. A diagnosis of ectopic pregnancy, appendicitis, bowel obstruction, sepsis, or ovarian torsion all dictate the need for immediate physician consultation and referral for care.

In the absence of an acute presentation, the midwife should perform a complete examination. The woman's demeanor and presentation should be included in the evaluation. Is she relaxed or tense in her stance or posture? Is her stance or posture asymmetrical indicating the guarding of an area or long-term discomfort? Vital signs may be helpful in assessing for an underlying condition related to the pain. Evaluation of the back and lower extremities are often useful to rule out a musculoskeletal injury, such as a muscle strain or stress fracture.

Abdominal Examination A standard abdominal exam should be performed, including observation, auscultation, percussion, and palpation. The goal in palpation is not only to palpate for organ enlargement or displacement, or to identify a mass or enlarged lymph nodes, but also to see if the pain can be reproduced. It is often useful to first ask the woman if she herself can reproduce the pain. If not, proceed with care and respect, with attention to the unaffected side or area first. For instance, if the woman reports right lower quadrant pain, examine

the left side first to encourage relaxation and improve her ability to tolerate the entire examination. Communicating your findings and letting her know what is next throughout your examination is usually helpful and maintains an atmosphere of trust and caring. Pay special attention to any area of tension or guarding. Knowledge of patterns of referred pain points is useful as well.

Pelvic Examination As noted in Chapter 56, pelvic examinations must always be performed with respect and care. This is especially important in the presence of pelvic pain. The ability to perform a thorough examination can be severely limited by a lack of trust or inordinate discomfort on the part of the woman.

On visual inspection, check for any signs of swelling, lesions, trauma, or other skin changes. The woman's tolerance of the insertion of the speculum is often an important observation, especially if she reports pain with sexual activity. After insertion, check for the presence of physiologic or abnormal vaginal secretions, collect a sample of any secretions for a wet mount examination, and perform STD testing as indicated. Visual inspection of the cervix may reveal a protruding IUD, color change indicative of pregnancy, or the presence of a polyp or other mass. After the speculum has been withdrawn, prepare the patient for the bimanual portion of the examination. If she anticipates discomfort, pause for enough time to allow her to regroup and relax. Proceed carefully, noting whether any discomfort is at the introitus versus deep in the vagina. Note any cervical, adnexal, or uterine motion tenderness. Palpate for organ dislocation or the inability to completely palpate the uterus or adnexa indicating dislocation. Palpate carefully for any masses, uterine fibroids (myomata), or uterine or adnexal enlargement indicative of pregnancy. Note the muscle tone and the presence of any cystocele or rectocele or of uterine prolapse. Confirm any findings with a rectal exam and check for constipation, polyps, or masses. A fecal occult blood test (FOBT) may be useful as a preventive health measure or to aid in the management of any abdominal mass.

The midwife should always share physical examination findings appropriately with the client and allay as many fears as possible. The ability to communicate the finding of a mass or enlarged organ—to the woman or to any potential consultant—must include the size, shape, location, mobility and relation of the mass to other organs. In addition, one must proceed gently with the physical examination so as not to incur undue pain; but if pain is elicited, the midwife must be able to describe the intensity and location of the pain, especially as it compares with the woman's perception of the pain.

Laboratory/Screening/Diagnostic Tests Judicious selection of screening and diagnostic tests is necessary in the contemporary evaluation of pain. Women often encourage their providers to test for "everything" based on fear, especially with regard to malignancies. It is important for midwives to resist this request and proceed based on the need for test results that will directly inform management plans. Clearly a pregnancy test is indicated if there is any suspicion of pregnancy, missed menses, or other unexplained vaginal bleeding in a woman who is heterosexually active. A complete blood count (CBC) is often ordered as a standard test—although in the absence of an infectious process or concerns with regard to anemia, a CBC may not be particularly useful. If concerns exist that the cause of the pain is urologic in nature, a urinalysis or urine culture may be useful. Tests for STDs or a wet mount for vaginitis may be useful if indicated by history and examination.

A pelvic or abdominal ultrasound (U/S) is a common test to aid in the diagnosis of uterine or adnexal abnormalities. If an ultrasound is ordered, a vaginal probe may be part of the examination. For women who have never had vaginal penetration or who have cultural prohibitions with regard to pelvic procedures, this part of the test may be distressing. Prepare your client for this portion of the examination, explain its purpose and if necessary, note on your order form that this is an initial pelvic ultrasound for this particular client. This may alert the technician that a little extra patience and time may be required in this instance.

Consultation and referral for further physician evaluation may be indicated upon diagnosis of a condition requiring treatment or management beyond the midwife's scope of practice. If this is indicated, the woman should be provided with as much information as possible, and a report of her care by another practitioner should be requested.

If the evaluation results in an inability to diagnose the cause of the woman's pain, a variety of plans might be made. If the woman wishes to continue investigation of her pain with the midwife, a more detailed "history" of her pain should be suggested. This might include the use of anatomical drawings to locate her pain; the use of a pain diary

with a pain severity scale; the use of a journal to additionally chart her pain in relation to her daily activities, menstrual cycle, bowel habits, sexual activity, and diet.

The midwife may also wish to review with the woman normal anatomy and physical sensations related to gynecologic and menstrual function, including the wide range of normal variations. If nothing abnormal is found on examination, reinforcing the normalcy of the woman's anatomy and organs is vital, as this may be what she is seeking after all. Education and support may provide her with a new perspective on her relationship to her "gynecologic self." The social, religious, and cultural forces in her life may have shaped her view of her physicality, and the clinician may be able to provide an additional, previously unknown perspective on this "self." This might include viewing both positive and negative aspects of the woman's menstrual cycle, her sexuality, and her fertility. The midwife's office can continue to serve not only as an ongoing source of primary health care or gynecologic care but also as a safe space for education and exploration.

Referrals to specialists may be appropriate, including mental health specialists, if it is felt that an exploration of the woman's psychological well-being might be useful. Many support groups also exist for women who experience a variety of conditions, such as endometriosis, as well as those who have been abused or sexually traumatized.

Causes of Acute Abdominal/Pelvic Pain

Ectopic Pregnancy Ectopic, or tubal, pregnancy is any pregnancy implanted outside the endometrial cavity. In the past, tubal pregnancies were considered to be emergency situations that necessitated surgical intervention and loss of the affected Fallopian tube. While still considered an emergency, ectopic pregnancy may currently be treated using a medical approach (e.g., Methotrexate), and in the event of surgical intervention efforts are usually made to preserve the integrity of the tube. No matter what the treatment, ectopic pregnancy must still be looked upon as a life-threatening condition and promptly diagnosed and treated. The classic ectopic presentation is a triad of abdominal pain, irregular vaginal bleeding, and amenorrhea [69]. Any combination of these symptoms must always trigger an evaluation for an ectopic pregnancy in a woman who is heterosexually active. Additionally, women who present with any of the above and with fever, tachycardia, or low blood pressure must be evaluated for shock and emergency referral, even in the absence of vaginal bleeding. Adnexal enlargement or tenderness on pelvic examination, a pregnancy test, and ultrasound may confirm the diagnosis of ectopic pregnancy. Sharing the diagnosis of an ectopic pregnancy with the woman must be done in a manner that conveys the serious nature of the problem and the need for referral to a provider capable of a potential surgical intervention. It is important to note that the client may have not suspected a pregnancy at this time and may be required to integrate a great deal of information at a very stressful moment. (For more detailed information, refer to Chapter 24.)

Appendicitis Another common abdominal emergency is appendicitis. The classic symptoms of right lower quadrant pain accompanied by a fever and an elevated white blood count (WBC) may not always be present. Appendicitis may present with left lower quadrant pain, fever may be not present, and changes in the WBC do not always initially occur. The variety in the presentation of appendicitis may include right-sided pain, bilateral pain, nausea, vomiting, diarrhea, constipation, referred shoulder pain, fever, and a loss of appetite.

Any suspicion of appendicitis necessitates consultation and referral to a surgical provider. The management of appendicitis includes a variety of management options currently. These include surgery as well as inpatient and outpatient observation. (Refer to Chapter 7 for a complete discussion of appendicitis.)

Ovarian Torsion An uncommon cause of acute pelvic pain is ovarian torsion [70]. Causes of torsion include previous adnexal surgical manipulation, especially tubal ligation, ovarian enlargement, adnexal structural anomaly, or pregnancy. The client may present with point specific pain or more generalized unilateral pelvic or flank pain, nausea, and vomiting. This diagnosis may be confused with gastrointestinal disorders.

The treatment is surgical intervention during which the ovary is replaced and fixed in place or removed depending on the cause, if evident, and any presence of tissue damage or necrosis. It is not uncommon on surgical examination to discover a false positive diagnosis of ovarian torsion. Instead, the pain may be due to endometriosis, ovarian enlargement, or unknown causes not apparent to the surgeon.

Causes of Chronic Abdominal/Pelvic Pain

Urologic Urinary tract infections (UTIs) or pyelonephritis may present as lower abdominal pain or achiness in addition to, or in place of, the better known symptoms of dysuria, urinary frequency, and changes in the appearance or odor of the urine. Either of these infections may present with increasingly intense pain, fever, and a feeling of malaise. Pyelonephritis may also present with back or flank pain and tenderness at the costovertebral angle. Management of urologic infections is discussed in Chapter 7.

Pelvic Inflammatory Disease/Salpingitis Pelvic inflammatory disease (PID) may present as either chronic or acute pelvic pain. Diagnosis and management of PID are discussed in Chapter 15.

Interstitial Cystitis Interstitial cystitis (IC) is a chronic urinary irritation that presents as a chronic pain or achiness in the pelvis [71, 72]. The woman may experience urinary frequency, urgency, nocturia (urination more than two to three times in a night), and relief upon emptying her bladder. Dysuria is not a typical symptom. Since any of these symptoms are common with urinary tract infections, many women are treated initially with a variety of antibiotics with little or no relief. Women with a long history of UTIs or unsuccessfully treated UTIs may benefit from an evaluation for IC. The urine culture of clients with IC is negative with the exception of the presence of small to numerous WBCs. The physical examination of a woman with IC is not particularly remarkable, although in some cases she may have pelvic floor pain. The diagnosis is essentially one of exclusion.

Spicy foods, alcohol, stress, or sexual activity may aggravate the IC symptoms, and vaginal penetrative sexual activity may be so painful as to be impossible. The cause of IC has not yet been identified successfully and a wide variety of pharmacological and surgical treatments exist, with varying degrees of success. Women with IC may experience relief from a change in diet, bladder training exercises, or long-term pain medication.

Dyspareunia and Vulvar Pain The woman with vulvar pain or pain associated with sexual activity may have some difficulty in articulating her discomfort. This may be due to embarrassment, a lack of anatomical information, or a reluctance to discuss sexual activity [73]. The use of anatomical drawings may be useful in obtaining an accurate history of her pain. Additionally, the midwife must validate that this is an appropriate opportunity for the discussion of this type of pain and that discomfort during sex is not uncommon. The midwife should reinforce the notion that attaining sexual pleasure is a healthy state and that sexual well-being is deserving of the woman seeking a health care provider's assessment and advice. A frank discussion of the woman's sexual activities and habits is important, including the use of douches, tampons and pads, "sex toys," lubricants, and contraceptives.

Fear of pain, as well as pain during sexual activity, can produce a distressing cycle of sexual frustration and tension in relationships. The woman's partner may be present during a visit intended to discuss these problems, and may be a support or a hindrance during the history and examination portions of the visit. The midwife may request to see the woman without her partner or offer this option to her. Common causes of tension resulting in painful or difficult sex include a fear of pregnancy, a history of infertility, a lack of trust in the contraceptive method used, a latex allergy if latex condoms are used, or a lack of vaginal lubrication due to age, medications, sexual arousal, or a lack of partner patience. A disinterest in sex or an interest that does not match that of her partner may also be at the root of a woman's pain. Each of these must be discussed frankly prior to seeking a physical cause of the pain.

Physical causes for vulvar pain irrespective of its presence during sexual activity include herpes simplex virus (HSV) lesions; vaginal tears or scarring due to tears as a result of trauma, surgery, or childbirth; vaginitis; Skene's or Bartholin's gland infections; or vulvadynia. Pain relief should follow the treatment of HSV lesions, vaginitis, or any other infections that are present. Vaginal trauma must be permitted to heal prior to any further vaginal sexual activity. An inquiry into and appropriate follow up of the source of the trauma is required. Vaginal scarring may be somewhat more difficult to treat. Additional lubrication during sex and partner patience may assist the healing process. If the woman fails to attain relief, a referral to a gynecologic surgeon may be required.

Vulvodynia Vulvodynia is defined by the International Society for the Study of Vulvar Disease as "chronic vulvar discomfort, especially that characterized by the patient's complaint of stinging, irritation or discomfort" [73]. The cause of vulvodynia is not yet well understood and consequently the ex-

pectations for treatment must be realistic. The presentation of vulvodynia may include vulvar complaints that are chronic and unrelenting, cyclic or related to some aggravating activity such as vaginal penetrative sex or prolonged sitting or bike riding.

The evaluation for vulvodynia includes an extensive history of the onset and duration of symptoms, aggravating activities, sexual activities, use of topical preparations, a history of vaginitis or other STDs, use of contraceptives comprised of latex including condoms, diaphragms, cervical caps, and any treatments used. A woman experiencing vulvar pain has frequently tried numerous over-the-counter treatments including antifungal medications and topical steroid preparations. These treatments in themselves may have caused a dermatitis that must be minimized before further evaluation can occur [74].

Examination of the vulva includes evaluation of skin changes, vaginal secretions, presence of lesions and changes in the vulvar architecture [75]. It is useful to perform an evaluation of point specific pain and sensitivity using a cotton swab and gently proceeding in a clockwise fashion on the vulva. Particular areas of sensitivity may be noted, especially at the 11 to 1 o'clock points and the 5 to 7 o'clock points [73, 76].

Treatment may be based on physical findings of dermatologic conditions such as lichens sclerosus or lichens planus and focus on topical steroids. Treatment may also focus on the diagnosis of a chronic yeast infection. A diet high in oxalates (e.g., tea, coffee, cocoa) may contribute to vulvadynia. Other relief measures include the use of white unscented toilet tissue, loose cotton clothing, unscented soaps, taking showers instead of baths, and avoiding the use of latex products. Some clinicians are making efforts to associate particular points of pain with a variety of specific nerve pathways or nerve injuries and suggest surgical treatment [77, 78]. Antidepressants have also been used in the treatment of this condition, as they appear to have value in the relief of some pelvic neuropathies [78]. A variety of alternative modalities have been used for the treatment of vulvadynia including herbal therapies, the use of traditional Chinese medicines, and homeopathy [71]. As previously noted in this chapter, clear evidence of benefit is not always readily available with regard to nonallopathic treatments. However, due to the complex nature of this problem, the midwife and her client may wish to explore a wide variety of relief options.

The woman with vulvar pain presents a special challenge to the clinician. This client is well served by the patience and sensitivity of midwifery care and the ability to incorporate a variety of approaches and consultation options in her treatment.

Endometriosis Endometriosis is the presence of endometrial tissue outside of the uterine cavity. It is believed that endometriosis exists in 5 to 20 percent of women and the degree of symptoms ranges from none to severe pelvic pain or infertility [79, 80]. The cause of endometriosis is unknown; however the presence of endometriosis is rare before menarche and after menopause and is most commonly diagnosed between the ages of 20 and 30 [79].

The presentation of women symptomatic for endometriosis is quite typical and includes three symptom clusters: (1) pelvic pain, (2) dyspareunia, and (3) infertility. Conversely, surgeons may discover endometriosis in a significant number of asymptomatic women during the course of some other pelvic surgery or procedure. The pelvic or lower abdominal pain due to endometriosis may be related to the menstrual cycle and present as pain at or following ovulation. The pain may be present intermittently from ovulation to menses or may continue through the menses as dysmenorrhea. This pain may also occur in patterns unrelated to the menstrual cycle. Pain related to sexual activity occurs during or after sex and may be so severe as to preclude sexual activities. Women with endometriosis may present for an infertility evaluation with any of the above symptoms or with infertility alone. In the evaluation of any pelvic pain, it is important to keep in mind that endometriosis may confuse a diagnosis of appendicitis or ectopic pregnancy as each of these conditions may present with the acute onset of severe, unilateral, pelvic pain.

Findings on physical examination may be normal, with no significant tenderness associated with organ palpation or movement. However, there may be significant cervical motion tenderness, bilateral or unilateral adnexal tenderness, ovarian enlargement, or a fixed, retroverted uterus. Definitive diagnosis is only possible by visualization during laparoscopy. Biopsies are typically taken to confirm the diagnosis and assist in future treatment. The use of imaging such as that possible by MRI may provide further information, but ultrasound is not particularly useful.

It is useful to note that the CA-125 marker test commonly used during the treatment of ovarian cancer may be positive in women with endometrio-

sis. As with its use in ovarian cancer, the CA-125 is not a definitive diagnostic tool as it may be elevated in women who have PID, are pregnant, or have fibroids, but it may be used to evaluate ongoing treatment.

The treatment for endometriosis remains variable in success owing to a lack of understanding of the etiology of the disease. The treatment may include pain relief measures such as the use of NSAIDs, medications that suppress hormonal stimulation of the endometrial tissue such as combined or progestin-only hormonal contraceptives, surgical removal of the lesions, a combination of medical and surgical means or complete surgical removal including hysterectomy and oophorectomy [81, 82]. The treatment employed remains dependent on the wishes of the client, her age, the degree of pain and impact on her quality of life, her desire for future childbearing, and the degree to which her fertility is impaired.

Medical treatment for endometriosis centers on the premise that pain and lesion growth and stimulation will be diminished by altering the ovulatory cycle and inducing a hypoestrogenic state [79, 80]. Current attempts to do so include a variety of medications. The most common approach is that of inducing anovulation with the use of danocrine (Danazol). Danazol reduces the LH and FSH surge of ovulation and at most doses produces amenorrhea. The androgenic side effects of Danazol are significant and may include a deepening of the voice, weight gain, and lowering of HDL. Though Danazol has been the treatment of choice for endometriosis for many years, recent reviews have shown that it is no more or less effective than other medical approaches [83]. Various progestins and antiprogestins such as depot medroxyprogesterone acetate and mifepristone (Mifeprex, RU-486) have also been employed. Common side effects of these medications include irregular vaginal bleeding. Combination oral contraceptives (both high- and low-dose formulations) are common options as well [84]. The usual side effects of oral contraceptives must be discussed with the woman. If relief is not adequate with routine OC use, a continuous regimen (i.e., omitting the use of the inert pills in the OC pack and taking the hormone-containing pills continuously) may be employed to produce amenorrhea. Gonadotropin-releasing hormone agonists (GnRH) may be used to reduce ovarian stimulation and produce a pseudomenopause [85]. The GnRH agonists, as might be expected, may produce a variety of side effects not unlike that of menopause, including hot flashes, irregular vaginal bleeding, vaginal dryness, decreased libido, breast tenderness, depression, and insomnia. Additionally, the GnRH agonists may have an impact on bone mineral density. This effect must be closely monitored and treated by a hormonal "add back" (i.e., the concurrent use of an estrogen and/or progestin concurrent with the GnRH use) typically employing combination OCs [86, 87]. Medical treatment of endometriosis is typically managed by a physician or by the midwife in close consultation with a physician.

The goals of surgical treatment for endometriosis may include the restoration of normal reproductive function and a decrease in pain by removing the lesions. A combination of medical and surgical treatment is a common approach with women experiencing infertility. Definitive surgical treatment, removal of the uterus, and depending on the age of the woman, her ovaries as well, are clearly management options of last resort.

Pelvic Masses

Fibroids

Fibroids, also known as leiomyomas or fibromyomas, are the most common gynecologic mass found. Estimations of occurrence range from 12 to 80 percent of the female population [88, 89]. Fibroids are also known to have a higher prevalence in some racial and ethnic groups, such as among African American women [90]. Fibroids are solid masses and are comprised of uterine smooth muscle tissue. Fibroid growth may respond to changes in circulating levels of estrogen and progesterone. Situationally, fibroid growth may be stimulated by pregnancy, while fibroids may degenerate during or after the menopause.

There are three types of fibroids based on their location: (1) subserous, (2) intramural, and (3) submucosal (see Figure 14-1). Subserous fibroids are just under the uterine serosa and are located outside of the uterus. They are attached to the uterus by a large or small base and may be easily palpated on abdominal exam. Intramural fibroids are located within the uterine myometrium and may give the uterus an irregular contour. Submucosal fibroids are located in the uterine endometrium and are usually palpable only as an enlarged uterus. On examination one can often differentiate an enlarged uterus due to fibroids from an enlarged uterus due to pregnancy by the more firm character of the fibroids and by the irregularity of the uterine shape.

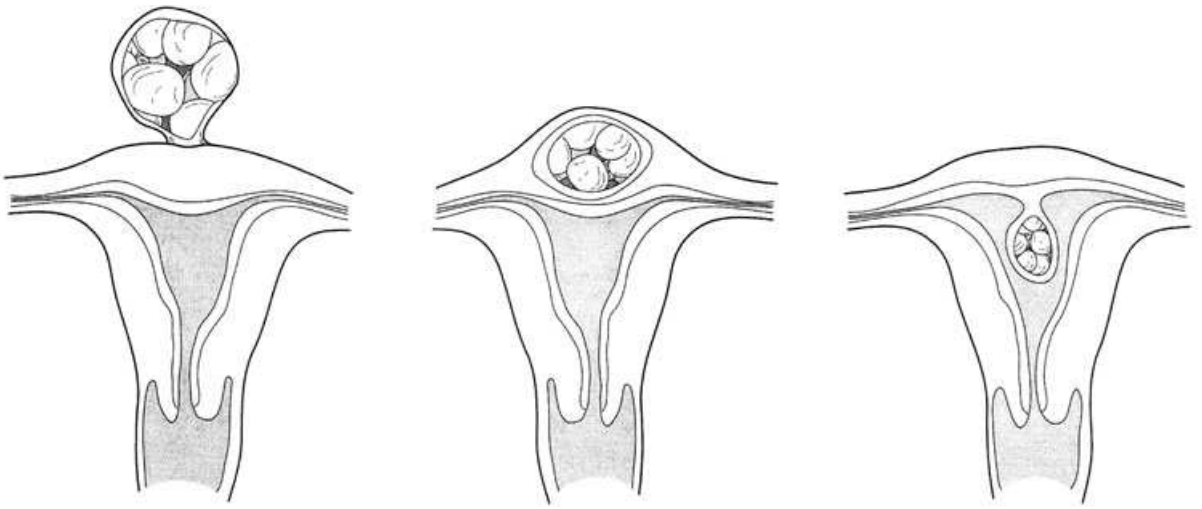

FIGURE 14-1 Classification of fibroids (leimyomas) by location in relation to the uterus.

Upon noting a fibroid during an examination, the midwife should share this information with the woman and discuss any appropriate follow-up or pertinent information.

Women with fibroids may be asymptomatic or present with chronic pelvic pain or "pressure." The fibroids may cause urinary frequency, rectal pressure, or interference with sexual activity. Depending on their location, fibroids may also interfere with pregnancy and may cause infertility, miscarriage, premature labor, malpresentation of a fetus during pregnancy or labor, or a dysfunctional labor pattern [91]. Women with large bulky fibroids may have gradually grown accustomed to the feelings of pelvic fullness and report few symptoms or little pain. Fibroids that have grown to a significant size may cause pain during pregnancy. Fibroids may also be implicated in dysfunctional uterine bleeding, especially in the perimenopause. This bleeding may be significant enough to cause anemia with resultant fatigue and headaches. Some women may not recognize the degree to which this blood loss may be a contributing factor to their overall feeling of ill health or lack of energy.

Changes in abdominal girth or shape may cause a woman to seek evaluation. She must be reassured that fibroids are always benign but may necessitate medical or surgical intervention. Fibroids can be well visualized on ultrasound, a frequent aid in assessing size, location, and growth changes [92].

Fibroids in women without physical symptoms may be observed until such time as the fibroids change significantly in size, begin to cause discomfort or a change in urinary or bowel function, or obstruct an adequate pelvic examination. In asymptomatic women, careful documentation of fibroid size and shape at each annual examination, along with a careful history of any change in symptoms, is an acceptable management plan.

Hysterectomy remains the most common nonpregnancy-related surgical procedure in this country [93]. Fibroids remain the most common diagnosis associated with hysterectomy and comprise a significant portion of cost for women's health care procedures [63, 93]. Controversy regarding the use of hysterectomy surfaced in the latter years of the twentieth century; however little has changed in the rate at which the surgery is performed. Research on the most appropriate approach to the treatment of fibroids lacks definitive answers but inquiry is proceeding into the spontaneous regression of fibroids if left untreated [94].

The most recent trend with regard to the treatment of fibroids is the exploration of alternative approaches to the management of problematic fibroids and reinforcment of the concept that all fibroids do not necessitate surgery. A variety of intrauterine procedures, including uterine artery embolization, are being employed to provide an intervention with fewer side effects and with preservation of the uterus [95, 96]. Many women welcome these organ-preserving procedures, as losing one's uterus is often feared and considered undesirable for a variety of social and psychological reasons, aside from those of fertility [97]. As with many other common gynecologic problems, re-

searchers are exploring a variety of alternative therapies for the treatment of uterine fibroids, including the use of acupuncture, bodywork, imagery and traditional Chinese medicine [98].

If surgical intervention is deemed appropriate, prior to the removal of fibroids (myomectomy), a GnRH agonist may be used to shrink the fibroids. Smaller fibroids are much easier to remove and shrinkage may give the surgeon the option of a vaginal versus an abdominal surgery [99]. In the case of large fibroids, hysterectomy is a common treatment option depending on the woman's age and childbearing plans.

Benign Ovarian Cysts

A variety of benign ovarian masses may present to the midwife either on pelvic examination or as a result of ultrasonic examination. Except for dermoid cysts or large cysts causing acute pain, most do not require intervention and may be managed by careful observation for changes in size or in the client's perception of pain or discomfort. It is vital to reassure clients that most ovarian cysts are not associated with malignancy and that watchful waiting is preferable to the risks of surgery.

On examination ovarian cysts may or may not be palpable, depending on their size and location. Due to their commonly asymptomatic nature, most ovarian cysts will only be found due to a ultrasound examination for some other reason. Cysts of significant size cause adnexal motion tenderness or pelvic pain and may grow to such a size that they cause ovarian torsion. Adolescent girls, in particular, may experience acute abdominal pain due to benign ovarian cysts [100]. The differential diagnosis of the pelvic pain in these women may be difficult since adnexal motion tenderness results from PID, ectopic pregnancy, endometriosis, or adhesions from prior surgical procedures.

Follicular Cysts If a normal ovarian follicle does not rupture or an immature follicle does not undergo normal atresia, a follicular cyst may form. Follicular cysts, the most common kind of ovarian mass, are generally asymptomatic and may be discovered due to an ultrasound examination or on pelvic examination. The most common management plan is to follow the size and probable regression of the cyst. Oral contraceptives may hasten this resolution [70, 101]. If the cyst increases in size, further evaluation must be made to rule out an ovarian neoplasm or other mass.

Corpus Luteum A corpus luteum cyst results from hemorrhage of the corpus luteum, most often from day 20 to day 26 of the menstrual cycle. Ultrasound may confirm the diagnosis and in the absence of a large amount of continued bleeding, no intervention is necessary as the cyst will regress spontaneously. In the event of significant bleeding or acute pain secondary to the bleeding, a negative pregnancy test may assist the midwife in differentiating the ruptured corpus luteum cyst from an ectopic pregnancy. If continued bleeding occurs, surgical intervention may become necessary.

Dermoid Cyst/Cystic Teratoma Dermoid cysts or cystic teratomas are generally asymptomatic, unilateral ovarian tumors that can develop to the point of being malignant. The mass arises from all three germ cell layers (ectoderm, endoderm, and mesoderm) and therefore may contain skin, bone, hair and teeth. Dermoid cysts are generally found on pelvic examination or ultrasound. Because dermoid cysts do not regress and have a 1 to 3 percent chance of becoming malignant, the treatment is surgical removal [70]. At the time of surgery, a thorough examination of the ovary, surrounding tissues, and the other ovary for any signs of abnormality or cancer is indicated.

Polycystic Ovary Syndrome

Polycystic ovary syndrome (PCOS) is a common condition affecting approximately 5 percent of women [102]. PCOS is the most common diagnosis implicated in ovarian dysfunction related to infertility [103]. In fact, PCOS is more correctly termed hyperandrogenism and is characterized by a complex of occurrences such as menstrual irregularities of either amenorrhea, or heavy irregular and infrequent menses (oligomenorrhea), chronic anovulation, and infertility. Physical characteristics of women with PCOS may include obesity, acne, alopecia, and hirsutism. Women with PCOS are often insulin resistant and may exhibit signs of diabetes, including Acanthosis nigricans, a brown velvety appearance to the skin in various folds, such as the back of the neck, in the axillae, under the breasts or in the groin [104]. The cause of PCOS is unknown.

The diagnosis of PCOS may be made coincidentally during infertility surgery, during routine pelvic examination, or by laboratory studies that reveal elevated levels of serum androgens. On ultrasound, one or both ovaries may be significantly en-

larged and contain multiple follicles. The enlarged, polycystic, ovary is actually a consequence of the anovulatory state, not a cause of anovulation. The expression of the hyperandrogenic state may range from complete amenorrhea to an apparently normally functioning endocrine system. Ovulation and conception may occur spontaneously and result in normal pregnancies. Due to the associated obesity in some women with PCOS, enlarged ovaries may not be detected on pelvic examination. Laboratory studies include serum levels of LH, testosterone, estrogens, and 17-OHP.

Treatment of PCOS varies and is dependent on the degree of infertility and desire for conception. PCOS in obese women has been treated with weight loss programs alone. Obese women who experience weight loss have been observed to resume more normal ovulatory and menstrual patterns and have conceived spontaneously [104, 105]. If conception is not immediately desired, ovarian function (and continued physical enlargement) may be suppressed with the use of combination hormonal contraceptives. This temporary ovarian suppression hopefully results in the initiation of normal ovarian function upon discontinuation of the contraceptives. A variety of other medications, such as GnRH agonists and spironolactone, have also been employed as antiandrogens. Induction of ovulation, with the use of clomiphene, is a common strategy for the prompt treatment of infertility in women with PCOS [103]. The antihyperglycemic agent metformin (e.g., Glucophage) has also been observed to result in spontaneous ovulation in women with diabetes and/or PCOS [106, 107] specifically for the treatment of anovulation [103].

As continued research is conducted on PCOS, two important theories have emerged pertaining to the long-term health of women with PCOS. The first is grounded in the knowledge that women with PCOS, even those who are not obese, may be significantly insulin resistant and thus at a higher lifetime risk for the development of Type II diabetes and also for cardiovascular disease [107–110]. The second is that due to the potential for the development of the above-mentioned diseases and the potential for a decreased quality of life due to infertility, obesity, and hirsutism it is especially important to diagnose and treat PCOS in adolescent girls presenting with amenorrhea, irregular menses, obesity, or hirsutism [108, 110–113]. This information has offered greater support for the continued examination of the use of metformin, because in addition to its antihyperglycemic action, the medication also increases insulin sensitivity [106, 107].

In the context of PCOS it is also important to consider the presentation of women with hirsutism, especially accompanied by obesity or any other signs of diabetes. Idiopathic hirsutism may represent a racial or ethnic variation and may occur in women with normal menstrual cycles and ovulatory patterns. However, it is important to thoroughly evaluate women with significant hirsutism, as the hirsutism may indeed be a sign of PCOS in a woman with normal menses and a normal BMI. Early diagnosis and intervention with respect to hyperglycemia and abnormal cholesterol and lipid profile may indeed prove to be lifesaving. It is important to note here that a dramatic short-term increase in hirsutism is not likely to be the result of PCOS but of a rapidly progressing adrenal tumor, which must be ruled out and warrants referral to a physician.

Congenital Uterine Anomalies

Congenital uterine anomalies are often undiagnosed until a woman presents for evaluation due to infertility, recurrent miscarriages, pelvic pain, difficulty with vaginal penetrative sexual activity, or ectopic pregnancy [114–116]. The diagnosis may be made by bimanual examination or ultrasound, or during a surgical procedure. The anomalies range from a failure of the uterus to develop (agenesis) resulting in primary amenorrhea to structural abnormalities of the uterus in an otherwise asymptomatic woman. Therefore, the actual incidence of anomalies is unclear [117–119].

The anomalies most commonly encountered by midwives in the office setting will most likely be those due to fusion defects resulting in an abnormally shaped uterus (see Figure 14-2) [120]. The midwife may be able to appreciate a uterus with one horn, (unicornuate), or with a V-shape (didelphys), or a heart shape (bicornuate). A woman may also have a heart-shaped uterus that is otherwise normal (arcuatus), in which case the aberrant shape is of little consequence. Women with uterine anomalies have a higher incidence of renal anomalies and should be screened accordingly.

The unicornuate uterus has one horn with its associated fallopian tube and uterus and one cervix. The opposite side of the uterus may be absent or underdeveloped. The didelphys uterus has two sep-

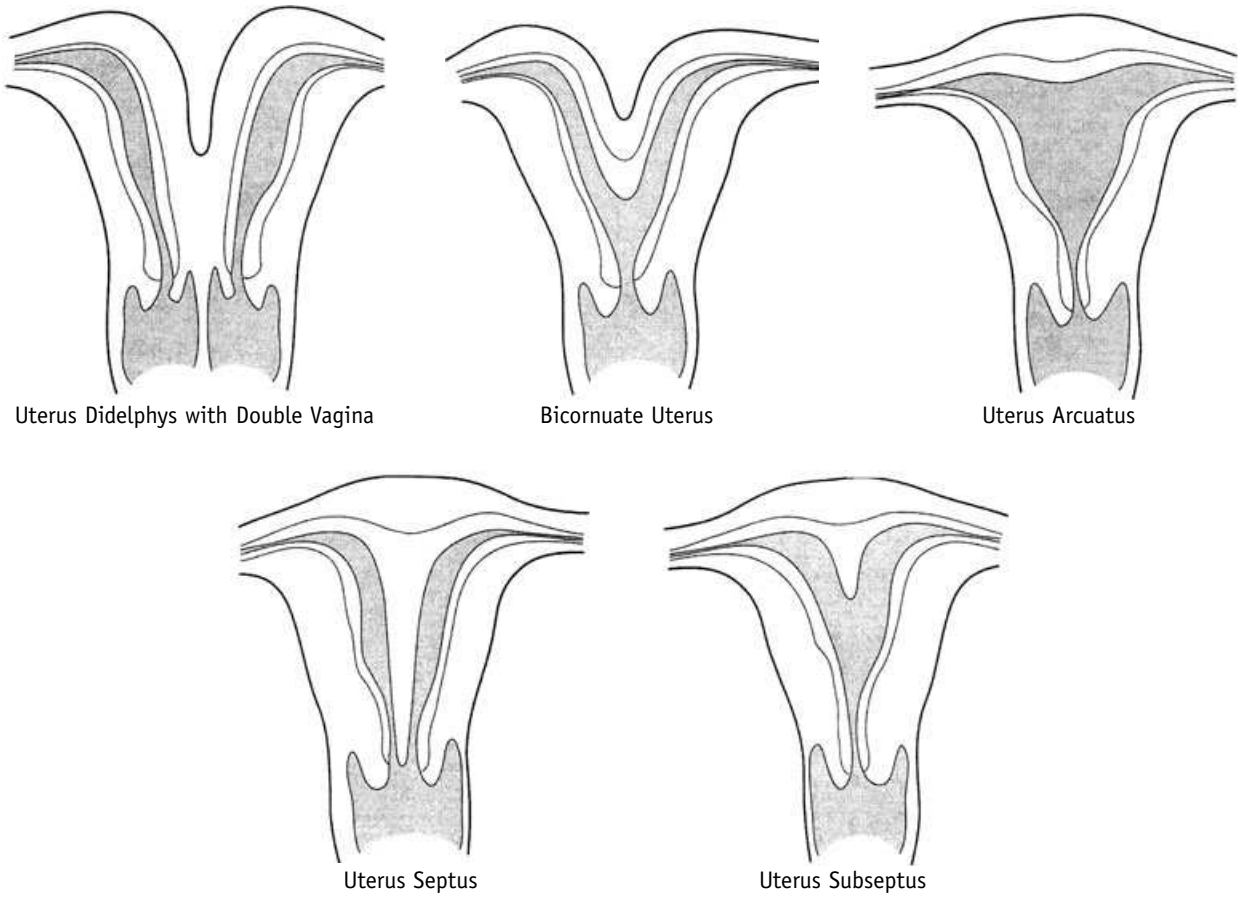

FIGURE 14-2 Types of uterine anomalies.

arate cavities, each with its own cervix. The uterus itself may have a V-shape. Upon diagnosis, it is important to remember that any future or current screening or diagnostic procedure must be performed on each cervix, for instance, two separate Pap smears; or two endometrial biopsies, one from each endometrial cavity. A pregnancy may occur in either or both cavities. The bicornuate uterus has a heart shape owing to two separate uterine cavities separated by myometrial tissue and one cervix. The septate uterus is essentially a normal uterus with a septum running down its midline. The septum may be complete (uterus septus) or partial (uterus subseptus). The septate uterus has two cavities separated by avascular tissue and one cervix. The contraceptive choices of a woman with an anomalous uterus may be somewhat complicated. If the woman does not desire to become pregnant, the most effective choices might involve hormonal methods or condoms as opposed to barrier methods or an IUD.

The diagnosis of an anomalous uterus must be shared in a gentle and supportive manner. Concerns related to fertility and childbearing may be uppermost in the mind of the woman of childbearing age and must be addressed promptly. Regardless of her age or childbearing plans, information pertaining to an organ anomaly, especially one so closely associated with one's "womanhood," may have a significant emotional impact. Continued support and referral to any local resources are essential.

Pelvic Floor

Midwives have always had a particular interest in the preservation of the integrity of the vagina and perineum during childbirth. The ability to allow for the safe birth of an infant in a manner that is nontraumatic to both the mother and the infant has long been a skill held in high esteem and meticulously taught in midwifery education. Although we

now know that a birth that occurs in the absence of episiotomy incurs less long-term harm to the woman's pelvic floor and vaginal health, even the most nontraumatic birth may result in a degree of loss of muscle tone from pregnancy alone [121–125].

Attention must be given to the loss of pelvic floor muscle tone, as well as organ prolapse into the vagina, in every woman during gynecologic exams [121]. Loss of pelvic floor integrity may be due to childbirth, the presence of abdominal or pelvic masses, previous surgical procedures or simply aging coupled with gravity. As a result, *cystocele* (bladder descent into the vagina), *rectocele* (protrusion of the rectum into the vagina), or *uterine prolapse* (descent of the uterus into the vagina) may occur. Each of these conditions, or a combination of them, may be of particular distress to the women and may interfere with normal bladder or rectum functions or with pleasurable sexual activity [126]. Either urinary or rectal incontinence may have a severe impact on a woman's quality of life as it may limit her ability to travel away from her home, her participation in various activities, or her ability to maintain good hygiene and avoid skin irritation or breakdown.

The evaluation of pelvic muscle strength is an important assessment during every routine examination. This examination may be performed by requesting that the woman tighten her vaginal muscles during the bimanual portion of the examination, otherwise known as a Kegel exercise [127]. Additionally, while observing the vulva, the midwife may request that the woman perform a Kegel or Valsalva maneuver. This may allow the midwife to assess the muscle integrity or the degree of organ prolapse visually. Uterine prolapse may also be observed with the woman in an upright position, since in significant prolapse the cervix may protrude through the vulva.

In the absence of pelvic masses, treatment for pelvic floor relaxation may include the initiation of a regimen of Kegel exercises. Women often require specific instruction and feedback during a vaginal examination to learn how to perform this exercise correctly. Additional therapies that have proved useful in efforts to improve pelvic floor muscle tone are the use of vaginal cones, biofeedback, and vaginal electrical stimulation [128].

A variety of support devices or pessaries have been employed in the case of significant uterine prolapse [129]. The choice of size and type of pessary is determined by a midwife or physician. After the choice of the appropriate pessary, the woman often returns for a follow-up visit in one week to assess comfort and normal urinary function. The woman then returns in one month and annually thereafter. The vagina of a woman with a pessary in place must be visually inspected at least annually to assess for any lesions or bleeding due to tissue erosion from the pessary. The pessary should be removed and cleaned monthly. This removal may be done by the woman herself or by her midwife. A woman with a pessary in place should be cautioned to report any vaginal bleeding promptly as this may be a sign of tissue damage or may be intrauterine bleeding indicative of the growth of a malignancy, especially in a postmenopausal woman.

Surgeons have employed a multitude of surgical procedures in attempts to repair or restore lost muscle tone. Despite these efforts, the long-term success rate of surgery is variable and may result in complications such as urinary incontinence [130, 131]. Obviously, the risk of taking a surgical approach to restoring pelvic floor integrity comes with a clear possibility of physical, emotional, and financial cost to the woman. It is important for the woman to discuss the risks and benefits of this approach with her providers prior to making a decision.

Urinary Incontinence

Urinary incontinence—the involuntary loss of urine—is a stressful condition that is unreported for a variety of reasons, including embarrassment, denial, and the prevailing notion that the only treatment option is surgical [132]. In assessing the potential for incontinence, it is important to appreciate that this often represents not only a physical condition but also a significant diminishment of a woman's quality of life [133]. A woman not only often begins to limit her activities or social contact, but she also experiences a significantly disturbed sleep pattern, with the consequence of an adverse effect on her emotional health and functionality. The impact of her incontinence may lead to a dramatic change in a woman's lifestyle and overall well-being.

The causes of incontinence are varied and require a detailed history and thorough workup by a primary care provider or urologist [134]. Incontinence may be temporary or transient if it is the result of a medication side effect, change in

mental status, or change in mobility. Structural abnormalities may result in incontinence, such as a small bladder capacity or a urethral abnormality (e.g., urethral diverticulum). A woman's lifestyle may result in incontinence, such as a change in the amount of fluids she is ingesting or the use of diuretics, either prescription, over-the-counter, or herbal. Certain disease states have the effect of increased urination and incontinence, such as diabetes, a urinary tract infection (UTI) or other renal disease, a bladder mass, or a pelvic mass such as fibroids or ovarian cancer. Neuropathies may result in a variety of incontinent presentations. A change in muscle tone, a side effect of various medications, may result in incontinence. Surgery, childbirth, or pelvic trauma also commonly result in some degree of involuntary loss of urine.

Stress incontinence is the most common type of urinary incontinence. It is the result of the inability of the urethral sphincter to maintain normal function. This may be due to the physical stress of childbirth, surgery, the presence of a mass, obesity, a UTI, or a chronic cough. Stress incontinence occurs when one laughs, sneezes, coughs, lifts an object or a child, or exercises. It is important to remember that nulliparous women also experience stress incontinence, and that incontinence is not entirely related to childbirth [135]. It is not uncommon for stress incontinence to occur with a detrusor instability—the involuntary and inappropriate contraction of the detrusor muscle in the absence of an urge to void. A less common type of incontinence is urge incontinence. Urge incontinence occurs when a woman experiences the "urge" to urinate and cannot tighten the urethral sphincter to inhibit voiding. Urge incontinence may be due to a variety of neuropathies. The combination of stress and urge incontinence is termed "mixed incontinence."

Due to the myriad causes of incontinence and varieties of clinical presentation, it is necessary to take a detailed history of physical, medical, or life event changes if a report of incontinence is made. A careful assessment must be made of a woman's voiding habits and pattern of incontinence, as well has her intake of fluids. It is important to reassure women that getting up to void once or twice in a night is not indicative of urinary dysfunction, or that an occasional episode of "leaking urine" does not meet the criteria for incontinence treatment. She may, however, benefit from an evaluation of her fluid intake and schedule of voiding. Many women resist the urge to void for long periods of time during the course of their waking hours, and over time believe that the eventual inability to "make it to the bathroom" is a sign of bladder dysfunction. Women must be reminded that to retain bladder health, a regular schedule of bladder emptying is needed. Women also restrict their fluid intake in a desire to eliminate the need to take the time to go to the bathroom. They must be reminded of the need for adequate fluids, especially water, for all body systems to function normally. A "diary" of fluid intake, number of voids, and number of incontinent episodes may be a useful teaching tool.

In the absence of a urinary tract infection, a pelvic mass, or some other extrinsic cause of incontinence, the diagnosis of incontinence is refined and the identification of the dysfunction is accomplished using a combination of the woman's history and a variety of urinary function tests. These tests include evaluating the woman's bladder pressure, the rate of urine flow, and the degree of incontinence [134, 136, 137]. Treatment for urinary incontinence is prescribed depending on the type and degree of incontinence identified. A variety of surgical procedures have been employed to correct anatomical defects or dysfunctions resulting in incontinence. It has been well acknowledged that these surgeries may have limited success and undesired surgical consequences, such as adhesion formation and a greater loss of urinary function [138]. Consequently, medical or behavioral therapies are commonly employed as a first line of treatment [139]. Behavioral therapies include pelvic floor exercises, bladder training exercises, the use of vaginal cones, and biofeedback. Pessaries have also been used to assist as mechanical bladder support. Stress incontinence is treated with either behavioral methods or surgery. Detrusor instability is treated with behavioral, medical, or surgical methods. Urge incontinence is most often treated medically.

As previously stated, at any point in the evaluation of a report of incontinence, it is vital to assess a woman's efforts at self-treatment by limiting her intake of fluids and to strongly advise against this practice. The role of the midwife in assessing and treating urinary incontinence is most often accomplished in consultation with physicians or other colleagues who specialize in this area.

Effects of DES Use

Diethylstilbestrol (DES) is a nonsteroidal estrogen that was widely used from 1948 to 1971 to prevent

a number of the complications of pregnancy. Initially used as a treatment of threatened abortion, DES came to be used to prevent recurrent miscarriage and third-trimester complications. Thus a woman might be on the medication for most of her pregnancy. An estimated 1 to 2 million women received the drug. In 1971 the FDA withdrew approval of the use of DES in pregnancy, as reports started to surface of women with clear cell adenocarcinoma who had been exposed to DES in utero. Since then a number of structural and functional abnormalities have also been identified as effects of in-utero exposure to DES:

1. Vaginal epithelial changes including adenosis and squamous metaplasia, most commonly observed on the anterior and posterior vaginal walls with extension into the lateral fornices.
2. Cervical collars (hoods), cockscombs, pseudopolyps, abnormal or absent fornix, fusion of cervix to vagina, and hypoplastic (immature) cervix.
3. Incomplete transverse or longitudinal septum of the vagina.
4. T-shaped or hypoplastic uteri.
5. Constricting bands in the endometrial cavity.
6. Infertility.
7. Poor pregnancy outcomes (preterm delivery, ectopic pregnancy).

Most clear cell adenocarcinomas in DES-exposed women have occurred before the age of 30. However, as this cohort of women is now approaching the age of higher risk and incidence of other reproductive cancers, it is vital to continue close monitoring [140]. Those women identified with in-utero DES exposure (also known as DES daughters) should have their first Pap smear at the onset of menses, at age 14, or after initiation of sexual intercourse, whichever comes first. A baseline colposcopy should be considered. Both vaginal and cervical Pap smears should be done every 6 to 12 months until the woman is 30 years old; after age 30 she should receive annual vaginal and cervical Pap smears. Any abnormal spotting or bleeding should arouse suspicion, and a colposcopy should be performed at that time.

Recent research has also begun to address a possible increased risk of reproductive cancer among women who took DES themselves (DES mothers) [141, 142]. This research has shown DES mothers to be at a somewhat higher risk for breast cancer. A relationship between the in-utero exposure of sons of pregnant women taking DES and testicular cancer remains under investigation [141]. Finally, there now exists the opportunity to follow the children of DES exposed daughters. The "third generation" effect remains unclear, although there is some evidence of an increased incidence of hypospadias in sons of DES daughters [143].

Due to the time lapse that has occurred between the discovery of the effects of DES on the offspring of women who took it and the present time, a knowledge gap may exist in the current population of women seeking gynecological care [144]. Information regarding a woman's mother or grandmother and DES exposure may be unknown. Women who took DES themselves may be unaware of continuing research into the long-term effects of exposure. Therefore, it remains important to continue to include this inquiry in one's health history-taking and adapt the question as indicated given the age of the woman. If she is a member of a family that includes DES mothers, daughters, sons or grandchildren, it is vital to share the most current information and courses of research.

Special Considerations in Gynecologic Care

For all of the above problem assessments the midwife should be cognizant of several key factors that can influence the manifestation of the woman's condition, as well as the follow-up care required. These special conditions include: age, culture, fertility status, sexual well-being, and past history of any possible sexual abuse.

Age

Children Children experiencing gynecological problems, including pelvic pain, present a unique challenge. Pediatric providers typically assume the care for children with gynecological issues. However, in the absence of pediatric gynecologists, the midwife may be called upon to consult with the pediatrician. The use of pictures or dolls may be useful in obtaining an accurate description or history of a problem. One must always evaluate the index of suspicion of abuse in children presenting with pelvic pain and proceed according to the protocols of your practice or institution. The pelvic examination of children must obviously be done sensitively and with a great deal of care, and demands the use of appropriate-sized specula.

Adolescents The treatment of teenagers for gynecologic problems present special issues as well. The need for confidentiality must always be balanced with the legal requirements for parental notification and involvement in care. In cases when the parent and teen have a conflicting view of management, it is important to try and sort out the best course of action for both the girl and her family. The midwife must respect the autonomy of the teenager and her ability to make safe decisions, as well as the teen's unique perspective on her health and her life choices. Issues that might present conflict for a midwife should be discussed with his or her professional colleagues. One must be cognizant of the legal ramifications of providing care to a teenager in the absence of her parents, and the relevant state or local laws pertaining to the care of minors. For example, in some states, teens are "emancipated" for the purposes of seeking care for pregnancy, family planning, or treatment for sexually transmitted infections. Such issues in the evaluation of pelvic pain, pelvic masses, or menstrual cycle dysfunction include sexual activity, previous or current pregnancy, past or current sexually transmitted diseases, the nature of the teen's sexual activities, past or current abuse, eating disorders, and the use of drugs or alcohol.

Teenage girls also present for gynecological evaluation based on their perceptions and possible misinformation regarding normal menstrual function and sensations and normal gastrointestinal function [100, 145]. Body image often has a direct impact on how a young woman perceives her physical sensations and developmental changes. An altered body image or eating disorder might color a young girl's view of her gynecologic health. A desire for control of one's bodily functions might also lead her to seek care. Misuse of laxatives or a restricted diet might lead to gastrointestinal distress or constipation, each of which might be interpreted to be a gynecologic problem. The activity level of teens, especially young athletes, might also contribute to a musculoskeletal injury presenting as pelvic pain. Any contact with teens provides a special opportunity to evaluate her need for information regarding sexual well-being, contraceptives, and substance abuse including cigarette smoking and diet. Performing the initial pelvic examination that a young woman receives also affords the midwife a unique opportunity to introduce the teen to nontraumatic, respectful, empowering care.

Aging Women As women progress through and beyond menopause, gynecological concerns take on a new context. Issues regarding childbearing, contraception, and menstrual cycle control fade and new priorities emerge. Postmenopausal concerns encompass disease prevention, disease detection, and preservation of function. Consequently, the role of the midwife must expand to address these health issues and address them in a comprehensive fashion. The midwife must take care to continue to address relationship issues and family demands, as the care of children may have been replaced by the care of aged parents or ill partners. Education must include anticipatory guidance with regard to potential physiologic changes related to aging (e.g., relief measures for vaginal dryness) in addition to preventive and screening measures for disease. Fear of cancer or other terminal illness diagnosis may often cause a woman to delay medical evaluation. Diagnosis of masses, abnormal bleeding, or organ dysfunction must be conducted sensitively and in a nonjudgmental fashion. The clinician must also continue to direct efforts to assess safety in the home with regard to both domestic partner violence as well as violence stemming from other family members, especially if the woman is frail and requires assistance with personal needs. Unexplained bruising or issues with regard to incontinence must be examined within the context of each woman's personal circumstances.

Culture

The evaluation of gynecologic complaints or concerns must address the issue of the role of culture in a woman's view of her body and her ability to address her health needs in an autonomous fashion. Trained medical interpreters are especially crucial in the evaluation and treatment of any gynecologic issue. Using family members, especially children, is never appropriate when dealing with sensitive and potentially embarrassing information. A woman may feel more comfortable with a female relative or friend present during her visit. Permission to limit the presence of her partner or male relative might be a difficult but important negotiation for the midwife to accomplish.

The ability to learn what the woman believes about her body and her identified problem are of primary importance. Additionally, the woman's beliefs and influences with regard to sexual activities, fertility, and pain are crucial. Pertinent questions might also include the following:

> What is this pain/problem called in your community? What is the meaning of this pain/problem?

Do other family members or friends experience this also? What do they do about it?

How is this treated? How have you treated it so far?

Are there other family or community members who must be consulted before treatment in this medical system can occur?

Fertility

The desire for or fear of pregnancy may have an enormous impact on how a woman interprets pelvic pain or sensations. Other family members may have an influence in this as well. Feelings following a birth, an abortion, a miscarriage, or hysterectomy may have an impact on how a woman perceives pelvic pain or menstrual irregularity. Feelings of depression, sadness, or worry about gynecologic function may contribute to or manifest as physical pain. An exploration of the nature of these events and their significance for the individual woman often prove useful. When caring for teenagers, it is important to recognize that pregnancy is not always undesired. The ability to conceive and bear children may be culturally or socially desirable to a young woman and being unable to do so may be the source of considerable distress. The midwife's responsibility includes offering information concerning the menstrual cycle, achieving and/or avoiding pregnancy, and the risks of pregnancy at an early age.

Sexual Well-Being

Despite the fact that all humans are sexual beings, it remains difficult for many women and their midwives to articulate sexual concerns or to perceive sexual health as an important element of general health care. Overtly encouraging an atmosphere of safety and acceptance often results in the disclosure of significant concern regarding pain with, or as a result of, sexual activity. Further exploration may reveal that the emotional overlay of guilt or fear of sexual activity has exacerbated any physical problem that might exist [97]. A nonjudgmental atmosphere established by the midwife will enable the woman to honestly discuss her sexual activities and concerns.

Sexual Abuse and Assault

Clearly, the woman who has experienced past or current sexual abuse presents with a very particular perspective on her gynecological needs, especially that of pelvic pain. It must be the primary goal of her gynecologic provider not only to address her medical needs but to do so in a manner that does not add to her pain, either physical or emotional. An honest explanation of the nature of the exam and a discussion of the cycle of "tension-fear-pain" might be of use in these circumstances. Midwives often have particular patience and skills in encouraging relaxation. This is a perfect opportunity to use those skills. The nature of the gynecologic examination may be particularly prone to retraumatizing the woman if her abuser and health care provider are of the same gender. If abuse is known to the midwife or revealed during the visit, the midwife should offer the presence of another staff member or a support person for the examination. Give control of the exam to the woman and proceed only with her consent. She must be given permission to stop the exam at any time, and you must comply at that time. If it is difficult for the woman to proceed with an exam, the visit may be broken up into smaller steps and encounters unless there is an acute, emergent problem apparent. If the problem appears to be acute, the midwife should assess what type of examination other providers (e.g., Sexual Assault Nurse Examiners [SANE]) may need to do and limit the current examination to only those elements that are absolutely necessary for consultation or referral.

Regardless of the reason for the visit, the midwife must acknowledge the woman's experience and offer the office as a safe haven for exploration and healing. As with all women, but especially with women who have been assaulted or abused, it is crucial to stress the normalcy of their anatomy, and to the extent that it exists, their gynecologic health and well-being. Similarly, any diagnosis of an abnormality might have a heightened meaning to women who have been abused and must be clearly discussed, especially as the problem may or may not relate to the abuse.

Cancer Screening/Diagnoses

"Cancer" is a word that arouses anxiety in most individuals, in part because almost everyone has known someone who was diagnosed with cancer; has cared for a family member or friend who lived, and possibly died, with cancer; or has experienced cancer themselves. In 1999, over 500,000 people in the United States died from cancer [146]. For women in this country, malignant neoplasms are

the primary cause of death between the ages of 35 and 75 [147]. Clearly, cancer is a major health problem demanding the attention of any clinician, especially those offering primary care. To this day, screening for cancer remains the best defense against this potentially lethal disease.

Because many people have a strong fear of cancer, screening for any health problems related to a cancerous process can become a challenge for midwives. Helping clients to understand the importance of monthly self-breast examinations, annual Pap smears, or routine stool occult blood testing without raising excessive fears of cancer requires skilled communication. Most people do *not* die of cancer in this country. Overall, heart disease remains the largest cause of mortality and is responsible for 40 percent more deaths annually than cancer [146]. Yet the potential suffering associated with cancer, and the success demonstrated with preventing cancer mortality through early detection, warrant every midwife incorporating cancer screening into general practice. The routine annual visit offers several opportunities to assess for signs or symptoms of a cancerous or precancerous process, through history-taking, physical examination, and possible follow-up laboratory work. Office visits also present the chance to teach individuals about screening that can be accomplished at home, as well as preventive measures for reducing the risks of ever experiencing cancer.

Although cancer can occur in a number of body sites, including the lungs and the circulatory system, the focus here will be on those areas most closely associated with gynecological health. These include the breasts, cervix, endometrium/uterus, ovaries, vulva, and vagina.

Breasts

Breast cancer has long been the second leading cause of cancer mortality in women in the United States, second only to lung cancer [148]. Due to an increased awareness of the prevalence of this illness, coupled with strong political pressure asserted over the past decade for greater governmental and societal funding to combat this almost exclusively female disease, there has been a greater understanding by clinicians and clients of the causes of breast cancer and the methods for averting it. However, confusion and large gaps in scientific knowledge about the illness continue.

For example, a statistic often heard in the media and printed in scientific journals is that a woman has a lifetime risk of 1 in 8 of contracting breast cancer. However, few are able to articulate exactly what this means. This figure assumes that the woman lives to be at least 85 years of age. If that is the case, then over her lifetime she has a 1 in 8 chance of developing breast cancer. So, for every eight women who are currently 30 years old and who live to be 85, 1 of them will develop breast cancer. The other seven will not [149]. Certainly, this lifetime figure is an important tool for helping to educate women as to the importance of breast cancer screening, but the midwife must be cautious not to use the statistic without accompanying explanation, and avoid running the risk of frightening individual clients into thinking that breast cancer is inevitable.

Similar to this confusion is the continued gap in knowledge about the origins and risks of breast cancer. Risk factors for this disease exist, and they include age, country of birth, prior history of breast cancer in one breast, and a family history of two first-degree relatives diagnosed with breast cancer at an early age (see Table 14-9). However, only 20 to 30 percent of women diagnosed with breast cancer have associated risk factors. Early excitement about the discovery of mutated BRCA1 and BRCA2 genes associated with breast cancer has been tempered somewhat by evidence that less than 10 percent of breast cancer cases are actually due to heredity, and only approximately 5 percent are related to mutated BRCA1 or BRCA2 genes [150, 151]. The majority of women diagnosed with

TABLE 14-9 Risk Factors Associated with Breast Cancer

- Older age (risk increases with each year of aging, especially after the age of 40)
- Early age at menarche (<12 years)
- History of never giving birth, or later age of giving first birth (≥30 years)
- No prior history of breastfeeding
- Caucasian American, African American
- Prior history of breast cancer
- Strong family history of breast cancer, especially in two or more first-degree relatives
- History of proliferative benign breast disease
- Prior history of having received thoracic radiation, especially prior to age 30
- History of nodular densities on postmenopausal mammograms
- Oophorectomy before age 35
- History of hormonal contraceptive or hormone replacement therapy use
- Alcohol use

breast cancer have no risk factors at all. While this may be a frightening fact for women to hear, it should serve no better purpose than to justify the need for careful and systematic screening.

Screening The three major aspects of screening for breast cancer include (1) client self-evaluation, (2) the physical examination, and (3) the use of radiology in the form of a mammogram. While all three are well known to clinicians, their effectiveness as screening tools and recommendations for their routine use remain open to discussion.

Self-Breast Examination (SBE). Most women past menarche, and especially from the age of 20 years on, are instructed by clinicians and advised to conduct monthly self-breast examinations (SBE) (see Chapter 52). The purpose of this recommendation is to encourage women to become familiar with their own breast tissue and to report any deviations from the norm, especially with regard to the presence or growth of any unfamiliar mass. Such a finding will lead, in theory, to further screening by a woman's clinician, and should result in early diagnosis of any cancerous tumor, thus facilitating treatment and recovery to optimal health. But does SBE actually accomplish this? The response is controversial, and far from being definitive.

In one of the larger recent reviews of the effectiveness of SBE in screening for breast cancer, an analysis of 35 years of research revealed that there is *not* sufficient evidence to support SBE as a method for detecting cancer [152]. Yet this advice goes against long-standing suggestions by health care providers that all women be taught and encouraged to conduct SBE. A review of current gynecology and advanced practice nursing textbooks reveals that it remains the standard of practice to encourage SBE with clients. Thus the decision of any individual midwife to educate clients about SBE currently cannot be supported definitively one way or the other [153]. It behooves practicing midwives to keep informed of the latest scientific literature exploring this issue and adjust clinical practice accordingly. It should be noted that whether or not SBE has a direct link to adequate cancer screening, familiarity of any individual with her own body is a positive health practice and should not be discouraged. While SBE alone may not be relied on as a sensitive screening tool for breast cancer, it still will lead to some women discovering tumors and will subsequently result in early treatment for cancer.

Clinical Breast Examination (CBE). The routine visualization and palpation of a woman's breasts during physical examination as a screen for breast cancer is another practice that has long been a part, like SBE, of the recommended trio of activities thought necessary for adequate breast cancer screening. As with SBE, there has been controversy as to whether there is actual evidence to support the belief that routine CBE reduces mortality related to breast cancer [148]. A review of the findings from over 750,000 CBEs show that while this practice is helpful in screening for breast cancer, the overall effect is modest at best [154]. Despite this lukewarm evidence, clinical texts in midwifery, obstetrics, and primary care continue to urge CBE as a routine method for breast cancer screening. The U.S. Preventive Services Task Force (USPSTF), a health care practices review board of the U.S. Public Health Service, recently examined the evidence for recommended breast cancer screening techniques. The USPSTF report stated that there is not enough evidence for or against CBE to recommend its continued use as a screening tool for breast cancer [153]. As with SBE, the decision to use CBE as a part of routine clinical practice remains an open question, given this lack of clear, definitive recommendations. CBE certainly increases the likelihood of discovering a breast mass when compared to not performing the examination at all. Of course, the risk of a false-positive finding always exists, and in part contributes to the lack of a definitive recommendation for CBE from such organizations as USPSTF. However, unless evidence is found pointing to greater harm being caused by CBE than by not performing CBE, it behooves the midwife and her client to continue incorporating this breast assessment tool into the larger screening physical examination. Plus, it is a good opportunity to teach the woman about breast health care and SBE.

Nationally, a number of health care organizations continue to recommend routine CBEs, including the American Cancer Society (ACS) and the American College of Obstetricians and Gynecologists (ACOG). Again, each midwife and her clients will probably realize greater benefit from continuing CBE than by discontinuing this routine practice. In the meantime, each midwife will need to stay current in the ever-expanding knowledge of the effectiveness of various breast cancer screening tools. It appears clear that *combining* CBE with mammography screening (see below), and/or with SBE, enhances to some degree the opportunity to discover a neoplasm before it metastasizes, and thus contin-

ues to be worth the effort until more efficient screening methods are devised.

Mammography. The use of routine radiologic examination to screen for breast cancer has become standard practice in the United States. Although the use of ionized radiation to image breast tissue was first performed in 1913, it was not until the mid-1960s that mammography was formally promoted as a means of screening for breast tumors [155, 156]. Widespread use of mammography gradually occurred but was only moderately effective in screening for cancer because of a lack of standardization of equipment, technicians, and interpreters of results. In 1992, the U.S. Congress passed the Mammography Quality Standards Act that mandated certification of mammographic facilities by the Food and Drug Administration (FDA). This standardization process, along with ever-improving technology, has advanced considerably the ability of mammography to accurately detect breast masses before they are palpable through SBE or CBE (approximately 1 to 10 millimeters in size) [157, 158]. Mammography today is the most common imaging examination that results in the reduction of mortality from disease [156]. Yet the timing and frequency of using this screening tool continue to be a matter of debate.

As recently as 1997, the National Cancer Institute (NCI) recommended that mammography screening begin at age 50. Because there was not enough evidence to support the effectiveness of screening before this age, the NCI had stated that any decision to have a screening mammogram prior to age 50 should be an individual choice made by the woman. The ACS disagreed and has long promoted annual screening beginning at age 40 [157]. The USPSTF, under the U.S. Department of Health and Human Services (HHS), recently called for screening mammography, with or without clinical breast examination, every one to two years for women age 40 and over [159]. It should be noted that for women with risk factors (see Table 14-9), there is consensus that initial mammography screening should occur between the ages of 35 and 40 and should be repeated annually thereafter.

Interestingly, there is conflicting evidence over the value of yearly mammography screening between the ages of 70 and 75, and no evidence of screening benefit for women over the age of 75 [157]. Traditionally, organizations such as the NCI and ACS have not placed upper age limits on recommendations for when to stop promoting yearly mammograms. Yet there is evidence that clinicians themselves stop ordering mammograms for women over a certain biological age [160]. Even if an older woman is experiencing a chronic illness, mammography should still be considered because advanced breast cancer can be very painful and can be avoided with early detection.

Additional Screening Tools. Other screening methods have been suggested but to date are not recommended by NCI, ACS, or the USPSTF. These proposed methods include the use of screening sonography and magnetic resonance imaging (MRI). While these types of examination have been helpful in diagnosing breast lesions once they have been discovered, the lack of specificity and high cost remain prohibitive in their use with the general population [161–163].

In summarizing breast cancer screening suggestions, it is clear that consensus does not exist as to whether all three of the traditional methods should be used and when. Additionally, new techniques exist for genetic screening, such as blood testing for mutated BRCA1 and BRCA2 genes, but these are not without controversy. Until more definitive evidence is available, individual midwives will need to discuss screening methods with clients and make decisions accordingly. Continuing routine use of SBE, CBE, and mammography is supported by NCI, ACS, and the USPSTF. Currently, genetic blood testing is only suggested for people at risk for inheriting mutated genes (see Table 14-9), but even the screening of these individuals raises difficult medical and ethical questions. For example, if someone is found to have a mutated BRCA gene, should prophylactic mastectomy be performed? And can this individual be denied insurance coverage for what could be viewed as a preexisting condition or for being too great a health risk for the insurer? These types of questions are not unique to the area of breast health care, but certainly do play a role in the quest to prevent breast cancer.

Diagnosis While the role of most midwives in addressing breast cancer is to screen for this potential illness, and then refer if necessary, some initial diagnostic steps can be performed if a neoplasm is suspected. *Any* suspicious or unidentifiable mass requires follow-up assessment and possible treatment. When referring a woman to a breast clinic or a surgeon, the midwife can initiate the diagnostic process by ordering a diagnostic mammogram or ultrasound. The former includes more views than a

screening mammogram, and its focus is on the region of concern, although additional bilateral screening can be ordered at the time if thought necessary. More specific information about a suspicious mass can be obtained with an ultrasound, which will distinguish between a fluid-filled cyst and the more worrisome solid mass. Depending on the findings of the ultrasound, the breast specialist will proceed with a fine needle aspiration, a lumpectomy, or a plan for monitoring the potential growth of the mass in question without current intervention. This plan will often involve collaborative practice between the specialist and the midwife to ensure the health of the woman.

Cervix

One of the greatest success stories in American public health in the twentieth century was the vast decrease in cervical cancer mortality. This success was due mostly to the invention and promotion of the cervical cytology smear, or Pap smear, by George Papanicolaou in the 1940s. Enhanced by more recently improved technologies, the Pap smear has reduced death by cervical cancer in the United States by over 70 percent [164], and has begun to have similar effects worldwide. It continues today to be the first-line screening tool for detecting cervical cancer [165, 166].

Despite the notable decrease in cervical cancer mortality, the quest for improved and less costly screening techniques continues, and for good reason. Each year, over 4000 women in the United States die from cervical cancer, and 13,000 new cases are diagnosed [167]. As with most terminal cases resulting from gynecological cancer, the circumstances of death are usually prolonged and painful [168]. Thus any efforts to discover signs of carcinoma early in the disease process will assist in decreasing further the mortality related to cervical cancer.

Screening

Pap Smear. As with breast cancer screening, guidelines for routine cervical cancer screening have never been absolute and can vary from one agency to the next. The NCI recommends Pap smear testing on a regular basis after the onset of sexual activity or at the age of 18, whichever comes first [164]. While these guidelines are not specific about what is meant by "sexual activity," it cannot be assumed that this refers to heterosexual intercourse, since recent evidence has shown that the risk of sexual practices associated with later development of cervical cancer can involve more than just exposure of the cervix to the male penis [169, 170]. Indeed, there is evidence that human papillomavirus (HPV), increasingly implicated as the primary cause of cervical cancer, can be contracted even without any history of sexual contact [171, 172]. Thus, the midwife should take a thorough approach to screening and resist any temptation to avoid doing a Pap test based on presumptive lifestyle factors (e.g., a lesbian woman or a nonsexually active individual).

More specific than the NCI guidelines, the ACS recommends *yearly* Pap screening beginning with onset of sexual activity or at the age of 21. Once an individual reaches the age of 30, and she also has had three consecutive negative Pap results, then the ACS suggestion is for this person to have Pap screening less frequently, usually once every two to three years. However, more frequent screening should occur if the woman has certain risk factors for cervical cancer, such as HIV or other immune system problems. The ACS also is currently recommending that women age 70 or older need not have Pap smear testing done if they have had three normal results and no abnormal findings over the last ten years (173).

On the other hand, the USPSTF recommends routine screening only after sexual activity has been initiated, and only once at least every three years. Like the ACS, USPSTF addresses testing later in a woman's life, stating that if an individual has had normal Pap results throughout her life, it may be possible to discontinue regular testing after the age of 65 if no risk factors for cervical cancer are present [174]. Thus, as with breast cancer screening guidelines, suggestions from organizations and agencies are varied. The midwife should practice according to those guidelines that best suit the population with which she is working, and she should offer each client appropriate education and choice regarding the interval timing of routine Pap testing.

The technique of collecting a Pap smear is discussed in Chapter 57. There has been discussion in recent years over the best data collection method to use when performing a Pap smear [165, 166]. Developments in gathering specimens and preparing them for transport to a laboratory have led to continual changes in how Pap smears are collected. Gathering Pap samples has involved the use of Ayre spatulas and cotton swabs, extended tip wooden spatulas, the cytobrush, the Cervex brush, and various combinations of these tools. No matter what technique is used, the primary goal of collecting a

Pap sample has always been to obtain cells from the endocervical region of the cervix. Current evidence, as reviewed in the literature by Mashburn [165], indicates that combining the use of an extended tip spatula and a cytobrush is the most efficient technique for accomplishing this goal. And, despite the increased amount of bleeding caused by using these two devices in combination, this is still the recommended Pap smear collection method for both nonpregnant *and* pregnant women.

In addition to ongoing discussion about the most efficient method of collecting Pap samples, there is continual dialogue about the most effective manner in which to prepare the specimen for transport to the cytopathology laboratory. Traditionally, smears have been prepared by swiping the collected cells onto a dry slide, followed by transfixing the specimen with a chemical spray. In recent years this technique has been increasingly replaced by the use of a liquid medium in which the cells are directly placed after collection, and then subsequently transported to a laboratory. At the laboratory, the cells are then prepared on a slide for evaluation. Evidence has shown that the latter method, commonly referred to as the thin-layered prep technique (e.g., ThinPrep or AutoCyte Prep), is better than the traditional transport method in reducing the number of ambiguous report findings that often require clinical follow-up [175, 176] (see below). Yet, the cost of the thin-layered prep method remains higher than the transfixing technique, and consumer advocates have raised concerns about the heavy influence of health care industry manufacturers on government officials who have promoted the use of thin-layered prep methods of cervical screening over the traditional Pap smear technique, especially without convincing evidence of the newer technology's benefit [166].

Interpretation of findings, as usually reported by a properly accredited external laboratory, is accomplished best by using the internationally accepted Bethesda Classification System of cervical cytological reporting [177] (see Table 14-10). Follow-up actions based on report findings can vary from one clinical site to the next. In general, if the test result reflects the presence of atypical squamous cells of undetermined significance (ASC-US) or a high-grade squamous intraepithelial lesion (HSIL), a colposcopic evaluation is warranted. If a low-grade squamous intraepithelial lesion (LSIL) is found, and the woman has no history of prior abnormal Pap results, then expectant management of repeat Pap smears every four to six months can occur. If three consecutive Pap smears are then negative, the woman may return to annual testing. If any of the three follow-up smears revealed ASC-US or SIL of any degree, then colposcopic testing should be initiated.

The presence of abnormal glandular cells (AGC) requires follow-up colposcopic testing that may be accompanied by a cervical biopsy, endocervical curettage, endometrial biopsy, and/or a pelvic ultrasound, since the origin of these atypical cells is difficult to discover and can be located at any point along the reproductive tract, including as high as the ovaries [165]. The role of the midwife in this testing can range anywhere from immediate referral to the actual performance of these tests, depending on the individual practitioner's experience and skill level. If the results of a Pap smear involve any finding of advanced disease, such as squamous cell carcinoma or adenocarcinoma, immediate referral to a specialist working with gynecological carcinomas is necessary.

Colposcopy. A second step in screening for cervical cancer involves the use of colposcopy. This technique of illuminating and magnifying the cervix to search for premalignant or cancerous cells was first used in Germany in the 1920s, but did not receive widespread use in the United States until the 1980s [166]. There has been debate in recent years about the potential use of colposcopy as a screening mechanism rather than just a diagnostic tool [165]. When compared to the Pap smear, the colposcopic examination is more specific and more sensitive in diagnosing abnormal cervical cells, yet the cost is much greater [178, 179]. While the specificity and sensitivity of Pap screening improve with serial testing, as is the current recommendation, the question that needs answering from both ethical and economic perspectives is at what point the cost of routine colposcopic screening becomes less than the cost of treating cancer left undetected by the use of the less costly Pap smear.

Diagnostic and/or follow-up indications for a colposcopy are shown in Table 14-11. For a woman the experience is similar to that of Pap smear, in that a speculum examination is performed (see Chapter 56). However, clients need to be made aware that the procedure lasts considerably longer than a Pap smear does, and pain or discomfort, as well as post-examination bleeding, can result from any biopsy procedures accompanying a colposcopy.

If any lesions of the cervix are found during the magnified inspection of the colposcopic procedure,

TABLE 14-10 The 2001 Bethesda System (Abridged) (177)

Pap smear reports using the Bethesda Classification System will reflect the following language:

[Note that confusion remains a problem with interpreting results because the alternative terminology of the three category "CIN (cervical intraepithelial neoplasia)" reporting system or the descriptive "dysplasia" system still may be used by some laboratories, either as a substitute for the Bethesda terminology or as additional descriptors.]

Specimen Adequacy

- Satisfactory for evaluation (presence/absence of endocervical/transformation zone component noted)
- Unsatisfactory for evaluation (reason specified)
- Specimen rejected/not processed (reason specified)
- Specimen processed and examined, but unsatisfactory for evaluation of epithelial abnormality because of (reason specified)

General Categorization (optional)

- Negative for intraepithelial lesion or malignancy
- Epithelial cell abnormality
- Other

Interpretation/Result

Negative for Intraepithelial Lesion or Malignancy

- Organisms:
  - *Trichomonas vaginalis*
  - Fungal organisms morphologically consistent with *Candida* species
  - Shift in flora suggestive of bacterial vaginosis
  - Bacteria morphologically consistent with *Actinomyces* species
  - Cellular changes consistent with herpes simplex virus
- Other non-neoplastic findings (optional to report)
  - Reactive cellular changes associated with:
    - Inflammation (includes typical repair)
    - Radiation
    - Intrauterine contraceptive device
  - Glandular cells status posthysterectomy
  - Atrophy

Epithelial Cell Abnormalities

- Squamous cell
  - Atypical squamous cells (ASC)
    - of undetermined significance (ASC-US)
    - cannot exclude HSIL (ASC-H)
    - [All ASC is considered to be suggestive of SIL. Accordingly, the category of "ASCUS, favor reactive" has been eliminated. Also, when a report of "ASC" is given, it has been suggested by the American Society for Colposcopy and Cervical Pathology (ASCCP) that laboratory personnel conduct HPV DNA typing for high-risk viruses, if the clinician had requested "reflex to HPV hybrid capture" on the original laboratory request form. If "reflex" was not specifically requested by the clinican, some laboratories' staff will inquire on the written report if the clinician desires follow-up typing. However, it is important to note that reflex HPV DNA typing is only available if cervical cells were collected originally using liquid-based cytology.]
  - Low-grade squamous intraepithelial lesion (LSIL)
    - [encompassing old terminology of human papillomavirus/mild dysplasia/cervical intraepithelial neoplasia (CIN) 1]
  - High-grade squamous intraepithelial lesion (HSIL)
    - [encompassing old terminology of moderate and severe dysplasia, carcinoma in situ; CIN 2 and CIN 3]
  - Squamous cell carcinoma
- Glandular cell
  - Atypical glandular cells (AGC) (endocervical or endometrial or not otherwise specified)—*formerly known as AGUS (atypical glandular cells of undetermined significance)*
  - Atypical glandular cells, favor neoplastic (endocervical or not otherwise specified)
  - Endocervical adenocarcinoma in situ (AIS)
  - Adenocarcinoma

TABLE 14-10 The 2001 Bethesda System (Abridged) (177) (*continued*)

Other (list not comprehensive)

Endometrial cells in a woman ≥40 years of age

[Note that cervical cytology is primarily a screening test for squamous epithelial lesions and squamous cancer. It is unreliable for the detection of endometrial lesions and should not be used to evaluate suspected endometrial abnormalities.]

Automated Review and Ancillary Testing (included as appropriate)

For example, if a slide has been scanned by an automated computer system, the instrumentation used and the automated review result should be included in the cervical cytology report.

Educational Notes and Suggestions (optional)

Although not required, there has been evidence reported in the literature that laboratory staff suggestions included on a Pap report regarding further evaluation improves the likelihood that appropriate follow-up actually will occur.

TABLE 14-11 Indications for Colposcopy

- An abnormal-appearing cervix on physical examination
- Pap smear consistent with HPV infection, dysplasia, or cancer
- Pap smear with ASC or repeated ASC
- Pap smear with ASG (possibly with other tests)
- Pap smear with multiple unexplained inflammation
- Patients with a history of intrauterine diethylstilbestrol (DES) exposure

Source: From the American Society for Colposcopy and Cervical Pathology (ASCCP). Accessed online at www.asccp.org/edu/practice/cervix/colposcopy/history.shtml.

sampling of the region is required. This is accomplished through the use of punch biopsies, endocervical curettage, and/or cone biopsy. The purpose is to rule out cancer or precancerous lesions, and subsequently treat the individual. Depending on the clinician's level of experience and preference, treatment can occur during an initial colposcopic examination, prior to laboratory confirmation of diagnosis, if any lesion is found to be suspicious of cancer. This avoids the need for follow-up surgery and a delay in treatment, yet runs the risk of unnecessary surgery being performed based on visual inspection without laboratory confirmation. As with any procedure, the possible actions to be taken during a colposcopy need to be discussed with the client *before* the examination begins. No matter what procedures were performed during the initial colposcopic examination, positive results on any tissue analysis require follow-up with a practitioner experienced in the treatment of cervical cancer, usually a gynecological oncologist.

Cervicography. A less expensive technique than colposcopy for screening and/or diagnosing abnormal cervical cells has been cervicography, also known as a cervigram. Introduced in the United States in the 1980s, this method involves the use of low magnification photographs of the cervix which are then read by a cytopathologist, either simultaneously at another location via real-time broadcast, or at a later time after transport of the images from the clinical site to the cytopathologist's laboratory. As with colposcopy, the use of this technique requires training and access to a practitioner skilled in interpreting the photographic images. Despite efforts to improve the sensitivity and specificity of cervicography, colposcopy remains a more effective technique [180]. For this reason, cervicography has not reached the level of use that colposcopy has. However, there is sufficient evidence to show that this technique can serve an important role in cervical cancer screening, especially in locations where access and cost are issues with which to contend [181].

HPV Molecular Testing. Another development in cervical cancer screening has been the ability to identify HPV according to type. Because most cervical cancers are related to at least one type of HPV, of which over 100 have been identified [172], it seems logical that screening for cancer would involve identifying the type of any HPV lesion discovered on Pap smear. Indeed, as many as 13 HPV types have been linked to the development of cervical cancer, with types 16 and 18 having been related to a majority of carcinoma cases [182].

While there is optimism that typing of HPV found on the cervix will lead to more specific iden-

tification and possible treatment of individuals at risk for cervical cancer, the use of HPV testing as a population-based screening tool remains not recommended [164, 165]. In fact, the cost of testing also curtails the use of HPV testing as a secondary level of screening following an abnormal Pap result but prior to colposcopic examination. In studies utilizing this three-step method, almost all individuals with an abnormal Pap were triaged to colposcopy based on HPV tests. Thus the HPV testing had become for most of the women an extra layer of testing, with time and cost involved, that resulted in the need for a colposcopy anyway [164]. There exists optimism that with new, less expensive techniques for HPV typing and with the quantification of the viral load, or amount, of particular HPV types, clinicians will someday be able to screen and treat in a more efficient and timely manner those women at greatest risk of developing cervical cancer.

Diagnosis

Pap Smear. The primary purpose of the Bethesda system for reporting Pap smear findings (see Table 14-10) is to categorize and describe epithelial cell abnormalities. However, refinement of clinical collection and data analysis techniques has also led to the reporting of positive findings listed as "negative for intraepithelial lesion or malignancy," but then followed with a description suggesting the presence of a specific organism on the cervix (e.g., "*Trichomonas vaginalis*," "Fungal organisms morphologically consistent with *Candida* species," or "Cellular changes consistent with herpes simplex virus"). This raises the question of the clinical significance of these laboratory findings, especially in the absence of any symptoms or signs of vaginal or cervical infection.

According to Policar [157], clinical action for Pap report findings that indicate the presence of an organism depends on the organism named. The Pap smear has been found to be a highly specific test for *Trichomonas* [183], meaning that if "trich" is found on a Pap slide, the woman almost certainly has the organism present in her vagina and thus should be treated. However, the Pap test is not a very sensitive mechanism for diagnosing *Trichomonas*. Only about half of women with this parasite will have it detected by a Pap smear. Therefore, diagnosis is still best accomplished using a wet mount microscopic examination.

Candida found on a Pap smear does not necessarily require treatment. All women have *Candida* colonized intravaginally as a part of normal flora. Its presence on a Pap report gives no indication of the amount of *Candida* present. When a woman's Pap smear findings mention *Candida*, two actions should be taken. The first is to decide if treatment was already accomplished by reviewing the chart, or establish if treatment is now required by contacting the individual to see if symptoms of *Candida* overgrowth are present. The second action is to assess the recommendation of the cytopathologist regarding the degree to which the Pap smear could be interpreted given the presence of the *Candida*. If inflammation due to the organism was sufficient enough to impede assessment of the cervical cells on the Pap slide, then repeating the Pap smear after treatment of the *Candida* infection is warranted.

As with *Trichomonas* findings on a Pap smear, the test is highly specific with regard to herpes simplex virus (HSV), yet not very sensitive. Thus, a Pap smear should not be used to screen for or diagnose HSV on the cervix. Obtaining HSV cultures remains the most accurate method of identifying this organism. However, if a Pap result indicates the presence of HSV, the woman needs to be notified of this. Treatment at the time would only be required if the individual is symptomatic (see Chapter 15).

Many laboratories still report a predominance of coccobacilli when greater numbers of these organisms are present than is normally found in vaginal flora. Originally, this potential finding was entered onto laboratory reports as a method of indicating possible bacterial vaginosis (BV). However, the Pap smear is neither sensitive nor specific in diagnosing BV, and some cytopathologists do not report specific information regarding the presence or amount of coccobacilli found in a sample. According to Policar [157], when a report of coccobacilli is given, there remains disagreement over what action, if any, to take. Some clinicians believe that no action is necessary, and that a routine Pap schedule should be maintained. Others will contact the woman and offer a clinical evaluation for BV infection. This especially is the case if the woman is pregnant because of the risk of preterm labor related to the presence of BV.

One final organism report on Pap should be acknowledged. If the findings from a Pap smear indicate the presence of "bacteria morphologically consistent with *Actinomyces spp*," the clinician needs to follow up with the woman if she has an IUD in place. *Actinomyces israelii* is a bacterium

found to cause pelvic inflammatory disease (PID) in women with IUDs. The woman needs to be examined for any signs and symptoms of pelvic infection. If infection is likely, the IUD should be removed and antibiotics initiated. If the woman is asymptomatic, Policar [157] has suggested removing the IUD, repeating the Pap smear in three months, and then inserting a new IUD if the follow-up Pap report indicates the lack of presence of *Actinomyces*. Alternative forms of birth control need to be discussed after removing the IUD or if the presence of *Actinomyces* persists.

To summarize the use of the Pap smear as a diagnostic tool, its main purpose is to categorize and describe epithelial cell abnormalities. In this capacity, the Pap smear is primarily a screening mechanism. Certainly, if the clinician discovers an unusual lesion or mass on the cervix, a Pap test will be performed. However, a colposcopy will be the main diagnostic tool used in this situation (see below).

If a Pap report indicates the presence of certain organisms, clinicians should act upon these results in accordance with the guidelines by which they practice. However, as indicated previously, the Pap test should not be used as a diagnostic tool due to the less-than-optimal sensitivity of this test in identifying organism-based vaginal or cervical infections.

Colposcopy. As mentioned above, the main purpose of colposcopy is as a diagnostic tool. Because colposcopy is more specific and more sensitive in diagnosing abnormal cervical cells than the Pap smear, it is the logical follow-up diagnostic tool to use when an abnormal Pap smear is reported. To date, its cost in terms of time and money still prevent the colposcopic examination from becoming the first line of screening for cervical cancer.

Table 14-11 indicates the reasons for utilizing a colposcopic examination. As with all techniques of assessment or management, the degree to which the midwife uses the colposcope for diagnosing suspicious cervical lesions depends on expertise, experience, and availability. When discussing the potential use of colposcopsy as a screening tool, follow-up of abnormal Pap reports will be dictated by an individual's practice guidelines; recommendations from organizations such as NCI, ACS, and the USPSTF; and the most recent evidence-based practice research findings published in health care literature. It is important in screening for, and treating, cervical cancer that midwives are clear about which recommended screening schedule (e.g., NCI, ACS, or USPSTF) they will follow in their practice, and are diligent in following-up with referrals and care as indicated.

Endometrium

Three times more women are diagnosed each year with endometrial cancer than with cervical cancer [167, 184]. While there are a variety of carcinomas that can be found in the uterus, including sarcomas and gestational trophoblastic tumors (e.g., hydatidiform mole), the endometrium is the source of 90 to 95 percent of cancers involving the corpus of the uterus [185]. One positive note is that the cure rate for endometrial cancer, when detected early in the disease process, is approximately 90 percent [186] because tumors tend to be localized and well-defined. However, the high incidence of this form of cancer still results in over 6500 deaths per year [167].

Screening The primary *diagnostic* tool for endometrial cancer today is the endometrial curettage or biopsy (EMB) (see Chapter 82). First proposed as a *screening* tool in the 1920s, EMB has undergone a series of proposals and analyses for being used to screen for endometrial cancer, especially as newer and less expensive techniques for performing EMB have been devised over time [187]. For many years, the standard of care in diagnosing endometrial hyperplasia, an overgrowth of the endometrium that often leads to the development of cancer, had been the use of the dilatation and curettage (D&C) [185]. However, this invasive procedure has always been considered too involved and costly to justify its use as a screening tool for endometrial cancer, and indeed is no longer the standard technique for diagnosing this disease.

Other tools that have been proposed as possible mechanisms for routine screening of endometrial cancer have been the Pap test, endometrial aspiration, and more recently, transvaginal ultrasound. However, a review of the literature on the effectiveness of all of these methods have led to the conclusion that routine screening of women for endometrial cancer, no matter which method is used, is currently of no proven benefit [184]. The primary use of these tools is in *diagnosing* women who are at high risk for endometrial cancer (see Table 14-12), or who display signs of endometrial hyperplasia or cancer.

Diagnosis Endometrial hyperplasia, and the possible subsequent development of endometrial cancer, occurs most often in women over the age of 50,

TABLE 14-12 Risk Factors Associated with Endometrial Cancer

- Age >50 years
- Early menarche or late menopause
- Polycystic ovary syndrome
- Obesity
- Nulliparity, infertility
- Family history
- Caucasian race
- European or North American country
- Use of unopposed exogenous estrogen (estrogen replacement therapy [ERT])
- Estrogen secreting tumors
- Diabetes
- Gallbladder disease
- Hypertension
- Prior history of pelvic radiotherapy
- History of breast cancer
- Use of tamoxifen for treatment of breast cancer

with the average age of diagnosis being approximately 60 years [185, 186]. However, other risk factors besides age exist (see Table 14-12), and the midwife should not make a decision to assess for endometrial cancer based on age alone. In fact, the length of time an individual has had unopposed stimulation of the endometrium by estrogen should be the principal factor guiding when to consider testing for endometrial cancer [188].

Clinically, the most significant sign of endometrial cancer is bleeding. In postmenopausal women, *any* bleeding, except that experienced in a regular pattern while on HRT, is considered to be a sign of potential cancer. Prior to menopause, irregular bleeding could be a sign of cancer. However, since most endometrial cancers occur in postmenopausal women, any irregular bleeding prior to menopause should be assessed in the manner described previously in this chapter with regard to abnormal uterine bleeding. Other signs or symptoms of endometrial cancer, such as pain, usually only occur during late stage disease, when the cancer spreads beyond the uterus.

Endometrial Biopsy. Today, endometrial biopsy (EMB) is the most frequently used method for diagnosing disorders of the endometrium. The procedure has been reported to be safe and cost-effective, and can easily be performed during an ambulatory setting visit [187, 188] (see Chapter 82). However, the rather wide range of evidence regarding EMB sensitivity and specificity for diagnosing endometrial abnormalities has raised objections to this test being the sole diagnostic tool used to assess for carcinoma [184]. Obviously, EMB serves an important role in evaluating the cause of abnormal uterine bleeding, and it is considered to be an important part of diagnosing endometrial cancer when used in conjunction with other assessment tools. Thus the midwife should consider the use of EMB in ruling out endometrial hyperplasia or cancer, but not rely only on that information ascertained from EMB.

It also needs to be mentioned that some clinicians who prescribe HRT to postmenopausal women will use EMB prior to initiation of hormone therapy as an assessment tool to establish a healthy endometrium. However, there is no clinical evidence that this invasive practice is necessary nor that it reduces the number of endometrial cancers that develop [184].

Transvaginal Ultrasound. Often accompanying EMB as an assessment of endometrial abnormality is the transvaginal ultrasound, which, in addition to detecting possible intrauterine masses, measures the thickness of the endometrium (the "endometrial stripe") as a gauge of intrauterine health. (Depending on the study reviewed, a thickness of greater than anywhere from 4 to 6 millimeters is thought to be associated with pathology [189].) As ultrasonographic technology has improved, this technique has increased in popularity for evaluating endometrial abnormalities. While not yet sophisticated or cost-effective enough to be used as a screening tool for endometrial cancer, transvaginal ultrasound has proved to be highly sensitive (96 percent) and fairly specific (61 percent) in detecting cancer [189, 190]. When combined with EMB, transvaginal ultrasound is quite effective in helping to rule out carcinoma of the endometrium.

Dilatation and Curettage (D&C). The traditional method for ruling out suspected endometrial cancer had been the use of dilatation and curettage (D&C). Not only did this procedure give the practitioner a more-than-adequate sample of endometrial tissue for analysis, it also initiated treatment of any anomalies by removing potentially harmful tissue. However, in the 1980s the value of this diagnostic procedure, which involved considerable time and money, began to be questioned, especially since its sensitivity and specificity in ruling out endometrial cancer were unclear. Attention turned toward EMB as being the most efficient method for directly assessing endometrial bleeding. Today, a D&C is rec-

ommended only for those women in whom the endometrial stripe is found to be thicker than normal, yet is resistant to sampling using other, less costly data-gathering tools. Also, when less invasive diagnostic measures have been unable to identify a cause of suspected bleeding, a D&C can be a useful tool for reaching a diagnosis [189].

Pap Smear. The success of the Pap smear in assessing for cervical cancer does not transfer to success in ruling out endometrial cancer. The collection technique for the Pap smear does not include any attempt to obtain intrauterine endometrial tissue samples. Thus, one should not anticipate that Pap results can assist the midwife in ruling out endometrial cancer. It should be noted, however, that in postmenopausal women who are not on HRT, a routine Pap result that shows the presence of endometrial cells requires follow-up assessment and possible treatment for endometrial hyperplasia that has extended into the cervical canal.

Other Techniques. The diagnosis of endometrial cancer can involve more technological mechanisms than those already discussed. As with transvaginal ultrasound, endometrial biopsy, and D&C, these are not techniques learned in basic midwifery education, but they should be understood by any midwife referring a woman for further uterine assessment so that preparatory teaching can be offered.

The two most common advanced assessment tools are hysteroscopy and sonohysterography. The former involves direct visualization of the uterine cavity using an endoscope that is inserted through the cervix. During the examination visible masses (e.g., polyps) or suspicious areas of endometrial lining can be biopsied or completely removed, depending on the type of endoscope equipment used. Due to this ability to directly visualize the endometrium, the hysteroscopy is quite effective in discovering the source of uterine bleeding. Although considered by some to be the new "gold standard" of endometrial assessment, replacing the traditional D&C, hysteroscopy is thought to be best used only if the less costly and invasive EMB and transvaginal ultrasound are used initially and are unable to reveal any evidence of cancer or cause of abnormal bleeding [189].

Sonohysterography involves inserting sterile saline into the uterine cavity through the cervix, and then imaging the uterus with a transvaginal ultrasound. This technique separates the two walls of the endometrium, allowing for a more detailed examination of endometrial thickness and possible polyp growths. In addition, submucosal myomas are more readily visible in sonohysterography than they are in transvaginal ultrasound, allowing for a better assessment of their site and size. As with hysteroscopy, sonohysterography is a more invasive procedure than other endometrial assessment tools described previously. Sonohysterography is used for diagnosis only, and any sampling of endometrium or removal of polyps requires additional interventions [189]. As with all medical procedures, it is important that the woman undergoing sonohysterography be aware of these advantages and disadvantages, and make an informed choice about having this procedure performed.

In summary, there are several mechanisms for *diagnosing* endometrial cancer when this pathology is suspected, usually as a result of abnormal uterine bleeding, especially in a postmenopausal woman. However, an accurate and cost-effective *screening* method for endometrial cancer remains elusive. Midwives are encouraged to keep abreast of new developments in endometrial assessment techniques; seek training in advanced, postgraduate skills so that clients can be offered a variety of assessment procedures without need for seeing additional practitioners; and inform and support clients in their choices regarding the ruling out of endometrial cancer.

Additional Uterine Cancers

Although endometrial cancer is by far the most common form of uterine cancer, two additional forms of abnormal growth bear mentioning: gestational trophoblastic tumors (e.g., hydatidiform mole) and uterine sarcoma. The former are masses composed of products of conception that are located in the uterus. The most common of these tumors is the hydatidiform mole, which in its beginning stages is a benign growth whose elements are those of placental tissue. The woman presents with a positive pregnancy test, usually with excessively elevated human chorionic gonadotropin (HCG) levels, and abnormal bleeding. Her uterus will be larger than expected given her gestational age, and confirmation of diagnosis is accomplished through ultrasonography. Treatment usually involves the use of D&C with the goal of preventing the development of metastatic disease. (More information on hydatidiform moles can be found in Chapter 24.)

Uterine sarcomas are a rare form of gynecologic cancer (less than 1 percent), and comprise

only 2 to 5 percent of all uterine carcinomas [191]. Generally occurring after menopause, these anomalies originate in the uterine muscle or the endometrial epithelium. The only known etiology, found in close to 25 percent of these cases, is prior therapeutic radiation to the pelvic region used to curtail benign uterine bleeding that occurred earlier in the individual's life. There is no recommended form of routine screening, other than the assessment of uterine size and shape that occurs with annual examination. The presenting symptom/sign of this form of cancer is abnormal uterine bleeding. Initial diagnosis involves a bimanual examination to discover any unusual growth or shape to the uterus. While sarcomas cannot be easily distinguished on physical examination from benign leiomyomas, it is important to remember that sarcomas usually are found postmenopause, whereas leiomyomas more commonly manifest themselves prior to menopause, and begin to reduce in size postmenopause when estrogen stimulation diminishes.

If sarcoma is suspected after a careful history and thorough physical examination, further assessment involves the possible use of endometrial biopsy, ultrasonography, D&C, and laparoscopy. In general, the midwife will refer the woman in whom uterine sarcoma is suspected to an appropriate specialist. As with most cancers, prognosis is dependent on the extent of the disease when diagnosis is made. If the cancer is confined to the uterine corpus upon discovery, the five-year survival rate is 50 percent. The survival rate at five years for metastatic sarcoma ranges, unfortunately, from 0 to 20 percent [191]. Therefore, early discovery is vital to curtailing the spread of this disease. As with efforts to successfully diagnose endometrial cancer in beginning stages, it is important to stress the significance of uterine bleeding in postmenopausal women.

Ovaries

Perhaps the most troubling of gynecological cancers faced by both women and midwives is that which affects the ovaries. Ovarian cancer represents an estimated 30 percent of new cases of genital forms of cancer diagnosed each year, yet constitutes over one-half of the deaths to women who suffer from carcinoma of the genital organs [167]. These statistics do not imply that a diagnosis of ovarian cancer constitutes automatic mortality. In fact, approximately 50 percent of the women afflicted with this disease will survive past five years from the time of diagnosis, thus effectively surviving the disease [167, 192]. However, by modern standards of diagnosing and treating individuals suffering from cancer, this rate of mortality is high.

Due to the almost total absence of signs and symptoms for the earlier stages of ovarian cancer, its presence often goes undetected until the disease is advanced, thus accounting in part for the high rate of mortality. Also adding to the perplexing nature of this disease is the fact that there is no single form of ovarian cancer. In fact, there exist at least three categories of malignant neoplasms of the ovary (epithelial, germ cell, and sex cord-stromal tumors), depending on the tissue types of origin [193]. The incidence of ovarian cancer increases with age, with the median age at diagnosis being 63. However, the disease can occur at any time during the reproductive or postmenopausal years [194]. The mystery that surrounds ovarian cancer is also due in part to the fact that its etiology is poorly understood. Increased parity, use of oral contraceptives, and breastfeeding are all associated with a decreased risk of having this form of cancer. On the other hand, a family history of ovarian cancer and a history of infertility drug use are associated with increased risk [194], as is use of estrogen replacement therapy [195] (see Table 14-13). Factors such as age at menarche, age at menopause, or age at first birth appear to be unrelated to ovarian cancer risk.

TABLE 14-13 Risk Factors Associated with Ovarian Cancer

- Age: ≥50 years
- Strong family history of ovarian cancer (first-degree relative [e.g., mother or sister] or multiple second-degree relatives)
- Evidence of mutations in the BRCA1 or BRCA2 genes
- More than 40 years of active ovulation (e.g., nulliparous never-user of oral contraceptives)
- Nulliparity
- Infertility
- Caucasian race
- Use of estrogen replacement therapy (ERT)
- Endometriosis
- High-fat, low-fiber diet deficient in multiple vitamins, including vitamins A, E, and beta-carotene
- Smoking
- Prolonged exposure to asbestos or talcum powder (the latter is controversial)

Note: Conflicting evidence regarding the above risk factors can be found in the literature, and strongly definitive risk factors for ovarian cancer have yet to be identified. Clinicians are encouraged to remain updated with the literature as more evidence becomes available.

Researchers investigating the etiology and risks of ovarian cancer have mentioned other possible associated factors. The use of talcum powder has been suggested by some to be related to ovarian cancer, yet the evidence remains conflicting [194]. Earlier investigations demonstrating increased levels of the CA-125 tumor antigen in serum samples of women with ovarian cancer led to optimism that this factor could identify nonaffected women at risk for later developing this form of cancer. However, more recent studies have tempered this optimism, with evidence showing that even individuals already in early stages of ovarian cancer have normal serum levels of CA-125 [196], and levels of CA-125 in healthy women vary considerably according to a number of biological and social factors [197]. Similarly, links between ovarian cancer and mutations in the BRCA1 and BRCA2 genes, more commonly known to be associated with certain familial strands of breast cancer, have been proposed, but conflicting evidence to date also renders this potential link inconclusive [198].

Screening The lack of evidence regarding the etiology of ovarian cancer, definitive risk factors, and means of early detection make screening for this disease difficult for both women and practitioners. Currently, there are no effective routine screening tools for detecting ovarian cancer. Potential methods include thorough anticipatory teaching, bimanual examination, transvaginal or abdominal ultrasound, measures of the CA-125 antigen, and assessment for mutations of the BRCA1 and BRCA2 genes.

Routinely instructing women about the signs and symptoms of ovarian cancer will potentially aid in detecting this carcinoma. These signs and symptoms include abdominal bloating, flatulence, and other persistent GI disturbances; abdominal or pelvic pain; fatigue; urinary complaints; and irregular vaginal bleeding [199]. For the woman whose review of systems includes such current symptoms, it is essential that the possibility of ovarian cancer be considered by the midwife as she performs the woman's clinical examination. However, the fact that a majority of individuals afflicted with this anomaly do not become symptomatic until late in the disease process renders the sensitivity of screening through education and history-taking low. Bimanual examinations during routine well-woman visits have long been the only ovarian cancer screening tool not dependent on self-report. However, there is no evidence as to the sensitivity or specificity of these examinations with regard to detecting ovarian cancer. When a finding leading to a diagnosis of ovarian neoplasm is initially reported, the disease usually has already advanced to a later stage in the process.

There is evidence that either transvaginal or abdominal ultrasounds are reliable in detecting small ovarian masses. However, the specificity of these screening tools for cancer is low. In research to date, the percentage of ovarian masses discovered on routine screening ultrasound that have been demonstrated to be cancer has ranged from 3 percent in asymptomatic women to 10 percent in individuals with a family history of ovarian cancer [194]. The financial and emotional costs that would be involved in routinely screening all women, or even those individuals with a strong family history, followed by performing surgery on those with positive ultrasound findings, are very high when weighed against the number of ovarian cancer cases that would actually be discovered.

While the detection of the tumor-associated antigen CA-125 in women diagnosed with ovarian cancer has led to a call for using this serum marker as a method for screening all women to discover those at risk for the disease, the sensitivity of this screening approach has proven to be too low to justify mass screening. What makes this approach especially difficult is that CA-125 is not specific to ovarian cancer. Elevated levels have been found in women with nongynecological cancers, with endometriosis, and even in the first trimester of pregnancy [194]. Even less specific than CA-125 in screening for ovarian cancer is the presence of mutations of the BRCA1 and BRCA2 genes. Originally linked to breast cancer, these mutations have also been discovered in some women found to have ovarian cancer and have led to hope that screening for the BRCA1 and BRCA2 mutations, especially in families with a history of ovarian cancer, would aid in the early diagnosis of this disease. However, only 20 percent of women diagnosed with ovarian cancer have a family history of this disease, and less than 10 percent actually carry a BRCA1 or BRCA2 mutation [200]. Thus the notion of screening the general female population for these mutations in order to screen for the potential subclinical presence of ovarian cancer is not currently recommended.

Diagnosis Because early ovarian cancer is essentially asymptomatic, and no effective widespread screening method is currently available, diagnosis

of this disease often occurs during later stages of the pathology. As stated previously, once the diagnosis of ovarian cancer has been made, the five-year survival rate is approximately only 50 percent. However, it should be noted that not all news about ovarian cancer is grim. While the causes and related factors remain a mystery, simply increasing the public's awareness of this form of cancer, coupled with some improvements in treatment, has raised the five-year survival rate over the last decade from 39 to 52 percent [167, 201]. Thus steps are being made to improve outcomes, and increasing greater awareness by midwives as to possible signs of the disease can only add to this improvement.

Although they are not very sensitive in diagnosing ovarian cancer, the earliest symptoms reported by women later discovered to have this disease tend to be gastrointestinal. Abdominal bloating and flatulence are two of the more common complaints expressed by those afflicted with this disease. Because many individuals attempt to treat these symptoms at home for some time before seeking medical care, and because practitioners often assess these complaints initially as originating in the gastrointestinal system, delay in diagnosing ovarian cancer can occur [202]. There is no evidence that screening *any* woman with these GI complaints will improve the rate of discovery of ovarian cancer, or improve overall outcomes. Yet it behooves the midwife who hears of these complaints from an individual with risk factors for ovarian cancer (see Table 14-13) to proceed toward diagnosing this disease.

Late stage ovarian cancer is associated with persistent GI disturbances; possible enlargement of the abdomen with ascites; abdominal or pelvic pain; fatigue; urinary complaints; and vaginal bleeding [199]. The presence of these symptoms in any woman should lead to the midwife to consider ovarian cancer in the differential diagnosis. The initial step in ruling out this disease is to conduct a thorough history, including family history and social history, with an emphasis on revealing exposure to environmental factors associated with the disease (see Table 14-13). A history is followed by a physical examination, with emphasis on the bimanual pelvic examination to explore for a possible mass. Even if no distinct mass is palpated, a transvaginal ultrasound should be ordered if the midwife suspects ovarian tumors. As noted above in the discussion of screening for ovarian cancer, this is a helpful tool in discovering ovarian masses, but it is not completely sensitive or specific [203]. Recommendations for more extensive evaluation also include the possible use of abdominal ultrasonography or magnetic resonance imaging (MRI). However, the use of these additional technologies are usually initiated by an oncology specialist to whom a woman has been referred.

Drawing blood to establish the possible presence and level of the CA-125 tumor antigen may be an additional task conducted by the midwife. This information will help to identify an individual at increased risk for ovarian cancer, although no matter what the findings, the results of this test are not definitive in making a diagnosis.

To date, the only manner in which to clearly diagnose ovarian cancer is through surgery, usually involving laparoscopy with appropriate biopsy. The midwife's role toward this regard is the initial referral to an appropriate specialist, along with an explanation to the woman regarding what to anticipate. Follow-up with the woman will depend on diagnostic findings and any subsequent treatment that may occur. Certainly, if the individual does have ovarian cancer followed by successful treatment, midwifery care would then include assisting the woman in reducing risky behaviors as well as encouraging her to educate her female relatives about the possible familial link involved with ovarian cancer.

Vulva and Vagina

The forms of genital cancer that are the least frequent in occurrence and in resulting mortality are those involving the vulva and the vagina. It is estimated that in 2002 there will be 5800 new cases of these forms of cancer, with vulvar incidences being almost double those of the vagina, and approximately 1600 deaths as a result of these cancers [167]. If the diseases are discovered prior to nodal involvement, the five-year survival rate is 90 percent for vulvar cancer and even greater for vaginal cancer [204, 205]. The majority of both forms of cancer are squamous cell in type, and most cases are found in women over the age of 50. However, a rarer form of vaginal cancer, found primarily in daughters of women who took diethylstilbestrol (DES) during pregnancy, is clear cell adenocarcinoma, which occurs in late adolescence and the early twenties [205].

Screening and diagnosis of these cancers involve any history of vulvar or vaginal growth noted by the client, followed by pelvic examination, with visualization and palpation playing major roles. Both forms of cancer are associated with the human

papillomavirus (HPV), which is thought to be a causative agent of these diseases. Thus anyone with a history of having had contracted HPV should be considered at risk for vulvar or vaginal cancer. The most common site of vulvar involvement is the labia majora, while the most common location of vaginal cancer is the upper third of the vaginal wall [206]. Early symptoms for vulvar cancer may be persistent pruritis and the presence of condylomata [207], whereas vaginal disease may be accompanied with bleeding, heavy discharge, and pelvic discomfort. Depending on the extent of the latter disease process, pelvic examination can reveal a mass at the site of involvement, and possible lymphadenopathy [208]. Any suspicious lesion could be sampled for a Pap smear, although typical diagnostic procedure involves a colposcopy and/or biopsy. Definitive laboratory findings or the inability to rule out a carcinogenic process necessitates referring the woman to a specialist, often a gynecologic oncologist. As stated previously, early detection, as is the case with most cancers, results in a high rate of survival.

Nongynecologic Cancer Screening and Teaching

As is the case with all primary care practitioners, midwives routinely screen for additional forms of cancer beyond those involving gynecologic organs. At each annual visit, history-taking and physical examination assist in assessing for cancer of the skin, thyroid, lungs, and abdominal organs. In addition, for women 50 years or older or at risk for GI disease, screening for GI cancer occurs through rectal examination followed by testing stool for occult blood. Any positive or suspicious findings as a result of physical assessment will lead the midwife to initiate follow-up testing, consult with an appropriate specialist, or refer the client for necessary care.

Accompanying the assessment that occurs during annual examination is teaching regarding healthy habits and lifestyle that help to thwart the development of cancer. There is sufficient evidence to demonstrate that, although heredity plays a role in the development of cancer, a majority of related factors involve behavior or activities that can be altered by the individual [167]. Research to date highlights the importance of people following certain dietary patterns, avoiding specific risky behaviors, and remaining physically active throughout life. Every individual type of cancer, both gynecologic and nongynecologic, has specific components of diet associated with prevention that are worth exploration by midwives and other practitioners who regularly counsel women. In general, the most common themes in the evidence presented about diet and cancer prevention are that the consumption of whole foods and mostly plant-based items is the healthiest approach to avoiding cancer. Processed and high fat foods are best avoided, and maintaining appropriate weight for age and height is optimal for staying healthy.

In addition to teaching about a healthy diet, midwives can promote cancer prevention by encouraging a physically active lifestyle. Moderate activity for 30 minutes or more a day for five days in a week has been shown to reduce the incidence of cancer. The reasons for this vary depending on the type of cancer. (For example, with regard to breast cancer, physical activity is thought to improve energy metabolism, which subsequently aids in reducing circulating concentrations of physiologic growth factors that may have a role in tumor growth. Also, physical activity helps to limit the presence of excessive body fat cells, in which is found additional endogenous estrogen that has been related to breast cancer development [167].) Accompanying the promotion of a physically active lifestyle should be discussion regarding the possible limiting of alcoholic consumption, which has been associated, for example, with increased risk of breast cancer, and the elimination of tobacco use. Certainly, individual and cultural differences need to be acknowledged when counseling women about cancer prevention. Knowledgeable recommendations to women depend on the midwife keeping apprised of the latest medical literature, as well as each individual's health and cultural background, and then assisting her in making optimal choices for preventing cancer and the ill health that accompanies it.

Conclusion

Certainly, the ACNM motto "With women, for a lifetime" speaks well to the role of the midwife. Both from a historical and a current perspective, the care offered by midwives has included the diagnosing and management of gynecological health and diseases. This chapter has summarized the most common gynecological problems and the diagnostic/management steps associated with them. As with all midwifery care, the essential element of practice involved with all of these situations is to listen to the client and what she has to say about her condition and the effect it has on her life. Not only will

this approach to care validate what the woman is feeling and experiencing, but it will offer the most essential information needed for making an accurate diagnosis and subsequent plan of care. As stated at the beginning of this chapter, the majority of most women's physical well-being over the lifespan involves gynecological health. It is thus paramount that midwifery practice offers optimal care that includes the knowledge presented here regarding the diagnosis and management of common gynecological problems as well as screening for more complicated conditions.

• • • References

1. U.S. Department of Health and Human Services. Women are having more children, new report shows: teen birth rate continues to decline. *Health and Human Services News*, 2002.
2. Wyshak, G. Infertility in American college alumnae. *Int. J. Gynaecol. Obstet.* 73(3):237–242, 2001.
3. Kraus, N. Readership and practice profile of members of the American College of Nurse-Midwives: findings of a direct mail survey. *J. Nurse-Midwifery* 39(1):29–38, 1994.
4. American College of Nurse-Midwives. *ACNM Philosophy*. Washington, DC: ACNM, 1989.
5. Speroff, L., Glass, R. H., and Kase, N. G. *Clinical Gynecologic Endocrinology and Infertility*. Philadelphia, PA: Lippincott Williams and Wilkins, 1999.
6. Jacobs, A., and Gast, M. *Practical Gynecology: Clinical Manual*. Norwalk, CT: Appleton and Lange Medical, 1994.
7. Sullivan, N. Dysmenorrhea. In Lichtman, R., and Papera, S. (Eds.) *Gynecology: Well-Woman Care*. Norwalk, CT: Appleton and Lange, 1990, pp. 345–353.
8. Davis, A., and Westhoff, C. L. Primary dysmenorrhea in adolescent girls and treatment with oral contraceptives. *J. Pediat. Adolesc. Gynecol.* 14(1):3–8, 2001.
9. Zhang, W., and Li Wan Po, A. Efficacy of minor analgesics in primary dysmenorrhoea: a systematic review. *Br. J. Obstet. Gynaecol.* 105(7):780–789, 1998.
10. Ostad, S. N., Soodi, M., Shariffzadeh, M., Khorshidi, N., and Marzban, H. The effect of fennel essential oil on uterine contraction as a model for dysmenorrhea, pharmacology, and toxicology study. *J. Ethnopharmacology* 76(3):299–304, 2001.
11. Zhang, Y., Hou, G., and Yue, Y. The analgesic action of semen coicis on severe functional dysmenorrhea—a sequential trial observation. *J. Trad. Chin. Med.* 20(4):293–296, 2000.
12. Imai, A., Horibe, S., Fuseya, S., Iida, K., Takagi, H., and Tamaya, T. Possible evidence that the herbal medicine shakuyaku-kanzo-to decreases prostaglandin levels through suppressing arachidonate turnover in endometrium. *J. Med.* 26(3–4):163–174, 1995.
13. Pavlovich, N. Herbal Remedies for Women's Wellness. In Olshansky, E. (Ed.) *Integrated Women's Health: Holistic Approaches for Comprehensive Care*. Gaithersburg, MD: Aspen Publishers, 2000, pp. 180–224.
14. Rulin, M., Davidson, A. R., Philliber, S. G., Graves, W. L., and Cushman, L. F. Changes in menstrual symptoms among sterilized and comparison women: a prospective study. *Obstet. Gynecol.* 74(2):149–154, 1989.
15. American College of Nurse-Midwives. Clinical Bulletin No. 6. Abnormal and Dysfunctional Uterine Bleeding. *J. Midwifery Womens Health* 47(3):207–213, 2002.
16. Dilley, A., Drews, C., Lally, C., Austin, H., Barnhart, E., and Evatt, B. A survey of gynecologists concerning menorrhagia: perceptions of bleeding disorders as a possible cause. *J. Womens Health Gender-Based Med.* 11(1):39–44, 2002.
17. Janssen, C. A., Scholten, P., and Heintz, A. P. A simple visual assessment technique to discriminate between menorrhagia and normal menstrual blood loss. *Obstet. Gynecol.* 85(6):977–982, 1995.
18. Engstrom, J., Rose, R., Brill, A., et al. Midwifery care of the woman with menorrhagia. *J. Nurse-Midwifery* 44(2):89–105, 1999.
19. Kouides, P. Obstetric and gynaecological aspects of von Willebrand disease. *Bailliere's Best Pract. Clin. Haematol.* 14(2):381–399, 2001.
20. Shulman, J. Bleeding disorders. In Lichtman, R., and Papera, S. (Eds.) *Gynecology: Well-Woman Care*. Norwalk, CT: Appleton and Lange, 1990, pp. 355–365.
21. Lusher, J. Systemic causes of excessive uterine bleeding. *Semin. Hematol.* 36(3 suppl. 4):10–20, 1999.
22. Goldrath, M, and Husain, M. The hysteroscopic management of endometrial leiomyomatosis. *J. Am. Assoc. Gynecol. Laparoscopists* 4(2):263–267, 1997.

23. Clark, T., Bakour, S., Gupta, J., and Khan, K. Evaluation of outpatient hysteroscopy and ultrasonography in the diagnosis of endometrial disease. *Obstet. Gynecol.* 99(6):1001–1007, 2002.

24. Granberg, S, Wikland, M., Karlsson, B., et al. Endometrial thickness as measured by endovaginal ultrasonography for identifying endometrial abnormality. *Am. J. Obstet. Gynecol.* 164:47–52, 1991.

25. Luukkainen, T., and Toivonen, J. Levonorgestrel-releasing IUD as a method of contraception with therapeutic properties. *Contraception* 52(5):269–276, 1995.

26. Sulak, P., Cressman, B. E., Waldrop, E., et al. Extending the duration of active oral contraceptive pills to manage hormone withdrawal symptoms. *Obstet. Gynecol.* 89(2):179–183, 1997.

27. Chuong, C., and Brenner, P. F. Management of abnormal uterine bleeding. *Am. J. Obstet. Gynecol.* 175(3, pt. 2):787–792, 1996.

28. Zhang, Y., and Wang, X. Fifty cases of dysfunctional uterine bleeding treated by puncturing the effective points—a new system of acupuncture. *J. Trad. Chin. Med.* 14(4):287–291, 1994.

29. Wang, Z. Differential TCM treatment of anovulatory dysfunctional uterine bleeding. *J. Trad. Chin. Med.* 15(4):270–272, 1995.

30. Tiran, D. *Aromatherapy in Midwifery Practice*. London: Bailliere Tindall, 1996.

31. Hudson, T. *Women's Encyclopedia of Natural Medicine*. Lincolnwood, IL: McGraw-Hill, 1999.

32. Hatmaker, D., Pinholster, L., and Saye, J. A community-based approach to sexual assault. *Public Health Nurs.* 19(2):124–127, 2002.

33. Stewart, G. Intrauterine devices (IUDs). In Hatcher, R., Trussell, J., Stewart, F., et al. (Eds.) *Contraceptive Technology*. New York: Ardent Media, 1998, pp. 511–543.

34. Krassas, G., Pontikides, N., Kaltsas, T., et al. (Eds.) Disturbances of menstruation in hypothyroidism. *Clin. Endocrinol.* 50(5):655–659, 1999.

35. Rosenberg, M., and Waugh, M. Oral contraceptive discontinuation: a prospective evaluation of frequency and reasons. *Am. J. Obstet. Gynecol.* 179(3):577–582, 1998.

36. Dickey, R. *Managing Contraceptive Pill Patients*. Dallas, TX, EMIS, 2000.

37. Mishell, D. R. Jr. Pharmacokinetics of depot medroxyprogesterone acetate contraception. *J. Reprod. Med.* 41(5 suppl.):381–390, 1996.

38. Dimmock, P. W., Wyatt, K. M., Jones, P. W., et al. Efficacy of selective serotonin-reuptake inhibitors in premenstrual syndrome: a systematic review. *Lancet* 356(9236):1131–1136 (September 30) 2000.

39. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*, (DSM-IV) 4th ed. Washington, DC: American Psychiatric Publishing, 1994.

40. Richardson, J. The premenstrual syndrome: a brief history. *Soc. Sci. Med.* 41(6):761–767, 1995.

41. Lin, J., and Thompson, D. S. Treating premenstrual dysphoric disorder using serotonin agents. *J. Womens Health Gender-Based Med.* 10(8):745–750, 2001.

42. Endicott, J. History, evolution, and diagnosis of premenstrual dysphoric disorder. *J. Clin. Psychiatry* 61 (suppl. 12):5–8, 2000.

43. Haywood, A., Slade, P., and King, H. Assessing the assessment measures for menstrual cycle symptoms: a guide for researchers and clinicians. *J. Psychosom. Res.* 52(4):223–237, 2002.

44. Cohen, L. S., Miner, C., Brown, E. W., et al. Premenstrual daily fluoxetine for premenstrual dysphoric disorder: a placebo-controlled, clinical trial using computerized diaries. *Obstet. Gynecol.* 100(3):435–444, 2002.

45. Pearlstein, T. Selective serotonin reuptake inhibitors for premenstrual dysphoric disorder: the emerging gold standard? *Drugs* 62(13):1869–1885, 2002.

46. Nelson, A. Menstrual problems and common gynecologic concerns. In Hatcher, R., Trussell, J., Stewart, F., et al. (Eds.) *Contraceptive Technology*, New York: Ardent Media, 1998, pp. 95–140.

47. Ehrenreich, B., and English, D. *Complaints and Disorders: The Sexual Politics of Sickness*. Old Westbury, NY: Feminist Press, 1973.

48. Ussher, J. M., Hunter, M., and Browne, S. J. Good, bad or dangerous to know: representations of femininity in narrative accounts of PMS. In Squire, C. (Ed.) *Culture in Psychology*. London: Routledge, 2000, pp. 87–99.

49. Boston Women's Health Book Collective. *Our Bodies, Ourselves for the New Century: A Book by and for Women*. New York: Touchstone, 1998.

50. Severino, S., and Moline, M. *Premenstrual Syndrome: A Clinician's Guide*. Collingdale, PA: Diane Publishing, 1997.

51. Women's Health Channel. Premenstrual syndrome (PMS). January 2002. Accessed online at http://www.womenshealthchannel.com/pms.

52. Hunter, M. S., Ussher, J. M., Cariss, M., et al. Medical (fluoxetine) and psychological (cognitive-behavioural therapy) treatment for premenstrual dysphoric disorder: a study of treatment processes. *J. Psychosom. Res.* 53(3):811–817, 2002.

53. Blake, F., Salkovskis, P., Gath, D., et al. Cognitive therapy for premenstrual syndrome: a controlled trial. *J. Psychosom. Res.* 45(4):307–318, 1998.

54. Dog, T. L. Integrative treatments for premenstrual syndrome. *Alternative Ther. Health Med.* 7(5):32–39, 2001.

55. Greenberger, P. The role of diet in disease prevention. *J. Womens Health Gender-Based Med.* 10(1):5–7, 2001.

56. Schellenberg, R. Treatment for the premenstrual syndrome with agnus castus fruit extract: prospective, randomised, placebo controlled study. *BMJ* 322(7279):134–137, 2001.

57. Frackiewicz, E. J., and Shiovitz, T. M. Evaluation and management of premenstrual syndrome and premenstrual dysphoric disorder. *J. Am. Pharm. Assoc.* 41(3):437–447, 2001.

58. Long, L., Huntley, A., and Ernst, E. Which complementary and alternative therapies benefit which conditions? A survey of the opinions of 223 professional organizations. *Complement. Ther. Med.* 9(3):178–185, 2001.

59. Stevinson, C., and Ernst, E. Complementary/alternative therapies for premenstrual syndrome: a systematic review of randomized controlled trials. *Am. J. Obstet. Gynecol.* 185(1):227–235, 2001.

60. Loch, E. G., Selle, H., and Boblitz, N. Treatment of premenstrual syndrome with a phytopharmaceutical formulation containing Vitex agnus castus. *J. Womens Health Gender-Based Med.* 9(3):315–320, 2000.

61. Yamada, K., and Kanba, S. Herbal medicine (kami-shoyo-san) in the treatment of premenstrual dysphoric disorder. *J. Clin. Psychopharmacol.* 22(4):442, 2002.

62. Levy B. Taking care of patients: the caregiver's perspective. In Steege, J. F., Metzger, D. A., and Levy, B. S. (Eds.) *Chronic Pelvic Pain: An Integrated Approach*. Philadelphia, PA: W. B. Saunders, 1998, pp. 298–302.

63. Howard, F. M., and El-Minawi, A. M. Taking a history. In Howard, F. M., Perry, C. P., Carter, J. E., El-Minawi, A. M., and Li, R. Z. (Eds.) *Pelvic Pain: Diagnosis and Management*. Philadelphia, PA: Lippincott Williams and Wilkins, 2000, pp. 7–25.

64. Jones, A., and Zachariae, R. Gender, anxiety, and experimental pain sensitivity: an overview. *JAMWA* 57(2):91–94, 2002.

65. Beal, M. W. Women's use of complementary and alternative therapies in reproductive health care *J. Nurse-Midwifery* 43(3):224–234, 1998.

66. Stones, R. W., and Mountfield, J. Interventions for treating chronic pain in women. *Cochrane Library* 2, 2002.

67. Mathias, S. D., Kupperman, M., Liberman, R. F., et al. Chronic pelvic pain: prevalence, health-related quality of life, and economic correlates. *Obstet. Gynecol.* 87(3):321–327, 1996.

68. Rannestad, T., Ole-Johan E., Helland, H., et al. Quality of life, pain and psychological well-being in women suffering from gynecological disorders. *J. Womens Health Gender-Based Med.* 9(8):897–903, 2000.

69. Jackson V., and Lichtman R. The ovaries. In Lichtman R., and Papera S. (Eds.) *Gynecology: Well-Woman Care*. Norwalk CT: Appleton and Lange, 1990, pp. 283–294.

70. Adelson, M. D., and Adelson, K. L. Miscellaneous benign disorders of the upper genital tract. In Copeland, L. (Ed.) *Textbook of Gynecology*. Philadelphia, PA: W. B. Saunders, 2000, pp. 723–739.

71. Driscoll, A., and Teichman J. M. H. How do patients with interstitial cystitis present? *J. Urol.* 166:2118–2120, 2001.

72. Sant, G. R., and Hanno, P. M. Interstitial cystitis: current issues and controversies in diagnosis. *Urology* 57(suppl. 6A):82–88, 2001.

73. Spadt, S. K. Suffering in silence: managing vulvar pain patients. *Contemp. Nurs. Pract.* 32–38 (November/December) 1995.

74. O'Hare, P. M., and Shetetz, E. F. Vulvodynia: a dermatologist's perspective with emphasis on an irritant contact dermatitis component. *J. Womens Health Gender-Based Med.* 9(5):565–569 2000.

75. Foster, D. C. Vulvar disease. *Obstet. Gynecol.* 100(1):145–163, 2002.

76. Jones, K. D., and Lehr, S. T. Vulvodynia: diagnostic techniques and treatment modalities. *Nurs. Pract.* 19(4):34–46, 1994.

77. McKay M. Vulvodynia. In Steege, J. F., Metzger, D. A., and Levy, B. S. (Eds.) *Chronic Pelvic Pain: An Integrated Approach*. Philadelphia, PA: W. B. Saunders, 1998, pp. 188–196.

78. Perry, C. P. Vulvodynia. In Howard, F. M., Perry, C. P., Carter, J. E., El-Minawi, A. M., and Li, R. Z. (Eds.) *Pelvic Pain: Diagnosis and Management*. Philadelphia, PA: Lippincott Williams and Wilkins, 2000, pp. 204–210.

79. Guarnaccia, M. M, Silverberg, K., and Olive, D. L. Endometriosis and adenomyosis. In Copeland, L. (Ed.) *Textbook of Gynecology*. Philadelphia, PA: W. B. Saunders, 2000, pp. 687–722.

80. Speroff, L., Glass, R. H., and Kase, N. G. Endometriosis. In Speroff, L., Glass, R. H., and Kase, N. G. (Eds.) *Clinical Gynecologic Endocrinology and Infertility.* Baltimore, MD: Lippincott Williams and Wilkins, 1999, pp. 1057–1074.

81. Jacobson, T. Z., Barlow, D. H., and Konickx, P. Laparoscopic surgery for pelvic pain associated with endometriosis. *Cochrane Library* 2, 2002.

82. Rice, V. M., Conventional medical therapies for endometriosis. *Ann. N Y Acad. Sci.* 955:343–352, 2002.

83. Selak, V., Farquhar, C., Prentice, A., et al. Danazol for pelvic pain associated with endometriosis. *Cochrane Library* 2, 2002.

84. Moore, J., Kennedy, S., and Prentice A. Modern combined oral contraceptives for pain associated with endometriosis. *Cochrane Library* 2, 2002.

85. Prentice, A., Deary, A. J., Goldbeck-Wood, S., et al. Gonadotropin-releasing hormone analogues for pain associated with endometriosis. *Cochrane Library* 2, 2002.

86. Surrey, E. S., and Hornstein, M. D. Prolonged GnRH agonist and add-back therapy for symptomatic endometriosis: long-term follow up. *Obstet. Gynecol.* 99(5 pt. 1):709–719, 2002.

87. Mitwally, M. F., Gotlieb, L., and Casper, R. F. Prevention of bone-loss and hypoestrogenic symptoms by estrogen and interrupted progestogen add-back in long-term GnRH-agonist down-regulated patients with endometriosis and premenstrual syndrome. *Menopause* 9(4):236–241, 2002.

88. Feldman, S., and Stewart, E. A. The uterine corpus. In Ryan, K. J., Berkowitz, R. S., Barbieri, R. L., and Dunaif, A. (Eds.) *Kistner's Gynecology and Women's Health*. St. Louis, MO: Mosby, 1999, pp. 121–142.

89. Jackson, V. The uterus. In Lichtman R., and Papera S. (Eds.) *Gynecology: Well-Woman Care*. Norwalk, CT: Appleton and Lange, 1990, pp. 261–272.

90. Marshall, L. M., Spiegelman, D., Barbieri, RL., et al. Variation in the incidence of uterine leiomyoma among premenopausal women by age and race. *Obstet. Gynecol.* 90(6):967–973, 1997.

91. Pritts, E. A. Fibroids and infertility: a systematic review of the evidence. *Obstet. Gynecol.* 56(8):483–491, 2001.

92. DeWaay, D. J., Syrop, C. H., Nygaard, I. E., et al. Natural history of uterine polyps and leiomyomata. *Obstet. Gynecol.* 100(1):3–7, 2002.

93. Farquhar, C. M., and Steiner, C. A. Hysterectomy rates in the United States 1990–1997. *Obstet. Gynecol.* 99(2):229–234, 2002.

94. Myers, E. R., Barber, M. D., Gustilo-Ashby, T., Couchman, G., Matchar, D. B., and McCrory, D. C. Management of uterine leiomyomata: what do we really know? *Obstet. Gynecol.* 100(1):8–17, 2002.

95. Tranquart, F., Brunereau, L., Cottier, J. P., et al. Prospective sonographic assessment of uterine artery embolization for the treatment of fibroids. *Ultrasound Obstet. Gynecol.* 19(1):81–90, 2002.

96. Nevadunsky, N. S., Bachmann, G. A., Nosher, J., et al. Women's decision-making determinants in choosing uterine artery embolization for symptomatic fibroids. *J. Reprod. Med.* 46(10):870–874, 2001.

97. Bachmann, G. A., and Phillips, N. A. Sexual dysfunction. In Steege, J. F., Metzger, D. A., and Levy, B. S. (Eds.) *Chronic Pelvic Pain: An Integrated Approach*. Philadelphia, PA: W. B. Saunders, 1998, pp. 77–90.

98. Mehl-Madrona, L. Complementary medicine treatment of uterine fibroids: a pilot study. *Alternative Ther. Health Med.* 8(2):34–46, 2002.

99. Lethaby, A., Vollenhoven, B., and Sowter, M. Pre-operative GnRH analogue therapy before hysterectomy or myomectomy for uterine fibroids. *Cochrane Library* 2, 2002.

100. Rome, E. S., and Gidwani, G. P. Pelvic pain in the adolescent. In Steege, J. F., Metzger, D. A., and Levy, B. S. (Eds.) *Chronic Pelvic Pain: An Integrated Approach*. Philadelphia, PA: W. B. Saunders, 1998, pp. 91–100.

101. Rice, L. The ovary. In Ryan, K., Berkowitz, R., Barbieri, R., and Dunaif, A. (Eds.) *Kistner's Gynecology and Women's Health*, 7th ed. St. Louis, MO: Mosby, 1999, pp. 166–190.

102. Speroff, L., Glass, R. H., and Kase, N. G. Anovulation and the polycystic ovary. In

Speroff, L., Glass, R. H., and Kase, N. G. (Eds.) *Clinical Gynecologic Endocrinology and Infertility*. Baltimore, MD: Lippincott Williams and Wilkins, 1999, pp. 487–522.

103. American College of Obstetricians and Gynecologists. Management of infertility caused by ovulatory dysfunction. *ACOG Practice Bulletin* No. 34. *Obstet. Gynecol.* 99(2):347–358, 2002.

104. Taylor, A., and Dunaif, A. E. Polycystic ovary syndrome and hyperandrogenism. In Ryan, K. J., Berkowitz, R., Barbieri, R., and Dunaif, A. (Eds.) *Kistner's Gynecology and Women's Health*, 7th ed. St. Louis, MO: Mosby, 1999, pp. 373–395.

105. Nestler, J. E., Stovall, D., Akhter, N., et al. Strategies for the use of insulin-sensitizing drugs to treat infertility in women with polycystic ovary syndrome. *Fertil. Sterility* 77(2):209–215, 2002.

106. Kirpichnikov, D., McFarlane, S. I., and Sowers, J. R. Metformin: an update. *Ann. Intern. Med.* 137(1):25–33, 2002.

107. Ovalle, F., and Azziz, R. Insulin resistance, polycystic ovary syndrome, and type 2 diabetes mellitus. *Fertil. Sterility* 77(6):1095–1105, 2002.

108. Macut, D., Micic, D., Cvijobic, G., et al. Cardiovascular risks in adolescent and young adult obese females with polycystic ovary syndrome (PCOS). *J. Pediatr. Endocrinol. Metab.* 14(suppl. 5):1353–1359, 2001.

109. Moghetti, P. Advances in the treatment of polycystic ovary syndrome. *Expert Opinion Investig. Drugs* 10(9):1631–1640, 2001.

110. Wild, R. A. Polycystic ovary syndrome: a risk for coronary artery disease? *Am. J. Obstet. Gynecol.* 186(1):35–43, 2002.

111. Kitzinger, C., and Willmott, J. "The thief of womanhood": women's experience of polycystic ovarian syndrome. *Soc. Sci. Med.* 54(3):349–361, 2002.

112. Schroeder, B. Early diagnosis, presenting complaints, and management of hyperandrogenism in adolescents. *Curr. Womens Health Rep.* 1(2):124–130, 2001.

113. Trent, M. E., Rich, M., Austin, S. B., et al. Quality of life in adolescent girls with polycystic ovary syndrome. *Arch. Pediatr. Adolesc. Med.* 156(6):556–560 2002.

114. Grimbizis, G. F., Camus, M., Tarlatzis, B. C., et al. Clinical implications of uterine malformations and hysteroscopic treatment results. *Hum. Reprod. Update* 7(2):161–174, 2001.

115. Spence, J. E. Vaginal and uterine anomalies in the pediatric and adolescent patient. *J. Pediatr. Adolesc. Gynecol.* 11(1):3–11, 1998.

116. Wheeler, D. G. Preterm birth prevention. *J. Nurse-Midwifery* 39(2 suppl.):66S–80S, 1994.

117. Nahum, G. G. Uterine anomalies. How common are they, and what is their distribution among subtypes? *J. Reprod. Med.* 43(10):877–887, 1998.

118. Patton, P. E. Anatomic uterine defects. *Clin. Obstet. Gynecol.* 37(3):705–721, 1994.

119. Woodward, P. J., Sohaey, R., and Wagner, B. J. Congenital uterine malformations. *Curr. Probl. Diagn. Radiol.* 24(5):178–197, 1995.

120. Edmonds, D. K., and Muram, D. Sexual developmental anomalies and their reconstruction: upper and lower tracts. In Sanfilippo, J. S., Muram, D., Dewhurst, J., and Lee, P. A. (Eds.) *Pediatric and Adolescent Gynecology*. Philadelphia, PA: W. B. Saunders, 2001, pp. 553–583.

121. Carter, J. E. Pelvic floor relaxation. In Howard, F. M., Perry, C. P., Carter, J. E., El-Minawi, A. M., and Li, R. Z. (Eds.) *Pelvic Pain: Diagnosis and Management*. Philadelphia, PA: Lippincott Williams and Wilkins, 2000, pp. 190–203.

122. Goldberg, J., Holtz, D., Hyslop, T., et al. Has the use of routine episiotomy decreased? Examination of episiotomy rates from 1983 to 2000. *Obstet. Gynecol.* 99(3):395–400, 2002.

123. Handa, V. L., Harris, T. A., and Ostergard, D. R. Protecting the pelvic floor: obstetric management to prevent incontinence and pelvic organ prolapse. *Obstet. Gynecol.* 88(3):470–478, 1996.

124. MacLennan, A. H., Taylor, A. W., Wilson, D. H., et al. The prevalence of pelvic floor disorders and their relationship to gender, age, parity and mode of delivery. *Br. J. Obstet. Gynaecol.* 107(12):1460–1470, 2000.

125. Wall, L. L. Birth trauma and the pelvic floor: lessons from the developing world. *J. Womens Health* 8(2):149–155, 1999.

126. Barber, M. D., Vixco, A. G., Wyman, J. F. et al. Sexual function in women with urinary incontinence and pelvic organ prolapse. *Obstet. Gynecol.* 99(2):281–289, 2002.

127. Kegel, A. H. Physiologic therapy for urinary stress incontinence. *JAMA* 146(10):915–917, 1956.

128. Bourcier, A. P. Physical therapy for female pelvic floor disorders. *Curr. Opinion Obstet. Gynecol.* 6(4):331–335, 1994.

129. Pott-Grinstein, E., and Newcomer, J. R. Gynecologists' pattern of prescribing pessaries. *J. Reprod. Med.* 46(3):205–208, 2001.

130. Rovner, E. S. Pelvic organ prolapse: a review. *Ostomy Wound Manage.* 46(12):24–37, 2000.

131. Subak, L. L., Waejen, L. E., van den Eeden, S., et al. Cost of pelvic organ prolapse surgery in the United States. *Obstet. Gynecol.* 98(4):646–651, 2001.

132. Sze, E. H. M., Jones, W. P., Ferguson, J. L., et al. Prevalence of urinary incontinence symptoms among black, white and Hispanic women. *Obstet. Gynecol.* 99(4):572–575, 2002.

133. Binder, M. R., and Prosen, H. Psychologic aspects of urinary incontinence in women. In Buchsbaum, H. J., and Schmidt, J. D. (Eds.) *Gynecologic and Obstetric Urology*. Philadelphia, PA: W. B. Saunders, 1993, pp. 423–426.

134. Harvey, M., and Versi, E. Urogynecology and pelvic floor dysfunction. In Ryan, K., Berkowitz, R., Barbieri, R., and Dunaif, A. (Eds.) *Kistner's Gynecology and Women's Health*, 7th ed. St. Louis, MO: Mosby, 1999, pp. 570–609.

135. Buchsbaum, G. M., Chin, M., Glantz, C., et al. Prevalence of urinary incontinence and associated risk factors in a cohort of nuns. *Obstet. Gynecol.* 100(2):226–229, 2002.

136. Wolters, M., Methfessel, H. D., Goepel, C., et al. Computer-assisted virtual urethral pressure profile in the assessment of female genuine stress incontinence. *Obstet. Gynecol.* 99(1):69–74, 2002.

137. Juma, S., Little, N. A., and Raz, S. Evaluation of stress urinary incontinence. In Buchsbaum, H. J., and Schmidt, J. D. (Eds.) *Gynecologic and Obstetric Urology*. Philadelphia, PA: W. B. Saunders, 1993, pp. 251–263.

138. Hullfish, K. L., Bovbjerg, V. E., Gibson, J., et al. Patient-centered goals for pelvic floor dysfunction surgery: What is success, and is it achieved? *Am. J. Obstet. Gynecol.* 187(1):88–92, 2002.

139. Roe, B., Williams, K., and Palmer, M. Bladder training for urinary incontinence in adults. *Cochrane Library* 2, 2002.

140. Hatch, E. E., Herbst, A. L., Hoover, R. N., et al. Incidence of squamous neoplasia of the cervix and vagina in women exposed prenatally to diethylstilbestrol (United States). *Cancer Causes Control* 12(9):837–845 2001.

141. Giusti, R. M., Iawamoto, K., and Hatch, E. E. Diethylstilbestrol revisited: a review of the long-term health effects. *Ann. Intern. Med.* 122(10):778–788, 1995.

142. Titus-Ernstoff, L., Hatch, E. E., Hoover, R. N., et al. Long-term cancer risk in women given diethystilbestrol (DES) during pregnancy. *Br. J. Cancer* 84(1):126–133, 2001.

143. Klip, H., Verloop, J., Van Gool, J. D., et al. Hypospadias in sons of women exposed to diethylstilbestrol in utero: a cohort study. *Lancet* 359(9312):1102–1107, 2002.

144. Wingard, D. L., Cohn, B. A., Helmrich, S. P., et al. DES awareness and exposure: The 1994 California Behavioral Risk Factor Survey. *Am. J. Prev. Med.* 12(5):437–441, 1996.

145. Hewitt, G. D., and Brown, R. T. Acute and chronic pelvic pain in female adolescents. *Med. Clin. North Am.* 84(4):1009–1025, 2000.

146. Ten leading causes of death, 1999, all races, both sexes. *Leading Causes of Death Reports*. Atlanta, GA: Centers for Disease Control and Prevention, 2002.

147. Ten leading causes of death, 1999, all races, females. *Leading Causes of Death Reports*. Atlanta, GA: Centers for Disease Control and Prevention, 2002.

148. National Cancer Institute. Breast cancer screening. Accessed online in September 2002 at www.nci.nih.gov/cancerinfo/screening/breast.

149. Feuer, E., Wun, L., Boring, C., Flanders, W., Timmel, M., and Tong, T. The lifetime risk of developing breast cancer. *J. Natl. Cancer Inst.* 85(11):892–897, 1993.

150. Burke, W., Daly, M., Garber, J., et al. Recommendations for follow-up care of individuals with an inherited predisposition to cancer. Part 2: BRCA1 and BRCA2. *JAMA* 277(12):997–1003, 1997.

151. McCool, W., Stone-Condry, M., and Bradford, H. Breast health care: a review. *J. Nurse-Midwifery* 43(6):406–430, 1998.

152. Baxter, N. Preventive health care, 2001 update: Should women be routinely taught breast self-examination to screen for breast cancer? *Can. Med. Assoc. J.* 164(13):1837–1846, 2001.

153. Humphrey, L., Helfand, M., Chan, B., and Woolf, S. Breast cancer screening: summary of the evidence. *Ann. Intern. Med.* 137:344–346, 2002.

154. Bobo, J., Lee, N., and Thames, S. Findings from 752,081 clinical breast examinations reported to a national screening program from 1995 through 1998. *J. Natl. Cancer Inst.* 92(12):971–976, 2000.

155. Picard, J. History of mammography. *Bulletin de l'Academie Nationale de Medecine* 182(8):1613–1620, 1998.

156. Sickles, E. Breast imaging: from 1965 to the present. *Radiology* 215(1):1–16, 2000.

157. Policar, M. Female genital tract cancer screening. In Hatcher, R., Trussell, J., Stewart, F., et al. (Eds.) *Contraceptive Technology*, 17th ed. New York: Ardent Media, 1998, pp. 43–67.

158. Winer, E., Morrow, M., Osborne, C., and Harris, J. Malignant tumors of the breast. In DeVita, V., Hellman, S., and Rosenberg, S. (Eds.) *Cancer: Principles and Practice of Oncology*, 6th ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2001, pp. 1651–1717.

159. HHS affirms value of mammography for detecting breast cancer. *HHS News*. Accessed online on February 21, 2002 at www.hhs.gov/news/press/2002pres/20020221.html.

160. McCool, W. Barriers to breast cancer screening in older women. *J. Nurse-Midwifery* 39(5):283–299, 1994.

161. Goscin, C., Berman, C., and Clark, R. Magnetic resonance imaging of the breast. *Cancer Control* 8(5):399–406, 2001.

162. Hou, M., Chuang, H., Ou-Yang, F., et al. Comparison of breast mammography, sonography and physical examination for screening women at high risk of breast cancer in Taiwan. *Ultrasound Med. Biol.* 28(4):415–420, 2002.

163. Thibault, F., Meunier, M., Klijanienko, J., et al. Diagnostic accuracy of sonography and combined sonographic assessment and sonographically guided cytology in nonpalpable solid breast lesions. *J. Clin. Ultrasound* 28(8):387–398, 2000.

164. National Cancer Institute. Cervical cancer screening. Accessed online in July 2002 at www.nci.nih.gov/cancerinfo/pdq/screening/cervical.

165. Mashburn, J. Evolution of the evidence-based Papanicolaou smear. *J. Midwifery Womens Health* 46(3):181–189, 2001.

166. Zones, J. In debate over new cervical screening technologies, money does most of the talking. *Network News—Natl Womens Health Network* 27(6):1, 4–5, 2002.

167. American Cancer Society. *Cancer Facts and Figures—2002*. Atlanta, GA: ACS, 2002.

168. World Health Organization. *Cancer Pain Relief: With a Guide to Opioid Availability*, 2nd ed. Albany, NY: WHO, 1996.

169. Marrazzo, J. Genital human papillomavirus infection in women who have sex with women: a concern for patients and providers. *AIDS Patient Care & STDs*, 14(8):447–451, 2000.

170. Scully, C. Oral squamous cell carcinoma; from an hypothesis about a virus, to concern about possible sexual transmission. *Oral Oncol.* 38(3):227–234, 2002.

171. Czegledy, J. Sexual and nonsexual transmission of human papillomavirus. *Acta Microbiologica et Immunologica Hungarica* 48(3–4):511–517, 2001.

172. Syrjanen, S., and Puranen, M. Human papillomavirus infections in children: the potential role of maternal transmission. *Crit. Rev. Oral Biol. Med.* 11(2):259–274, 2000.

173. Saslow, D., Runowicz, C.D., Solomon, D., et al. American Cancer Society guideline for the early detection of cervical neoplasia and cancer. *CA: Cancer J. Clin.* 52(6):342–362, 2002.

174. DiGuiseppi, C., Atkins. D., and Woolf, S. (Eds.) *Guide to Clinical Preventive Services (CPS): Report of the U.S. Preventive Services Task Force,* 2nd ed. Alexandria, VA: International Medical Publishing, 1996.

175. Sherman, M., Mendoza, M., Lee, K., et al. Performance of liquid-based, thin-layer cervical cytology: correlation with reference diagnoses and human papillomavirus testing. *Modern Pathol.* 11(9):837–843, 1998.

176. Carpenter, A., and Davey, D. ThinPrep Pap test: performance and biopsy follow-up in a university hospital. *Cancer* 87(3):105–112, 1999.

177. Solomon, D., Davey, D., Kurman, R., et al. The 2001 Bethesda System: terminology for reporting results of cervical cytology. *JAMA* 287(16):2114–2119, 2002.

178. Lonky, N. M., Sadeghi, M., Tsadik, G. W., and Petitti, D. The clinical significance of the poor correlation of cervical dysplasia and cervical malignancy with referral cytologic results. *Am. J. Obstet. Gynecol.* 181(3):560–566, 1999.

179. Mannino, J. R. Natural history of false-negative Papanicolaou smears: a prospective study using screening colposcopy in addition to cytology. *J. Am. Osteopath. Assoc.* 98(10):542–546, 1998.

180. Schneider, D., Burke, L., Wright, T., et al. Can cervicography be improved? An evaluation with arbitrated cervicography interpretations. *Am. J. Obstet. Gynecol.* 187(1):15–23, 2002.

181. Cronje, H., Cooreman, B., Beyer, E., Bam, R., Middlecote, B., and Divall, P. Screening for cervical neoplasia in a developing country utilizing cytology, cervicography and the acetic acid test. *Int. J. Gynaecol. Obstet.* 72(2):151–157, 2001.

182. Yamazaki, H., Sasagawa, T., Basha, W., Segawa, T., and Inoue, M. Hybrid capture-II and LCR-E7 PCR assays for HPV typing in cervical cytologic samples. *Int. J. Cancer* 94(2):222–227, 2001.

183. Krieger, J., Tam, M., Stevens, C., et al. Diagnosis of trichomoniasis: comparison of conventional wet-mount examination with cytologic studies, cultures, and monoclonal antibody staining of direct specimens. *JAMA* 259(8):1223–1227, 1988.

184. National Cancer Institute, Endometrial cancer screening. Accessed online in August 2002 at www.nci.nih.gov/cancerinfo/pdq/screening/endometrial.

185. Burke, T., Eifel, P., and Muggia, F. Cancers of the uterine body. In DeVita, V., Hellman, S., and Rosenberg, S. (Eds.) *Cancer: Principles and Practice of Oncology*, 6th ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2001, pp. 1573–1594.

186. Burke, T., and Morris, M. Adenocarcinoma of the endometrium. In Copeland, L. (Ed.) *Textbook of Gynecology*, Philadelphia, PA: W. B. Saunders, 2000, pp. 1299–1320.

187. Mashburn, J. Endometrial biopsy in the office setting. *J. Nurse-Midwifery* 38(2, suppl.):31–35, 1993.

188. American College of Nurse-Midwives. Clinical Bulletin No. 5—June 2001: Endometrial Biopsy. *J. Midwifery Womens Health* 46(5):321–326, 2001.

189. Good, A. Diagnostic options for assessment of postmenopausal bleeding. *Mayo Clin. Proc.* 72(4):345–349, 1997.

190. Smith-Bindman, R., Kerlikowske, K., Feldstein, V., et al. Endovaginal ultrasound to exclude endometrial cancer and other endometrial abnormalities. *JAMA* 280(17):1510–1517, 1998.

191. National Cancer Institute. Uterine sarcoma treatment. Accessed online in June 2002 at www.nci.nih.gov/cancer_information/cancer_type/uteri.

192. McGuire, V., Jesser, C., and Whittemore, A. Survival among U.S. women with invasive epithelial ovarian cancer. *Gynecol. Oncol.* 84(3):399–403, 2002.

193. Ozols, R., Schwartz, P., and Eifel, P. Ovarian cancer, fallopian tube carcinoma, and peritoneal carcinoma. In DeVita, V., Hellman, S., and Rosenberg, S. (Eds.) *Cancer: Principles and Practice of Oncology*, 6th ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2001, pp. 1597–1632.

194. National Cancer Institute. Ovarian cancer screening. Accessed online in August 2002 at www.nci.nih.gov/cancerinfo/pdq/screening/ovarian.

195. Lacey, J., Mink, P., Lubin, J., et al. Menopausal hormone replacement therapy and risk of ovarian cancer. *JAMA* 288(3):334–341, 2002.

196. Nagele, F., Petru, E., Medl, M., Kainz, C., Graf, A., and Sevelda, P. Preoperative CA 125: an independent prognostic factor in patients with stage I epithelial ovarian cancer. *Obstet. Gynecol.* 86(2):259–264, 1995.

197. Pauler, D., Menon, U., McIntosh, M., Symecko, H., Skates, S., and Jacobs, I. Factors influencing serum CA125II levels in healthy postmenopausal women. *Cancer Epidemiol. Biomarkers Prev.* 10(5):489–493, 2001.

198. Buller, R., Shahin, M., Geisler, J., Zogg, M., De Young, B., and Davis, C. Failure of BRCA1 dysfunction to alter ovarian cancer survival. *Clin. Cancer Res.* 8(5):1196–1202, 2002.

199. Rice, L. The ovary. In Ryan, K., Berkowitz, R., Barbieri, R., and Dunaif, A. (Eds.) *Kistner's Gynecology and Women's Health*, 7th ed. St. Louis, MO: Mosby, 1999, pp. 166–190.

200. Elit, L. Familial ovarian cancer. *Can. Fam. Physician* 47:778–784, 2001.

201. American Cancer Society. *Cancer Facts and Figures—1992*. New York: ACS, 1992.

202. Fitch, M., Deane, K., Howell, D., and Gray, R. E. Women's experiences with ovarian cancer: reflections on being diagnosed. *Can. Oncol. Nurs. J.* 12(3):152–168, 2002.

203. Huber, S., Medl, M., Baumann, L., and Czembirek, H. Value of ultrasound and magnetic resonance imaging in the preoperative evaluation of suspected ovarian masses. *Anticancer Res.* 22(4):2501–2507, 2002.

204. National Cancer Institute. Vulvar cancer treatment. Accessed online in July 2002 at www.nci.nih.gov/cancerinfo/pdq/screening/vulvar.

205. National Cancer Institute. Vaginal cancer treatment. Accessed online in July 2002 at

www.nci.nih.gov/cancerinfo/pdq/screening/vaginal.

206. Eifel, P., Berek, J., & Thigpen, J. Cancer of the cervix, vagina, and vulva. In DeVita, V., Hellman, S., and Rosenberg, S. (Eds.) *Cancer: Principles and Practice of Oncology*, 6th ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2001, pp. 1526–1573.

207. Gordon, A. Vulvar neoplasms. In Copeland, L. (Ed.) *Textbook of Gynecology*. Philadelphia, PA: W. B. Saunders, 2000, pp. 1185–1208.

208. Hopkins, M. Vaginal neoplasms. In Copeland, L. (Ed.) *Textbook of Gynecology*. Philadelphia, PA: W. B. Saunders, 2000, pp. 1209–1224.

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CHAPTER

15

Infections of the Genital Tract

Vulvovaginal/Cervical Infections and Sexually Transmitted Diseases

Vulvovaginal/cervical infections and sexually transmitted diseases (STDs) not only cause intense physical discomfort, pain, and mental anguish but STDs may be devastating to a woman's reproductive health and even to life [1]. The acquisition of the STD is usually so distant from any resulting mortality that the association is not made. Examples include mortality from ectopic pregnancy (associated with PID) and cervical cancer (associated with HPV) [1, 2].

Women are especially vulnerable to the acquisition of STDs and thus to STD-related morbidity and mortality. There are several reasons for this vulnerability in women compared to men:

1. more biologically susceptible to STDs [1, 3]
2. more apt to acquire an STD from a man than vice versa [1, 4, 5]
3. more apt to be asymptomatic with an STD, with resulting delay in diagnosis and treatment [1, 6]
4. STD complications are more severe [4]
5. powerlessness in situations of sexual abuse and rape
6. the practice of douching [7]

The Committee on Prevention and Control of Sexually Transmitted Diseases of the Institute of Medicine published a report in 1997 entitled *The Hidden Epidemic: Confronting Sexually Transmitted Diseases* [4]. The report details a number of conclusions and recommendations made by the committee in the areas of education, population groups, and clinical practice. The clinical practice recommendations fall into two categories: (1) prevention and (2) management and treatment of STDs in accord with CDC guidelines [8]. Prevention encompasses risk assessment, counseling, and promotion of sexual health [9]; partner notification and treatment; and incorporation of STD-related services into primary care.

Risk assessment involves obtaining a history that will reveal practices that put a woman at risk for STDs (see Table 15-1). Preface your history taking with an expression of your understanding that these questions are highly personal but that you need to ask them in order to provide her with the best possible care. The woman's answers then become the basis

TABLE 15-1 STD Risk Assessment History

At what age did you start having sex?
How often do you have sex now?
Are you having sex with more than one partner?
How many partners have you had sex with in the last six months?
Do you have sex with men, women, or both?
What sex is your current partner?
Does your partner have other partners? Are they the same sex as your partner or the opposite sex?
Do you and your partner have sex while using alcohol or recreational drugs?
Do either you or your partner use intravenous drugs? Do you or your partner share needles?
Do you have anal intercourse?
What percentage of the number of times you have sex do you use a condom or dental dam?
Do you have a history of a previous sexually transmitted disease? Which one(s)? When? Treatment? Cure?
Do you douche?
What is your occupation?

Source: Used with permission from Washington State Department of Health STD/TB Program Training Center, and Cindy Fennell, MS, MT, ASCP.

for your counseling as you individualize the information and make it pertinent to her. Be careful not to make assumptions about the woman and in the process either alienate or deprive her from health care she needs. It helps to remember that age makes no difference and that counseling needs to be sensitive, nonjudgmental, and in accord with the woman's sexual orientation, sexual practices, frequency, number of partners, associated use of alcohol or drugs, contraceptive method, frequency of use of condoms, practice of douching, and occupation. The primary health care of every woman, regardless of age, should include essential STD-related services as enumerated in Table 15-2 [1].

A cardinal rule in diagnosing and making a differential diagnosis among the possible vulvovaginal/cervical infections is to never make the diagnosis on the basis of what you see on speculum examination (i.e., characteristics of the discharge; condition of the cervix, vaginal walls, and vulva). Although these findings are helpful in distinguishing among the different possible vulvovaginal/cervical infections, "eyeballing" is fraught with error. The discharge caused by one infection sometimes looks like the discharge caused by another; excoriation, inflammation, redness, and edema of the cervix, vaginal walls, or vulva may or may not be present with more than one infection; and pruritus is not an uncommon finding. Eyeballing also leads to missing coexisting infections and treating only part of the problem. Definitive diagnosis of vulvovaginal/cervical infections is made by microscopic findings on a wet mount or from diagnostic testing for specific diseases. The various methods of diagnosing sexually transmitted diseases are detailed in the discussion of each.

There are two vulvovaginal/cervical infections whose primary transmission may be other than sexual: candidiasis and bacterial vaginosis. The rest of the infections are primarily or exclusively sexually transmitted. Each state mandates the reporting of certain sexually transmitted diseases, usually at least syphilis and gonorrhea. Midwives need to know their state reporting regulations and be in compliance with them.

TABLE 15-2	Essential Primary Health Care STD-Related Services
Risk assessment history and evaluation (see Table 15-1)	
Counseling regarding high-risk behaviors or occupation	
Provision of Hepatitis B vaccine as indicated	
Obtaining a Papanicolaou smear	
Screening for STDs: wet mount, diagnostic testing of vaginal/cervical samples, blood test	
Treatment of STDs	
Partner notification and treatment as indicated	
Follow-up on effectiveness of treatment and counseling	

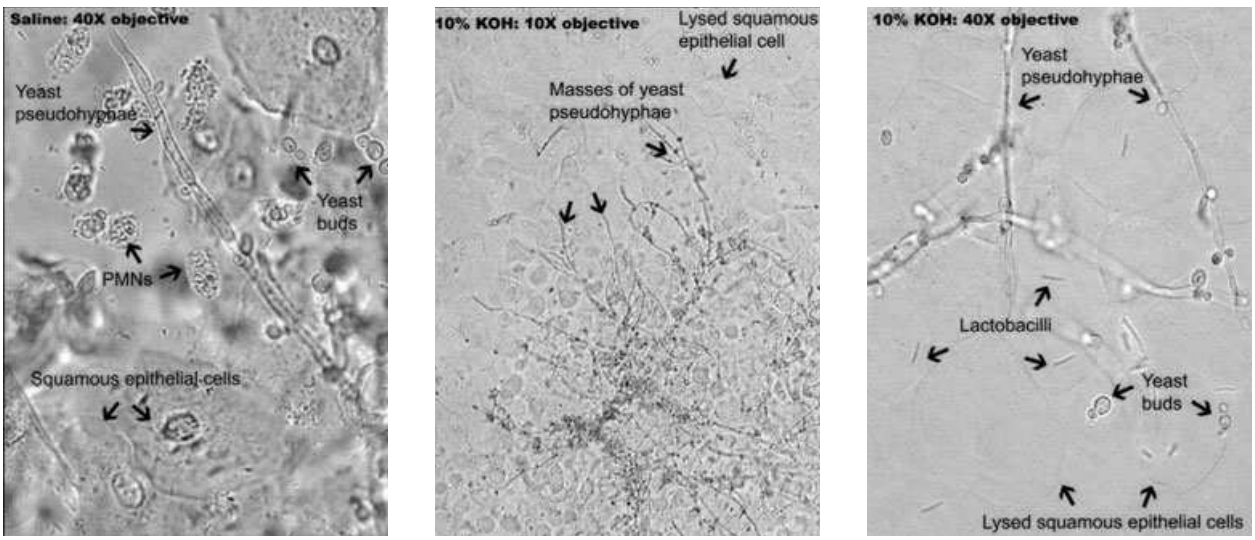
The midwife needs to be particularly sensitive to the impact of the news on a woman who learns she has a sexually transmitted disease. The woman needs to be given time to express anger, grief, and guilt (often felt by a woman who is pregnant and whose STD may affect her baby); the midwife needs time to provide explanations, facts, and support; and the two of you need time to develop a plan that includes telling the sexual partner, fulfilling reporting requirements, treatment, follow-up, and a discussion of sexual practices and future sexual relationships.

Vulvovaginal Candidiasis (Monilial Vulvovaginitis; Yeast Infection)

Commonly caused by *Candida albicans*, from which it takes its name, candidiasis is the vaginal infection with which most women are familiar. Predisposing factors include pregnancy, broad-spectrum antibiotic therapy, diabetes mellitus, diets high in refined sugars, obesity, HIV, and use of corticosteroids, immunosuppressant agents, and exogenous hormones, including contraceptive hormones. Candidiasis is thought to be hormonally dependent, based on the observation that *Candida* is rarely isolated from premenarchal girls or postmenopausal women [10]. Pregnancy almost doubles the incidence of *Candida*, with increased symptomatology in the third trimester. *Candida* vaginitis can occur concomitantly with STDs and should also be treated in this event.

The stereotypic clinical picture of monilia is of a white, thick, cottage cheese-like discharge, with white or white-yellow adherent plaques or patches on the cervix or vaginal walls. The discharge of monilia may also be thin and watery, or there may be none at all. Women complain of intense itching; the reddened, edematous, and excoriated vulva and vagina often seen during an examination may be the result of scratching or attempts to "wipe out" the discharge. There is generally no odor. The vaginal pH is normal (″4.5).

Diagnosis is made from microscopic evaluation of a wet mount (wet smear slide; wet prep) of discharge and plaques obtained during the speculum examination. (See Chapter 59 on making a wet smear slide.) Although the characteristic pseudohyphae and budding spores of *Candida* (see Figure 15-1) can be seen on a regular saline wet mount, they



(a) (b) (c)

FIGURE 15-1 *Candida* pseudohyphae and budding spores under microscopic examination. (1) saline, 40×, (b) KOH, 10×, (c) KOH, 40×, PMNs = polymorphonuclear cells.

Source: Used with permission from Washington State Department of Health STD/TB Program, Seattle STD/HIV Prevention Training Center, and Cindy Fennell, MS, MT, ASCP.

can be seen more easily if you add a drop or two of 10% KOH to your mix. The effect of the KOH is to destroy or blanch all the other cells on the slide except for the fungus. Up to 20 percent of wet mounts give false-negative results. Nickerson's medium for culture has a sensitivity of 95 percent, but most clinicians rely on a combination of wet mount and symptomatology to make a diagnosis and initiate treatment.

Any number of anti-fungal agents are available over the counter for treatment of *Candida*. Antifungal agents (see Table 15-3) include nystatin (Mycostatin); any agents that have an imidazole preparation, such as miconazole (Monistat), clotrimazole (Gyne-Lotrimin; Mycelex), butoconazole (Femstat), and ketoconazole (Nizoral); and agents containing a triazole agent, such as terconazole (Terazol). With the exception of fluconazole (Diflucon) and ketoconazole (Nizoral), all come in suppository or cream form; a few also come as vaginal tablets. The usual dosage is one suppository or one applicatorful of cream intravaginally hs for 7 days, although there are some 1-day and 3-day regimens. The cream may also be applied topically on the vulva for relief of symptoms. If a nondiabetic woman is experiencing recurrent *Candida* not related to antibiotic therapy, her sexual partner should also be treated.

Fluconazole and ketoconazole have the advantage of being oral tablets and absorbable, which eliminates the inconvenience of vaginal therapy and provides treatment to the digestive tract. However, ketoconazole is a very potent drug with hepatic side effects and potential for liver damage. Fluconazole has several gastrointestinal side effects and the woman generally does not experience symptom relief for 2 to 3 days. Nystatin also comes in oral form but is not absorbable, works only on the digestive tract, and is not as effective for *Candida* vaginitis as the azole drugs. None of the oral formulations should be used when a woman is pregnant or breastfeeding.

Fewer than 5 percent of women have recurrent (four or more) episodes of symptomatic infection a year. Vaginal cultures should be obtained on these women to identify unusual species of *Candida* that do not form pseudohyphae or hyphae and are not easily recognized from microscopic evaluation of a wet mount. Treatment is a longer duration of topical therapy (14 days) or a repeated oral dose (3 days later) before initiating a maintenance antifungal regime (see CDC Treatment Guidelines) [8].

In addition to being given information on the etiology and course of the infection and on how to insert the suppositories or cream, the woman should be given the following instructions:

1. Insert the medication when you are ready for bed and lying down and will stay lying down for several hours (after your last trip to the bathroom, kitchen, etc.).

TABLE 15-3 Primary Treatment Guidelines for Genital Tract Infections

Recommended Regimen*	Treatment During Pregnancy	Evaluation/ Treatment of Sex Partner	Note**
Candidsasis (Monilia; Yeast) Topically applied azole drugs: see Note butoconazole (Femstat; Gynazole-1) clotrimazole (Gyne-Lotrimin; Mycelex) miconazole (Monistat) tioconazole (Monistat1; Vagistat-1) terconazole (Terazol) as intravaginal cream or ointment, vaginal tablets, or vaginal suppositories × 1, 3, or 7 days depending on dosage fluconazole (Diflucon) 150 mg po in a single dose	Yes, see Note	No	Over the counter formulations are available. Butoconazole cream, clotrimazole cream, miconazole cream and vaginal suppositories, tioconazole ointment, and terconazole vaginal suppositories are oil based and may weaken latex condoms, cervical caps, or diaphragms. Pregnancy: Only 7-day topical azole therapies are recommended. Do not use oral medications.
Bacterial Vaginosis (BV) metronidazole (Flagyl) 500 mg po BID × 7 days or, metronidazole gel 0.75%, one full applicator (5 g) intravaginally QD × 5 days or, clindamycin (Cleocin) cream 2%, one full applicator (5 g) intravaginally hs × 7 days or, alternatively (less efficacious), metronidazole 2 g po in a single dose or, clindamycin 300 mg po BID × 7 days *Pregnancy Regimen* metronidazole 250 mg po TID × 7 days or, clindamycin 300 mg po BID × 7 days	Yes, see *Pregnancy Regimen* and Note	No	Instruct woman to avoid alcohol during and for 24 hours after treatment with metronidazole. Clindamycin cream is oil based and may weaken latex condoms, cervical caps, or diaphragms. *The use of clindamycin vaginal cream during pregnancy is not recommended*; some experts prefer the use of systemic therapy for low-risk pregnant women to treat possible subclinical upper genital tract infections; no long-term maintenance regimen with any therapeutic agent is recommended. TOC unnecessary if asymptomatic after treatment or reinfection is not suspected *except* for pregnant women high risk for preterm delivery who should be reevaluated one month after completion of treatment.
Trichomoniasis metronidazole (Flagyl) 2 g po in a single dose or alternatively, 500 mg BID × 7 days	Yes, see Note	Yes	Instruct woman to avoid alcohol during and for 24 hours after treatment. TOC unnecessary if asymptomatic after treatment or reinfection is not suspected. Pregnant women can be treated with the single dose regimen; *metronidazole is secreted in breast milk; use single-dose therapy and discontinue breastfeeding for 12–24 hours* to allow excretion of dose.†
Chlamydia azithromycin (Zithromax) 1 g po in a single dose or, doxycycline 100 mg po BID × 7 days *Pregnancy Regimen* erythromycin base 500 mg po QID × 7 days or, if erythromycin cannot be tolerated, amoxicillin 500 mg po TID × 7 days	Yes, see *Pregnancy Regimen* and Note	Yes	Treat presumptively for chlamydia if woman has gonorrhea because of high incidence of coexisting infection. Instruct woman to abstain from sexual intercourse for 7 days and until all sex partners are cured. TOC unnecessary if asymptomatic after treatment or reinfection is not suspected, unless there was an earlier recent infection or the woman is pregnant. *Doxycycline is contraindicated in pregnancy; erythromycin estolate is contraindicated during pregnancy*. The pregnancy regimen is not as efficacious; retest 3 weeks after completion of regimen.

TABLE 15-3 Primary Treatment Guidelines for Genital Tract Infections (continued)

Recommended Regimen*	Treatment During Pregnancy	Evaluation/ Treatment of Sex Partner	Note**
Gonorrhea (uncomplicated) cefixime (Suprax) 400 mg po in a single dose or, ceftriaxone (Rocephin) 125 mg IM in a single dose or, ciprofloxacin (Cipro) 500 mg po in a single dose or, ofloxacin (Floxin) 400 mg po in a single dose or, levofloxacin (Levaquin) 250 mg po in a single dose PLUS (for treatment of chlamydia if not ruled out) azithromycin 1 g po in a single dose or, doxycycline 100 mg po BID × 7 days *Pregnancy Regimen* Treat with cephalosporin (cefixime, ceftriaxone) or, if unable to tolerate a cephalosporin, spectinomycin 2 g IM in a single dose	Yes, see *Pregnancy Regimen* and Note	Yes	Dual therapy treating both gonorrhea and chlamydia is recommended. May use 1% lidocaine solution as a dilutant to reduce pain of injection. TOC unnecessary if asymptomatic after treatment or reinfection is not suspected. *Quinolones (ciprofloxacin, ofloxacin, and levofloxacin) are contraindicated for pregnant women.*
Pelvic Inflammatory Disease (PID) *Regimen A* ofloxacin 400 mg po BID × 14 days or, levofloxacin 500 mg po BID × 14 days with or without metronidazole 500 mg po BID × 14 days *Regimen B* ceftriaxone 250 mg IM or, cefoxitin (Mefoxin) 2 g IM *plus* probenecid 1 g po in a single dose concurrently or, other parenteral third-generation cephalosporin (e.g., ceftizoxime [Cefizox] or cefotaxime [Claforan]) *plus* (for both options in Regimen B) doxycycline 100 mg po BID × 14 days with or without	Yes, see Note	Yes	Treat empirically in presence of cervical motion tenderness or uterine adnexal tenderness and no other cause of pain. *Pregnancy:* hospitalize for parenteral antibiotics; contraindicated for ofloxacin, levofloxacin, and doxycycline. Treatment of sexual partner(s) during 60 days preceding woman's symptoms imperative to prevent reinfection.
Genital Herpes Simplex Virus (HSV) *First Clinical Episode:* acyclovir (Zovirax) 400 mg po TID × 7–10 days or, acyclovir 200 mg po 5 times a day × 7–10 days or, famciclovir (Famvir) 250 mg po TID × 7–10 days or, valacyclovir (Valtrex) 1 g po BID × 7–10 days	Yes, see Note	Yes, for evaluation and counseling; treatment if symptomatic	There is no cure for HSV. Instruct patient to henceforth use condoms for every sexual exposure. Antiviral therapy is not recommended for women without clinical manifestations of infection. Topical acyclovir therapy is substantially less effective and its use is discouraged. Suppressive therapy does not totally eliminate viral shedding or the potential for transmission although it does reduce the frequency of recurrences; discontinue acyclovir after 1 year of continuous suppres-

TABLE 15-3 Primary Treatment Guidelines for Genital Tract Infections (continued)

Recommended Regimen*	Treatment During Pregnancy	Evaluation/ Treatment of Sex Partner	Note**
Genital Herpes Simplex Virus (HSV) (cont.) *Episodic Recurrent Infection:* acyclovir 400 mg po TID × 5 days or, acyclovir 200 mg po 5 times a day × 5 days or, acyclovir 800 mg po BID × 5 days or, famciclovir 125 mg po BID × 5 days or, valacyclovir 500 mg po BID × 3–5 days or, valacyclovir 1 g po QD × 5 days *Daily Suppressive Therapy:* acyclovir 400 mg po BID or, famciclovir 250 mg po BID or, valacyclovir 500 mg po QD (less effective with very frequent recurrences) or, valacyclovir 1 g po QD			sive therapy to allow assessment of patient's rate of recurrent episodes. See CDC Guidelines for discussion of treatment of patients with genital herpes who are also HIV-infected. *Pregnancy:* Treat primary and nonprimary first episodes and recurrent episodes with acyclovir; may continue with suppressive therapy for duration of pregnancy; for women with history of genital herpes, may use suppressive therapy starting at 36 weeks to reduce potential of recurrence at term; systemic acyclovir crosses the placenta, is concentrated in amniotic fluid and breast milk, and reaches therapeutic levels in the fetus.
Human Papillomavirus (HPV) Genital Warts (condylomata acuminata) cryotherapy with liquid nitrogen (*external genital, vaginal, urethral meatus, anal warts*) or cryoprobe (*external genital warts only*) or, podofilox (Condylox) 0.5% solution or gel BID × 3 days then no treatment for 4 days. Repeat 7-day cycle as necessary for total of 4 cycles (*self-treatment for external genital warts only*) or, imiquimod (Aldara) 5% cream three times a week up to 16 weeks. Wash area with mild soap and water 6–10 hours after application (*self-treatment for external genital warts only*) or, podophyllin 10–25% in compound tincture of benzoin. Air dry. Wash off in 1–4 hours. Repeat weekly if necessary (*external genital, urethral meatus warts*) or, trichloroacetic acid (TCA) or bichloroacetic acid (BCA) 80–90%. Apply sparingly. Dry. Repeat weekly if necessary (*external genital, vaginal, anal warts*)	Yes, see Note	No	*Podofilox, imiquimod, and podophyllin should not be used during pregnancy*. When using TCA, BCA, or podophyllin, protect the adjacent tissue with petroleum. When using podophyllin, be sure it is dry before contact with clothing. When using TCA or BCA be sure it is dry before woman sits or stands; powder with talc or sodium bicarbonate (baking soda) after treatment to remove unreacted acid and counteract any sensation of burning. Treat any vaginal or cervical infection. Emphasize careful cleaning and dryness of warts and surrounding area to woman. Presence of genital warts is not an indication for cervical colposcopy.

TABLE 15-3 Primary Treatment Guidelines for Genital Tract Infections (continued)

Recommended Regimen*	Treatment During Pregnancy	Evaluation/ Treatment of Sex Partner	Note**
Syphilis (primary, seconday, early latent) benzathine penicillin G, 2.4 million units IM in a single dose or, if allergic to penicillin and *not pregnant*, doxycycline 100 mg po BID × 14 days or, tetracycline 500 mg po QID × 14 days	Yes, see Note	Yes	Test all patients with syphilis for HIV infection. Reexamine clinically and with titers at 6 and 12 months (also at 24 months for latent syphilis), expect a fourfold decrease. Pregnant women who have primary, secondary, or early latent syphilis may have a second dose of benzathine penicillin G, 2.4 million units IM 1 week after the initial dose, *doxycycline and tetracycline are contraindicated in pregnancy*; pregnant women who are allergic to penicillin should be treated with penicillin after desensitization.
Syphilis (late latent, latent of unknown duration, or tertiary) benzathine penicillin G, 7.2 million units, administered in three doses of 2.4 million units IM each, at 1 week intervals or, if allergic to penicillin and *not pregnant*, doxycycline 100 mg po BID × 28 days or,	Yes, see Note	Yes	

* From CDC STD Treatment Guidelines, 2002 [8].

** Also see text.

TOC, test-of-cure; po, orally; QD, once daily; BID, twice daily; TID, three times daily; QID, four times daily; hs, at bedtime; IM, intramuscularly.

2. Use a small towel under your buttocks to catch drainage.
3. Use a panty liner during the day.
4. Use all medication as prescribed, even if symptoms subside.
5. Wear only cotton underwear for symptomatic relief.
6. Avoid tight-fitting clothing; loose clothing will increase air circulation for symptomatic relief.
7. Do not douche with feminine hygiene products.
8. Do not use tampons during treatment.
9. Use condoms or abstain from sexual intercourse during treatment.
10. Make an appointment for your next visit.

Many women know from experience when they have a monilial infection. Some women prefer to use plain yogurt douches or an intravaginal applicatorful of yogurt twice a day for 1 week. Other self-help remedies have been used, with unknown effectiveness.

Bacterial Vaginosis

Bacterial vaginosis (BV) has been known in preceding years as *Gardnerella vaginalis* vaginitis, *Haemophilus vaginalis* vaginitis, *Corynebacterium vaginale* vaginitis, and nonspecific vaginitis. The name changes reflect the various anaerobic organisms that have been found through the years and held responsible for this vaginal infection. Bacterial vaginosis is the result of a major change in vaginal flora from a predominance of *Lactobacillus* to a predominant mixture of anaerobic bacteria, including those mentioned above and *Mobiluncus*, with a lack of lactobacilli. These organisms also cause an increase in vaginal pH to between 5.0 and 6.0. Vaginitis, by definition, is an inflammation of the vagina. Since this vaginal infection does not

cause an inflammation, the term *vaginosis* is used instead.

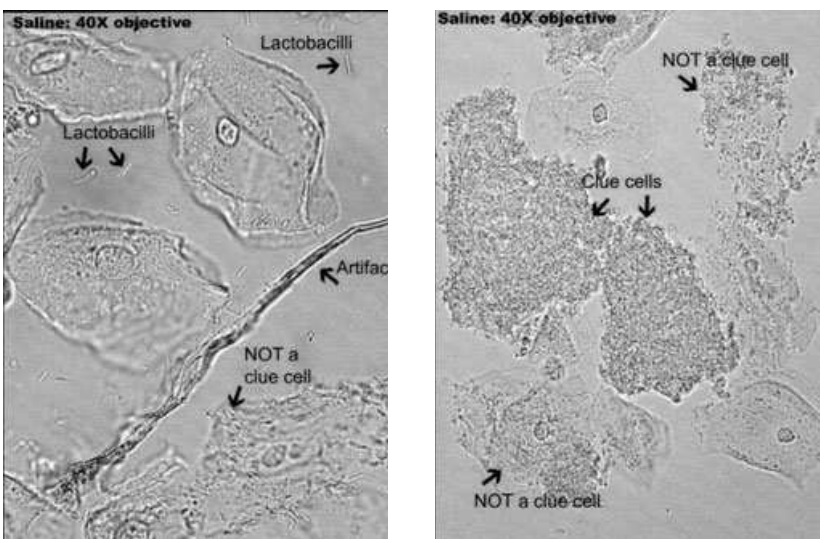
Bacterial vaginosis has been implicated with pelvic inflammatory disease, endometritis, and vaginal cuff cellulitis after invasive procedures including IUD insertion, endometrial biopsy, and therapeutic abortion. Women who have bacterial vaginosis during pregnancy are in special need of treatment as BV has been implicated in premature rupture of membranes, preterm labor, preterm birth, postpartum endometritis, and wound infection after cesarean section [8].

The clinical picture of bacterial vaginosis includes the increased pH; scanty, thin, homogeneous, milky, gray or white, malodorous discharge; and a positive "whiff" test. The pH can be tested with Nitrazine paper and a sample of discharge from the speculum. Discharge on your gloved fingers should not be tested, especially if you have used a lubricant, which may raise the pH. The discharge may be copious, and upon occasion there is vaginal irritation, pruritus, and burning and pain of the vulva, although these are usually absent. The woman may have noticed a "fishy" odor. The "whiff" test is done by adding a drop of 10% KOH to a specimen of the discharge, which releases amines and a potent "fishy" odor.

Microscopic examination reveals clue cells, a lack of lactobacilli, and very few white blood cells. The normal epithelial cell is translucent and has a clearly demarcated border. A clue cell is a desquamated epithelial cell with adherent bacteria. The bacteria appear as little black dots, which obscure the border of the cell, making it indistinct or jagged. This gives the cell a granular or speckled appearance (see Figure 15-2). However, up to 40 percent of women with bacterial vaginosis will not have clue cells [10, p. 775]. Culture is not a recommended diagnostic tool because it is not specific and Pap smears are not diagnostic because they have low sensitivity for bacterial vaginosis [8].

Diagnosis, thus, must be based on a combination of the symptoms and microscopic evidence and the ruling out of other vaginal infections. (For example, *Trichomonas* can also increase the pH and produce a fishy odor, although not as pronounced. A *Trichomonas* infection, however, is highly pruritic with vulvovaginal irritation, and trichomonads are present in the discharge.) Diagnosis and treatment of any sexual partners is not indicated for bacterial vaginosis.

The most effective treatment of bacterial vaginosis is with metronidazole (Flagyl) (see Table 15-3). Dosage is either 2 g po for one dose, or 500 mg po BID for 7 days (which offers the highest cure rate and is the recommended regimen of the Centers for Disease Control and Prevention [8]), or 250 mg po TID for 7 days. Metronidazole also comes in a



(a) (b)

FIGURE 15-2 Microscopic diagnosis of bacterial vaginosis (BV). (a) no BV; note normal epithelial cells and presence of lactobacilli, (b) BV; note clue cells and lack of lactobacilli.

Source: Used with permission from Washington State Department of Health STD/TB Program, Seattle STD/HIV Prevention Training Center, and Cindy Fennell, MS, MT, ASCP.

gel form, 0.75%; the typical dosage is one applicatorful intravaginally BID for 5 days. Multiple studies and meta-analyses indicate no significantly increased teratogenic risk with first trimester exposure to metronidazole [8, 11].

Clindamycin (Cleocin) 300 mg po BID for 7 days or clindamycin cream, 2% (Cleocin Vaginal Cream) (one applicatorful intravaginally hs for 7 days) can be given during the first trimester. Clindamycin cream is the preferred treatment, based on a general desire not to use systemic medications during the first trimester and to avoid possible gastrointestinal side effects. Pregnant women also can be treated with ampicillin (500 mg po QID for 7 days) or amoxicillin (500 mg po TID for 7 days); however, this treatment is only 50 to 60 percent effective and may cause *Candida* overgrowth. Clindamycin may also cause a *Candida* infection. Sulfa vaginal creams are palliative only and should not be given to women of Mediterranean or African origin or descent without first screening for G6PD. Because of the association of bacterial vaginosis with premature rupture of membranes, preterm labor/preterm delivery, and with postpartum endometritis, it is essential that it be effectively treated.

In addition to being told the etiology and course of the infection and being taught how to take the medication prescribed, the woman should receive the following instructions:

1. If taking metronidazole or using metronidazole gel, avoid alcohol intake during treatment and for 24 hours after completion of treatment.
2. If using clindamycin cream, do not use latex or rubber products such as condoms, diaphragms, or cervical caps during treatment and for 72 hours after completion of treatment. The oil base in clindamycin cream may weaken these products.
3. If using an intravaginal gel or cream,
   a. Insert the medication when you are ready for bed and lying down and will stay lying down for several hours (after your last trip to the bathroom, kitchen, etc.).
   b. Use a small towel under your buttocks to catch drainage.
   c. Use a panty liner during the day.
   d. Do not use tampons during treatment.
4. Use all medication as prescribed, even if symptoms subside.
5. Wear only cotton underwear for symptomatic relief.
6. Avoid tight-fitting clothing; loose clothing will increase air circulation for symptomatic relief.
7. Do not douche.
8. Do not use intravaginal yogurt or other commercial products of lactobacilli; they are ineffective and may contain contaminants potentially harmful to the vaginal microecosystem [12].
9. Make an appointment for your next visit.

Trichomonal Vaginitis (Trichomoniasis)

The causative organism for trichomonal vaginitis is *Trichomonas vaginalis*, a one-cell flagellated anaerobic protozoan. *Trichomonas* is primarily sexually transmitted. *Trichomonas* may coexist with other sexually transmitted infections, such as chlamydial and monilial infections. Up to 50 percent of women with gonorrhea also have trichomonal vaginitis [13].

Trichomonas presents clinically as a malodorous, copious, frothy or nonfrothy, thin or thick, white/yellow-green/gray discharge with pruritus. The odor may be "fishy," and a "whiff" test may be positive. The vagina may be inflamed, ecchymotic, erythematous, or excoriated. There may be a distinctive pattern of petechiae on the vaginal walls or cervix, a condition known as "strawberry patches" or "strawberry cervix." The woman may report dysuria, dyspareunia, or postcoital bleeding. Or the woman may be asymptomatic but harboring the parasite, which may be found in the bladder, urethra, Skene's glands, and Bartholin's glands, as well as the vagina and endocervix. Severe cases of *Trichomonas* can cause the woman great pelvic and lower abdominal pain with tender inguinal lymph nodes.

Definitive diagnosis is made by finding the motile trichomonads upon microscopic examination of the discharge. The trichomonad is pyriform or ovoid, with four anterior flagella and an undulating membrane. They are visible on a wet mount made with a mixture of discharge and normal saline (see Figure 15-3). The slide should be examined immediately while the trichomonads are alive, motile, and easy to identify. You should also check the woman's Pap smear report to see if *Trichomonas* was identified.

Treatment is with metronidazole (Flagyl) (see Table 15-3). The regimen recommended by the Centers for Disease Control and Prevention is 2 g po in a single dose; the alternative regimen is 500 mg BID for 7 days. Multiple studies and meta-analyses indicate no significantly increased teratogenic risk with first trimester exposure to metronidazole [8, 11]. Clotrimazole (Gyne-Lotrimin) vaginal cream (1 applicatorful intravaginally hs for 7 days) or metronidazole gel (1

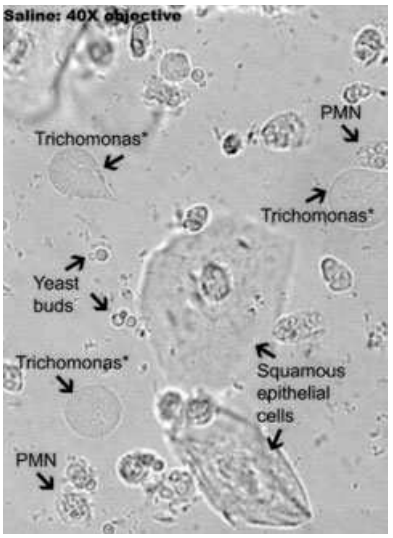


FIGURE 15-3 Trichomonads seen microscopically. Must be motile for identification.

Source: Used with permission from Washington State Department of Health STD/TB Program, Seattle STD/HIV Prevention Training Center, and Cindy Fennell, MS, MT, ASCP.

applicatorful intravaginally every day for 5 days) can be used for symptomatic relief but is not curative.

The woman's sexual partner should be simultaneously treated with metronidazole. Follow-up is not necessary if asymptomatic after treatment. The woman should be evaluated for coexisting gonorrhea, chlamydia, and syphilis.

The woman should be informed of the etiology and course of the infection and given the following instructions:

1. Avoid alcohol intake during treatment and for 24 hr after completion of treatment.
2. If breastfeeding, stop during treatment and for at least 24 hr after.
3. If taking the multiple-dose regimen, take all medication, even if symptoms subside.
4. Wear only cotton underwear for symptomatic relief.
5. Avoid tight-fitting clothing; loose clothing will increase air circulation for symptomatic relief.
6. Do not douche.
7. Do not have sexual relations until you and your partner have completed treatment and are without symptoms.
8. Make an appointment for your next visit.

Chlamydial Infections

Chlamydia trachomatis is the most prevalent sexually transmitted disease in the United States. There are several serotypes of human *Chlamydia trachomatis*, which cause trachoma, lymphogranuloma venereum (rare in the United States), and a number of urogenital infections that may be transmitted to the baby during delivery and result in ophthalmia neonatorum and chlamydial neonatal pneumonia. This discussion will be limited to the urogenital infections, which may, if the woman is pregnant, be transmitted to the baby at the time of delivery. A number of urogenital infections can occur, including endocervicitis, salpingitis, pelvic inflammatory disease, urethritis, cystitis, and postpartum infection. *Chlamydia trachomatis* is also implicated in infertility, ectopic pregnancy, premature rupture of the fetal membranes, and preterm labor/preterm delivery. *Chlamydia trachomatis* is often found coexisting with *Trichomonas* and *N. gonorrhoeae*.

Fifty percent of women infected with *Chlamydia trachomatis* are asymptomatic. This means that you will not be able to provide the woman with information she may want to know about when she became infected. Because of the widespread incidence and potential devastating effects of this infection, a cervical culture for chlamydia should be part of the annual physical examination of sexually active women and of the initial prenatal examination. There is an increased incidence of *Chlamydia trachomatis* in women using oral contraceptive pills, probably because the pills cause cervical ectopia, which makes the woman more vulnerable to a chlamydial infection.

Women with symptomatology will present with mucopurulent discharge from the cervix and an edematous, congested cervix with ectropy of the columnar epithelial cells (which line the endocervix). Unless there is a coexisting vaginal infection, there will not be vaginal symptomatology, because *Chlamydia trachomatis* does not infect squamous epithelial cells (which line the vaginal walls). A wet mount of the mucopurulent discharge will reveal a high number of white blood cells but only confirms there is an infection. Diagnosis is made by cervical culture, or by a variety of nonculture tests of cervical specimens including DNA probes or amplification, enzyme immunoassays (EIA), and polymerase chain reaction (PCR), or by either cervical or urine nucleic acid amplification tests. The nonculture cervical specimen tests have the advantages of being less expensive than cultures with more timely results, wider availability, and easier handling and processing [14]. The nucleic

acid amplification tests are more expensive than the DNA probe or EIA. DNA and RNA amplification tests have greater than 90 percent sensitivity and specificity. Culture has nearly 100 percent specificity and 80 percent sensitivity while the DNA probe and EIA are also high in specificity but only 60 to 65 percent in sensitivity [14]. Serologic tests are not recommended [10, p. 777].

Treatment is with antibiotics. The regimen recommended by the Centers for Disease Control and Prevention is either doxycycline 100 mg po BID for 7 days or azithromycin (Zithromax) 1 g po in a single dose (see Table 15-3). Doxycycline is contraindicated during pregnancy. Preliminary data suggest that azithromycin is both safe and effective during pregnancy [8], but the CDC does not yet recommend it for use in its pregnancy regimen. Instead, the recommended regimen for pregnant women is erythromycin base (500 mg po QID for 7 days), erythromycin ethylsuccinate (800 mg po QID for 7 days), or erythromycin ethylsuccinate (400 mg po QID for 14 days). Erythromycin estolate is contraindicated during pregnancy. If erythromycin cannot be tolerated, then use amoxicillin (500 mg po TID for 7 days). The Centers for Disease Control and Prevention recommend the presumptive treatment of chlamydia in patients who are being treated for gonorrhea because of the high incidence of coexisting infection [8, p. 36].

The most recent sexual partner should be seen, evaluated, and treated. If there is more than one sexual partner, then all partners the woman has had sexual contact with during the 60 days prior to the onset of symptoms or diagnosis should be evaluated, tested, and treated. The woman and all partners should abstain from sex until all sexual partners have completed treatment. Pregnant women should be retested 3 weeks after completing therapy as erythromycin is less efficacious. Also, gastrointestinal side effects might interfere with compliance in taking all the prescribed medication.

The woman should be informed of the etiology and course of the infection and the potential effects of the disease on her pregnancy and on the newborn if she is infected and is not treated while pregnant. She should be given the following instructions:

1. Complete all medication, even if you have no symptoms or your symptoms subside.
2. Do not have sexual relations until you and your partner have completed treatment and are without symptoms.
3. Make an appointment for your next visit.

Gonorrhea

Gonorrhea is a sexually transmitted disease caused by gram-negative intracellular diplococcal bacteria called *Neisseria gonorrhoeae*. A high incidence of women with gonorrhea also have coexisting chlamydia and, to a lesser extent, *Trichomonas*. Women with *N. gonorrhoeae* also should be screened for syphilis, as both have a high prevalence in the same risk populations. Infection may involve the urethra, Skene's glands, Bartholin's glands, vulva, vagina, cervix, endometrium, fallopian tubes, ovaries, peritoneum, rectum, conjunctiva of the eyes, oral mucosa, and joints (yielding gonococcal arthritis). In the female, the infection is most commonly found in the lower genital tract. It can cause pelvic inflammatory disease (PID) with resulting tubal scarring that can cause ectopic pregnancy or leave the woman infertile.

During pregnancy the adherence of the membranes to the decidua provides a barrier to ascending infection. However, if not treated or if treated inadequately, the infection will ascend rapidly after delivery, with resulting gonorrheal endometritis, salpingitis, oophoritis, and pelvic peritonitis. *N. gonorrhoeae* has also been implicated in premature rupture of the membranes and preterm labor/preterm birth. Failure to detect and treat gonorrhea in pregnant women also may result in neonatal gonorrheal ophthalmia, which may in turn cause blindness. For this reason, prophylactic treatment of the newborn's eyes shortly after birth with silver nitrate, erythromycin ophthalmic ointment, or tetracycline ophthalmic ointment is essential (and mandated in most states by law) to prevent gonococcal ophthalmia neonatorum.

Because of the asymptomatic start of a gonococcal infection, the prevalence of the disease, and the potentially devastating outcomes of this infection, a culture for *N. gonorrhoeae* should be included as a routine part of the annual physical examination of sexually active women and of the initial prenatal examination.

The common site of initial infection in women is in the lower genital tract. The woman is most often asymptomatic until the infection has ascended to the upper genital tract and she experiences the signs and symptoms of complications, such as pelvic inflammatory disease. She may have none, any, or all of the following:

1. lower abdominal pain
2. urethritis with tenderness, urinary frequency, and dysuria

3. expression of purulent discharge from Skene's or Bartholin's glands or the urethra
4. tenderness in the area of Skene's or Bartholin's glands (skenitis or bartholinitis)
5. acute PID (pelvic inflammatory disease) in the nonpregnant woman
6. a history of vaginal discharge, metrorrhagia, and menorrhagia
7. yellowish, purulent, or mucopurulent vaginal discharge

Diagnosis is either by culture or by DNA probe. Culture plates use Thayer-Martin medium, which must be at room temperature at the time of streaking the plate with a sample of the discharge and then immediately incubated. Refrigeration will kill the gonococci. Candle jars are used in some settings. Other settings use a transport medium, which is then recultured in the lab; but reculturing must occur within 3 hr of obtaining the specimen to avoid false negatives. While culture is the most sensitive and specific test for detecting gonorrhea, DNA probe also has a very high sensitivity and specificity. EIA are significantly lower in both sensitivity and specificity and serology is not sufficiently sensitive or specific for use [14].

Treatment for uncomplicated gonococcal infections is with the cephalosporin ceftriaxone (Rocephin) 125 mg IM in a single dose. Oral doses of cefixime (Suprax), ciprofloxacin (Cipro), ofloxacin (Floxin), or levofloxacin (Levaquin) may also be used. Cefixime does not provide equivalent sustained, high bactericidal levels in the blood. Quinolones (ciprofloxacin, ofloxacin, and levofloxacin) are contraindicated for pregnant women and for persons less than 18 years of age who weigh less than 45 kg (99 lbs). Ceftriaxone is expensive, and the injection is painful. Use of 1% lidocaine solution as a diluent may reduce the pain of the injection. If a pregnant woman cannot tolerate a cephalosporin, she should be treated with spectinomycin (2 g IM in a single dose). (See Table 15-3.)

Quinolones are not effective in the presence of quinolone-resistant gonorrhea. Quinolone-resistant gonorrhea is common in parts of Asia and the Pacific and has an increased prevalence in Hawaii and California. Therefore, quinolones (ciprofloxacin, ofloxacin, levofloxacin) are not recommended for treatment in Hawaii and California [8]. When a woman is positive for gonorrhea, a recent travel history should be obtained and correlated with her history of sexual intercourse to ensure an appropriate treatment is selected. Women who do not respond to treatment should have a culture and antimicrobial susceptibility done and her case reported to the local health department for purposes of surveillance of antimicrobial resistance [8].

All women with gonorrhea also should be treated for presumptive or diagnosed *Chlamydia trachomatis* infection, and a serology should be drawn to screen for syphilis.

The woman's most recent sexual partner should be seen, evaluated, and treated. If there is more than one sexual partner, then all partners the woman has had sexual contact with during the 60 days prior to the onset of symptoms or diagnosis should be evaluated, tested, and treated. The woman and all partners should abstain from sex until all sexual partners have completed treatment and no longer have symptoms. Follow-up for test of cure is not needed [8, p. 38]. Persistent infection is usually due to new infection or untreated chlamydia, but in their absence, and treated with a quinolone, quinolone-resistant gonorrhea must be suspected.

The woman should be informed of the etiology and course of the infection and the potential effects of the disease on her pregnancy, her postpartum recovery, and the newborn if she is infected and is not treated while pregnant. The midwife should review and discuss the woman's sexual practices, including number of partners and use of condoms. The need for her to contact and refer her sexual partner(s) for evaluation and treatment should be discussed. The woman should be instructed to abstain from sexual relations until she and her partner(s) have completed treatment and are without symptoms. Finally, she should make an appointment for her next visit.

Syphilis

Syphilis is a sexually transmitted disease caused by the spirochete *Treponema pallidum*. The disease progresses through four stages: primary, secondary, latent (early and late), and tertiary. Central nervous system disease (neurosyphilis) can occur during any stage of syphilis. The disease is transmitted through the placenta to the fetus of a woman in any stage of syphilis. Forty percent of women with untreated syphilis experience fetal or neonatal loss due to spontaneous abortion, stillbirth, or perinatal death. Another 40 percent of women give birth to babies with congenital syphilis. Congenital syphilis is a destructive disease with effects ranging from crippling lesions in the internal organs and long bones to death. The placenta of a syphilitic fetus is abnormally large and heavy with a pale yellowish-gray color. Coexisting infection with HIV is common,

and women with syphilis should be tested for HIV. The midwife should inform the consulting physician of any clinical or laboratory findings indicative of syphilis for further evaluation, treatment, and collaborative management of this disease.

Primary syphilis is characterized by a chancre, a primary ulcerous lesion, at the site of infection. It is usually single, filled with spirochete-laden purulent discharge, and highly infectious. The chancre begins as a painless papule that then erodes and becomes well demarcated with induration of the base and circumference. It appears approximately 10 to 90 days after infection and in women is more common in the genital area, on the clitoris, labia, fourchette, vulva, or cervix. Since the chancre is usually painless and heals spontaneously in two to eight weeks, it may be missed. There may be associated adenopathy. Antibody response is not measurable for three to six weeks after infection, so it is possible for a woman to have a chancre and test negative for syphilis. The antibody response, however, will be present by the time the chancre has healed.

The manifestations of secondary syphilis appear anywhere from four weeks to six months after infection (the average time is six to twelve weeks). It is possible for the rash of secondary syphilis to appear while the lesion of primary syphilis is still present. Manifestations of secondary syphilis include the characteristic papular rash of the palms of the hands and soles of the feet; patchy alopecia of head hair, eyebrows, and eyelashes; condylomata lata on the vulva or perineum; lesions of the mucous membranes, especially around the mouth; and symptoms of a systemic illness: low-grade fever, sore throat, hoarseness, malaise, headache, anorexia, and generalized adenopathy. Condylomata lata are highly contagious, flat, moist, wartlike lesions that should not be confused with the condylomata acuminata of HPV (human papillomavirus). The manifestations of secondary syphilis heal themselves within two to ten weeks, even if they are untreated. If untreated, the skin rash may recur, with less potency with each recurrence, during the next two years. High levels of antibodies are present during secondary syphilis.

Latent syphilis has no clinical manifestations. Early latent syphilis is the period of one year from the time of having acquired syphilis. Late latent syphilis is after one year of acquiring syphilis, during which the woman is seroactive but there is no evidence of the disease (i.e., no recurrence of secondary syphilis); late latent syphilis continues in the untreated woman until tertiary syphilis develops.

Tertiary syphilis can appear anywhere from one or two years after infection to 30 years or more later. It is associated with high morbidity and mortality and takes two forms: gumma and cardiovascular syphilis. Gumma are soft tissue granuloma tumors, which occur most frequently in the liver but may also occur in the brain, heart, bone, and skin. When a granuloma bursts, an ulcer forms that is painless but slow to heal and destructive of the organ and bone. Cardiovascular syphilis may result in aortic valve disease, aortic aneurysm, and coronary artery disease.

Neurosyphilis can occur in any stage of syphilis. Clinical symptoms of central nervous system disease (e.g., cranial nerve palsies, personality changes, ophthalmic or auditory symptoms, loss of reflexes) warrant examination of the cerebrospinal fluid. The disease may also present as acute syphilitic meningitis, syphilis of the spinal cord, vascular neurosyphilis, or syphilitic eye disease.

Diagnosis of syphilis depends on the stage the disease is in. The definitive methods for diagnosing primary syphilis are darkfield examination, in which the *Treponema pallidum* spirochetes are observed, and direct fluorescent antibody tests of exudate or tissue from the chancre. Screening tests follow a two-step process. First are the nontreponemal serologic tests, which demonstrate the presence of reagin (antibodies to nontreponemal phospholipid antigens) in serum. The most common are the VDRL (Venereal Disease Research Laboratory) and the RPR (rapid plasma reagin) tests. If the VDRL or RPR is positive (reactive), treponemal testing should be done; usually the FTA-ABS (fluorescent treponemal antibody absorbed) test, which uses treponemal antigens and is more specific, is preferred. If the FTA-ABS is also positive (reactive), the woman should be treated. If the VDRL or RPR is reactive and the FTA-ABS is nonreactive, the woman's history should be scrutinized for exposure to syphilis and signs of the disease. The many other conditions that would make the VDRL or RPR a false positive (such as acute bacterial or viral infections including infectious mononucleosis, leprosy, or malaria; rheumatoid arthritis; intravenous drug use; and collagen vascular disease, to name a few) should be investigated, and the tests should be repeated in a month. Because the nontreponemal tests can be serially quantified, they are also used to help identify the stage of syphilis or degree of disease activity; to ascertain new or previously treated disease (in addition to a careful history and documentation of treatment); and to determine adequacy of treat-

ment. Current infection is characterized by a fourfold increase in titer or a high titer; previously treated infection is characterized by a low titer that does not increase. Adequate treatment would show a fourfold decrease in titers. The same test (VDRL or RPR) should be used in serial testing. Although equally valid, RPR titers are often slightly higher than VDRL titers and the quantitative results from these two tests cannot be compared directly [8].

The treponemal tests cannot be used to measure the stage of syphilis, degree of disease activity, or adequacy of treatment, because once a woman tests positive, she is most likely to test positive for life. Pregnant women should be tested at their first prenatal visit and again at 28 weeks, as it is possible to have had primary syphilis at the time of the first testing and to have tested negative (see above). They also could have acquired syphilis since their first prenatal visit and not have noticed symptomatology. If a woman is diagnosed and treated for gonorrhea, chlamydia, or condylomata acuminata, she should be tested again for syphilis because of the frequency of coexisting infections. (Some clinicians would also include trichomoniasis and new cases of herpes simplex virus in this list for retesting for syphilis.) The woman should be tested again at the time of labor and delivery; this test also screens for syphilis in the baby and is preferable to testing cord blood, which can yield false negatives. Some states mandate that women be tested at the time of delivery.

Treatment of syphilis has the double goal of prevention of transmission and prevention of progression of the disease. In pregnant women, treatment includes prevention of transmission to the fetus, so that the baby will not be born with congenital syphilis. Because congenital syphilis is such a terrible disease, the possibility of a Jarisch-Herxheimer reaction to the treatment (with the possible effect of preterm labor, fetal distress, or, in rare instances, stillbirth) is not considered a reason to forgo or to delay treatment. Jarisch-Herxheimer reaction occurs within a few hours of treatment. It is an acute febrile reaction with headache and myalgia that lasts 12 to 24 hours. Congenital syphilis is a worse outcome, and the only way to prevent it is by treatment as soon as possible.

The preferred drug for treatment of all stages of syphilis is parenteral penicillin G. The preparation used, dosage, and length of treatment depend on the stage and clinical manifestations of the disease. Parenteral penicillin G is the only drug considered effective for syphilis during pregnancy. Tetracycline and doxycycline (used in nonpregnant women who are allergic to penicillin) are contraindicated during pregnancy, and erythromycin will not cure an infected fetus. The advice of the Centers for Disease Control and Prevention regarding pregnant women who are allergic to penicillin is to desensitize them and then treat them with the penicillin [8, p. 19]. The desensitization process and subsequent treatment with penicillin take several hours and should take place only under controlled circumstances in the hospital with emergency equipment ready.

The following treatment schedules are those recommended by the Centers for Disease Control and Prevention and are the same for both pregnant and nonpregnant women. See also Table 15-3. The treatment schedules are in accord with the stage of syphilis [8, pp. 20–23]:

Primary, Secondary, and Early Latent Syphilis

Benzathine penicillin G, 2.4 million units IM in a single dose

For pregnant women, a second dose of benzathine penicillin G, 2.4 million units IM 1 week after the initial dose (according to some experts)

For nonpregnant women who are allergic to penicillin, doxycycline 100 mg po BID for 14 days or tetracycline 500 mg po QID for 14 days

Late Latent Syphilis, Latent Syphilis of Unknown Duration, and Tertiary Syphilis

Benzathine penicillin G, 7.2 million units, administered in three doses of 2.4 million units IM each, at 1-week intervals

For nonpregnant women who are allergic to penicillin, doxycycline 100 mg po BID for 28 days or tetracycline 500 mg po QID for 28 days

Women with neurosyphilis require even larger doses of penicillin involving either intravenous or IM injections daily for 10 to 14 days.

Both clinical and serologic testing follow-up is imperative. For nonpregnant women treated for primary or secondary syphilis, this means clinical and serologic evaluation at 6 and 12 months postreatment with the expectation of a fourfold decrease in quantitative nontreponemal serologic test titers within six months after therapy. For nonpregnant women treated for early latent, late latent, or latent syphilis of unknown duration, follow-up testing is at 6, 12, and 24 months with the expectation of a fourfold decrease in quantitative nontreponemal serologic test titers within 12 to 24 months after therapy. For a pregnant woman with syphilis,

serologic titers may be checked monthly if she is at high risk for reinfection, but should be checked at least in the third trimester and at the time of labor and birth. Most likely, a woman will give birth before her serologic response to treatment can be definitively assessed [8]. The pediatric health care provider should be notified of the mother's diagnosis, treatment, and titers.

It is also imperative to follow up with the woman's sexual partner(s). Determination of the partners' risk for syphilis is based on when the contact was in relation to the woman's stage of disease and the duration of her symptoms (i.e., three months plus duration of symptoms for primary syphilis, six months plus duration of symptoms for secondary syphilis, and one year for early latent syphilis). Partners exposed within the preceding 90 days could be infected and be seronegative, so they should be treated presumptively even if they are seronegative at the time of evaluation. Partners exposed more than 90 days before diagnosis should also be treated presumptively if test results are not immediately available or opportunity for follow-up or compliance is uncertain.

The woman should be informed of the etiology and course of the infection, the effects of the disease on her baby if she is infected and is not treated while pregnant, and the need for notification of her sexual partner(s). She should be instructed not to have sexual relations until she and her partner(s) have been treated and titers indicate adequacy of treatment. She should be taught the signs and symptoms of primary, secondary, and tertiary syphilis and the signs and symptoms of Jarisch-Herxheimer reaction, which is common when women with early syphilis are treated. In pregnant women, it may also induce preterm labor or cause fetal distress. If the woman is pregnant when treated, she should be taught the signs and symptoms of preterm labor, how to do fetal movement counts, and when to call the midwife. Finally, the woman should be given the schedule of follow-up visits for clinical and serologic evaluation.

Genital Herpes Simplex Virus (HSV)

Herpes simplex virus has two serotypes: HSV-1 and HSV-2. HSV-1 is usually associated with oral herpes; HSV-2 is usually associated with genital herpes. However, it is not uncommon to find HSV-1 as the causative organism in genital herpes infection, most likely as a consequence of oral-genital sexual practices. HSV-1 causes up to 30 percent of first-episode cases of genital herpes. The difference is that recurrences are much less frequent for genital HSV-1 infection than for genital HSV-2 infection [8, p. 13]. This affects prognosis and counseling. After invasion of the body, HSV resides in a latent state in nervous system ganglia. HSV lesions are common in women with HIV infection [8, p. 16].

HSV is transmitted to the baby in approximately 50 percent of vaginal deliveries by mothers with an active infection. Transmission of the infection during delivery may result in neonatal death (in approximately 60 percent of those infected) or severe central nervous system or ocular damage. The baby may also contract HSV through an ascending infection if the membranes rupture or through close contact with an infected mother or care provider after birth.

It is not possible to distinguish clinically between the lesions of HSV-1 and HSV-2. The classifications of primary first episode and nonprimary first episode refer to whether there has been a previous asymptomatic infection. A primary first episode is much more severe; recurrences are much less severe.

Symptomatic primary first episodes last about three weeks. After an incubation period of 3 to 6 days, a large number of thin-walled vesicles occur singly or in clusters over the genital area, ulcerate, crust over, and undergo reepithelialization. They may become secondarily infected. Specific ulcers, diffuse inflammation, and friability may be noted over the cervix and vaginal walls. There may be a vaginal or urethral discharge. The vulvar lesions are extremely painful, and there may be pruritus and severe edema. Systemic symptoms of fever, malaise, headache, and myalgias start early after the onset of the lesions and last about a week. There is usually very tender inguinal lymphadenopathy. This clinical picture is evident in about one-third of women with newly acquired genital HSV-2 infection. The other two-thirds of primary first episodes are either asymptomatic or mild.

Recurrent episodes are about half as long as primary episodes, with fewer vesicles, no systemic symptoms, and no inguinal lymphadenopathy but do result in viral shedding. Recurring episodes usually are caused by reactivation of latent virus rather than a new infection. The latent virus that causes the eruption of a recurrent episode may come from a single ganglion, which would account for the common unilateral distribution of the lesions. The pain and itching are generally less severe. Recurrence is more likely with a more severe primary first episode and with HSV-2. There is no pat-

tern of recurrence either in general or for an individual woman. What triggers a recurrence is not known but may be associated with emotional stress; trauma; anesthesia; hormonal changes of menstruation, pregnancy, or oral contraceptive use; heat; moisture; fever; or climate changes. About half of infected women have prodromal signs of an impending recurrence consisting of itching, a tingling sensation, neuralgia, vulvar pain or burning, or increased vaginal discharge (heavy, clear, sticky, nonodorous) if the cervix or vaginal wall is involved, a few hours to a few days before eruption. Some women have the prodrome without eruption of lesions.

Because the clinical picture varies so much, a clinical diagnosis of genital herpes should be confirmed by laboratory testing. It is also important not to misdiagnose benign conditions of the genitals such as pimples, infected hair follicles, or nabothian cysts. Lesions are opened and cultured with a specific commercially prepared medium. The sensitivity of this virologic cell culture test declines rapidly as lesions begin to heal and false-negative results are common. Cervical Pap smears are even less sensitive and neither they nor the culture should be relied upon for diagnosis [8]. A negative culture or a negative smear does not rule out the disease. Type-specific serologic tests, although not 100 percent sensitive or specific, are more useful in either confirming a clinical diagnosis of genital herpes or diagnosing a woman who is asymptomatic. The most accurate tests are those that are based on the HSV-specific glycoproteins G1 and G2 for diagnosis of HSV-1 and HSV-2, respectively. The type-specific gG-based assays should be specifically requested for serologic testing [8].

There is no cure for HSV and antiviral therapy is not recommended for women without clinical manifestations of infection. Systemic acyclovir (Zovirax) (200 mg po five times a day for 7 to 10 days or until clinical resolution is attained) will reduce symptoms of a first clinical episode but has no effect on recurring infections or on the frequency and severity of recurrences once the drug is discontinued. Topical acyclovir is substantially less effective than the systemic treatment. Oral and intravenous acyclovir cross the placenta, is concentrated in amniotic fluid and breast milk, and reach therapeutic levels in the fetus [15]. (See Table 15-3 for medication regimens for first clinical episodes, recurrent episodes, and suppressive therapy.)

After the first clinical episode is over, a discussion should be held with the woman about future antiviral therapy for recurrent episodes. There are two options: episodic therapy or suppressive therapy. Episodic therapy reduces the severity of the pain and shortens the duration of the lesions. In order to be effective, episodic therapy must be initiated during the preceding prodrome or with the first day of lesions. For this reason, the midwife should provide the woman with a prescription and instructions to start treatment immediately when symptoms begin. Suppressive therapy reduces the frequency of recurrent genital herpes by 70 to 80 percent and improves the quality of life as long as the woman is on the drug. Women should discontinue suppressive therapy after a year to ascertain their natural frequency of recurrence as this decreases over time. Viral shedding is reduced but not eliminated with suppressive therapy.

There may be viral shedding and transmission of HSV even when the woman is asymptomatic. Since 70 percent of neonatal infection occurs without a maternal history of HSV infection and HSV has occurred in approximately 10 percent of babies delivered by cesarean section in which the membranes were intact, weekly testing of women with known HSV infection is not justified. The following management is suggested for various situations during pregnancy, labor, and birth [8, 15, 16]:

woman acquires genital herpes during first half of pregnancy: higher risk of transmission of herpes to her baby; avoid invasive transcervical procedures until lesions have healed; treat with acyclovir; some experts suggest continuing with suppressive therapy for duration of pregnancy; examine closely for recurrence of lesions or experiencing prodrome at time of labor and birth; may deliver vaginally if no lesions or prodrome.

woman acquires genital herpes in late pregnancy: baby is at high risk for herpes; avoid transcervical invasive procedures; may be treated with acyclovir; birth is by cesarean section.

woman has history of genital herpes: some experts advocate suppressive therapy with acyclovir starting at 36 weeks' gestation to reduce the frequency of recurrence at term; if no lesions or prodrome at time of labor and birth, she may give birth vaginally—cesarean section is not warranted.

woman at term has active genital herpes lesions or symptoms of prodrome: birth is by cesarean section.

woman at term has active genital herpes and membranes rupture: immediate cesarean section.

woman with preterm rupture of membranes and active genital herpes: some experts advocate ex-

pectant management and treatment with acyclovir to gain the benefits of time and glucocorticoids; avoid invasive transcervical procedures; mode of birth depends on the presence of active lesions or prodrome at the time of birth.

woman has recurrent active herpes lesions in only nongenital areas of her body (e.g., buttock, thigh, foot): may deliver vaginally; cover lesions with an occlusive dressing prior to birth.

postpartum woman with active herpes: may breastfeed if no lesions on her breasts, otherwise contraindicated; attention to handwashing before handling her baby is vital.

The diagnosis of this chronic, painful sexually transmitted disease is shattering to women. Time should be taken by the midwife to help a woman through her initial reaction and beginning efforts to cope. In addition, the woman should be instructed not to douche, not to have sexual relations until reepithelialization has occurred, and to always use condoms during intercourse. She should also be given information on the following topics:

1. etiology and course of infection
2. recurrences and possible prodrome
3. effects of the disease (if the woman is pregnant) on the baby of a recurrence at the time of delivery; necessity for cesarean section in that case
4. importance of informing obstetric health care providers that she has HSV infection
5. importance of telling her sexual partner(s) and future sexual partner(s) that she has HSV infection
6. need for careful handwashing to prevent spread of virus to mouth or eyes, particularly when caring for a baby
7. comfort measures:
   a. Keep the lesions dry; use a hair dryer on the cool setting.
   b. Wear soft cotton underwear.
   c. Wear loose-fitting clothing.
   d. Use pain medication such as aspirin (except during pregnancy) to reduce inflammation and relieve pain.
   e. If she is having trouble walking, use topical analgesic ointment or spray.
8. need for annual Pap smears
9. referral to a support group, if desired
10. importance of making an appointment for her next visit

Sexual partners should be informed. Symptomatic partners should be evaluated and receive the same treatment (see Table 15-3). Asymptomatic sex partners should be offered type-specific serologic testing and instructed on how to recognize symptoms of herpes.

Condylomata Acuminata (Genital Warts; Venereal Warts)

Condylomata acuminata are caused by human papillomavirus (HPV). HPV infection is classified as clinical, subclinical, or latent. Condylomata acuminata represent the clinical manifestation of HPV, are most often caused by HPV types 6 and 11, and are the most common sexually transmitted viral disease. The incidence of condylomata acuminata is at least three times that of genital herpes simplex virus; one or more of the over 60 genotypes of HPV infect about one-third of the sexually active population [17]. Approximately 10 percent of these genotypes manifest themselves as condylomata or dysplasia.

HPV infection is associated, in concert with facilitating co-factors, with the development of cervical dysplasia that leads to premalignant and malignant epithelial lesions in the lower genital tract. Papillomaviruses are epitheliotropic viruses that infect the surface epithelia and mucous membranes. This infection produces warts and epithelial proliferations. Over 90 genotypes of HPVs have been identified, 21 of which occur predominantly or exclusively in the anogenital area. HPV types may be grouped according to their association with cancer, with HPV 6, 11, 42, 43, and 44 considered low-risk types; HPV 33, 35, 39, 40, 45, 51–56, and 58 considered medium- or intermediate-risk types; and HPV 16, 18, and 31 considered high-risk. Intermediate-risk and high-risk viruses are considered to have the potential to produce tumors, especially malignant tumors. HPV types 16 and 18 are most frequently associated with anogenital cancers. These viruses are found in approximately 60 to 95 percent of anogenital cancer tissue samples [18].

Less than 1 percent of women with HPV infection, however, develop cervical cancer. This means that HPV alone does not result in neoplastic cell changes. For cellular changes to occur with HPV infection, there must be additional co-factors such as smoking, history of sexually transmitted diseases, and more than three sexual partners over a lifetime.

Condylomata acuminata are seen in the vulvar, perineal, and perianal areas but may also be found attached to the vaginal walls, on the cervix, and in the urethra, anus, and mouth. The characteristic warts of condylomata acuminata may start as single

growths but usually come together in clumps that have a cauliflower appearance, with the head of the clump larger than the portion that attaches to the genitalia. Vaginal condylomata acuminata are also usually multiple, raised, and white and may bleed after sexual intercourse. Cervical condylomata acuminata may be single and flat and more difficult to distinguish from condylomata lata. There usually is an associated discharge, and the condition is exaggerated by untreated vaginitis/cervicitis. Women with condylomata acuminata should also be screened for syphilis, gonorrhea, chlamydia, trichomonas, and bacterial vaginosis.

Diagnosis is by gross observation and careful history and laboratory tests to rule out syphilitic condylomata lata. Condylomata acuminata frequently increase in size and number during pregnancy, perhaps stimulated by the leukorrhea of pregnancy, and regress after the woman gives birth. If birth occurs while condylomata are still present, care must be taken to avoid tearing or cutting into any of them because they may bleed excessively. The skill of the midwife in helping a woman give birth over an intact perineum decreases this risk. If an episiotomy absolutely must be cut, it is far better to cut an episiotomy in an unusual direction than to cut through condylomata acuminata. Extensive growth in the vagina and over the cervix may necessitate delivery by cesarean section because of dystocia. The pediatric health care provider should be notified when a baby is born vaginally to a woman with condylomata acuminata because these babies have an increased risk of developing laryngeal papillomatosis (vocal cord polyps). Cesarean section does not eliminate this risk. The presence of condylomata acuminata is not an indication for colposcopy as genital warts are not associated with the development of cervical cancer [8].

Treatment at all times is directed toward making the woman more comfortable and takes the form of attempts to eradicate the condyloma. Treatment during pregnancy is additionally directed toward reducing the possibility of the bulk of the condylomata acuminata complicating delivery. Treatments abound, but there is no guaranteed cure for condylomata acuminata or for HPV. Even surgical removal is followed by a high incidence of regrowth. As there is the possibility of spontaneous resolution of the warts and treatment is not without side effects, a woman may choose not to be treated.

The standard provider-administered topical treatment for external genital condylomata acuminata is a 10 to 25% solution of podophyllin in tincture of benzoin applied carefully to each wart without touching and chemically burning the surrounding tissue. You can protect the surrounding tissue by first covering it with petroleum, but be careful to not get the petroleum on the warts, which would render the treatment ineffective. If the condylomata acuminata are extensive, the treatment should be divided into weekly intervals so as not to trigger local and systemic side effects. The woman should wash the podophyllin off one to four hours after application. If she tolerates the initial treatment well with minimal inflammation and pain, then the solution can be left on for four to six hours with the next treatment. Podophyllin cannot be used for anal, vaginal, cervical, or oral condylomata acuminata, and is contraindicated in pregnancy. Possible systemic absorption is a concern.

The other standard topical treatment is trichloroacetic acid (TCA) or bichloroacetic acid (BCA) 80 to 90%, which can be used not only for external genital warts but also for vaginal and anal warts by both nonpregnant and pregnant women. Again, the surrounding skin should be protected to avoid burns. Apply sparingly and allow to dry before the woman sits or stands. The external layer of the warts turns white. Sodium bicarbonate can be used to counteract any burning the woman may feel from the treatment on the warts.

If topical treatment does not work, referral to your consulting physician for further evaluation and treatment such as cryotherapy, laser, or surgical removal may be indicated. As there is no evidence that reinfection plays a role in recurrence, there is no need to examine the sexual partner(s).

Any existing vaginal or cervical infection should be treated, and the moist environment created from the discharge should be reduced. Large clumps of external condylomata acuminata create hygienic and psychosocial-sexual difficulties. Vaginal discharge and feces may be entrapped in the clumps and cause a foul odor. Careful cleaning, a sitz bath after each bowel movement and when needed, and frequent change of cotton underwear will help promote cleanliness and dryness and help control the problem of odor. The aesthetics of having large, uncomfortable condylomata negatively affect the woman's self-image and sexual life.

The woman should be given information on the etiology and course of the infection, on the need to

discuss the infection with any sexual partner, and (if she is pregnant) on the possible effects of the infection on her giving birth and the baby. In addition, she should be given the following instructions:

1. Use condoms during sexual intercourse.
2. Do not engage in sexual intercourse during treatment.
3. Schedule annual Pap smears.
4. Comfort measures:
   a. Have any vaginal/cervical infections treated.
   b. Be sure to wash hands carefully.
   c. Be sure to clean carefully after bowel movements; use a sitz bath.
   d. Use a hair dryer on the cool setting to keep the area dry.
   e. Change cotton underwear frequently.
5. Make an appointment for her next visit.

Pelvic Inflammatory Disease

Pelvic inflammatory disease (PID) comprises any combination of endometritis, salpingitis, oophoritis, tubo-ovarian abscess, and pelvic peritonitis. The usual organisms involved in PID are *Neisseria gonorrhoeae* or *Chlamydia trachomatis* and perhaps the organisms involved in bacterial vaginosis. What starts out as a lower genital tract infection (vaginitis/cervicitis/urethritis/skenitis/bartholonitis) ascends, for a variety of reasons, past an altered cervical mucous barrier to become an upper genital tract infection. The cervical mucous barrier may be altered by menstruation or the influence of hormones. The ascension may be facilitated by douching, dilatation and curettage, and sperm. The ascension is first to the endometrium and then to the fallopian tubes, aided by sperm or by menstrual blood reflux. The inflammatory process in the tubes eventually leads to inflammation of the peritoneum [19].

Risk factors include exposure to *N. gonorrhoeae*, *Chlamydia trachomatis*, and bacterial vaginosis; multiple sexual partners; and douching practices. Diaphragms and cervical caps used with vaginal spermicides, and condoms decrease the risk of PID. The possible sequelae of PID include infertility due to tubal adhesions, ectopic pregnancy, chronic lower abdominal pain due to pelvic adhesions, and increased susceptibility to recurrence.

A woman may have very subtle symptoms of PID, so you must have a constant high suspicion level in order to diagnose it early in the infectious process. The earlier the diagnosis and treatment, the less severe the sequelae. An infected woman may experience lower abdominal pain, generally bilateral, which may or may not be severe. She most likely will have a vaginal/cervical mucopurulent discharge indicative of the infecting organism. If the urethra is involved, she will have the symptoms of urethritis: dysuria, frequency, and urgency. Metrorrhagia is a common symptom of endometritis. Fever above 101°F and nausea/vomiting are signs of clinical severity of the disease and reflect peritonitis. Upon pelvic examination you will find cervical motion tenderness, bilateral adnexal tenderness, and adnexal enlargement if the disease is well established in the fallopian tubes. Leukocytes will outnumber the epithelial cells in a wet mount. The woman will have an elevated erythrocyte sedimentation rate.

Midwives should treat empirically when a woman presents with cervical motion tenderness (CMT) or uterine/adnexal tenderness, there is no other cause for her pain (e.g., ectopic pregnancy; acute appendicitis), and she is sexually active. Prevention of long-term sequelae is linked with early treatment based on a presumptive diagnosis [8]. If the woman has an IUD, it should be removed either at the time of initiating antimicrobial treatment or shortly thereafter. Laboratory tests that document *N. gonorrhoeae* or *Chlamydia trachomatis*, leukocytosis, and an elevated sed rate increase the specificity of the diagnosis.

Hospitalization is indicated in the event of an uncertain diagnosis, suspected pelvic abscess, severity of symptoms including fever and nausea/vomiting, HIV, failed outpatient therapy, or pregnancy (in which case it is necessary to rule out ectopic pregnancy and outpatient therapy drugs are contraindicated). Treatment within the hospital is with intravenous broad-spectrum antimicrobial agents.

If the woman does not fall into the categories indicating need for hospitalization and it is the midwife's best judgment that the woman will comply with the regimen (including a clinical reevaluation within 72 hours), the midwife initiates outpatient treatment. Discussion with your consulting physician is appropriate if further evaluation by laparoscope or hospitalization or intravenous therapy are necessary. Following are the 2002 guidelines for outpatient treatment from the Centers for Disease Control and Prevention [8]. Treatment of PID has to cover both of the likely pathogens, *N. gonorrhoeae* and *Chlamydia trachomatis*, plus the other

possibilities, such as anaerobic bacteria. Negative endocervical screening does not preclude infection in the upper genital tract [10].

Regimen A

ofloxacin 400 mg po BID × 14 days, **or**
levofloxacin 500 mg po BID × 14 days, **with or without**
metronidazole 500 mg po BID × 14 days

Regimen B

cefoxitin 2 g IM plus probenecid 1 g po in a single dose concurrently, **or**
ceftriaxone 250 mg IM, **or**
Other parenteral third-generation cephalosporin (e.g., ceftizoxime or cefotaxime), **plus** (**for both options in Regimen B**)
doxycycline 100 mg po BID × 14 days, **with or without**
metronidazole 500 mg po BID × 14 days

If there is no clinical response within 72 hours, the woman should be hospitalized.

Instructions to the woman should emphasize the need to take all medications on schedule and to call you if her symptoms get worse. Other instructions are the same as those given for bacterial vaginosis, chlamydia, and gonorrhea. The woman may need time to express any concerns/anger she may have about potential infertility. The incidence of infertility increases with repeated episodes of PID, so in-depth counseling regarding prevention and her sexual practices is indicated. Her male sexual partner(s) during the sixty days preceding her onset of symptoms should be evaluated. Because the partner may be asymptomatic, the partner should be treated empirically for both *N. gonorrhoeae* and *Chlamydia trachomatis* as he most likely will have a urethral infection with one or the other of these organisms.

Anaphylactic Shock

Anaphylactic shock is a severe allergic reaction that may end in death. It is included here because this disastrous event may occur in individuals who are unknowingly allergic to penicillin. Allergic reactions may also occur in response to cephalosporins such as ceftriaxone (Rocephin) or cefixime (Suprax). A careful history of any previous evidence of sensitivity to penicillin or to cephalosporins should be obtained prior to both prescribing and administering these drugs.

The signs and symptoms of anaphylactic shock include the following:

1. diffuse urticaria
2. rhinitis
3. laryngeal edema
4. dyspnea
5. wheezing
6. marked pallor
7. hypoxia
8. cyanosis
9. tachycardia
10. convulsions
11. hypotension
12. pupil dilatation
13. vascular collapse
14. cardiac arrest

Anaphylactic shock is a very frightening experience, as the woman finds her airway closing. She may have a panic reaction. Knowing these signs and symptoms gives you and the woman the best chance to stop the progress of the reaction before it gets to convulsions, vascular collapse, cardiac arrest, and death. The reaction is exacerbated by a panic reaction. The woman needs to stay calm and concentrate on breathing as slowly and deeply as she can. Emergency treatment includes epinephrine, corticosteroids, and oxygen. Intubation may be required. Antihistamines are useful for lesser reactions or very early evidence from erythema or urticaria of a more severe reaction, which may lead to anaphylactic shock. If the woman is not in a hospital, parenteral penicillin and cephalosporins should only be given in a setting that has the necessary emergency drugs and equipment for life support pending transport to the hospital.

References

1. Burst, H. V. Sexually transmitted diseases and reproductive health in women. *J. Nurse-Midwifery* 43(6):431–444 (November/December) 1998.
2. Althaus, F. A. An ounce of prevention: STDs and women's health. *Fam. Plann. Perspectives* 23:1173–1177 (July/August) 1991.
3. Sharts-Hopko, N. C. STDs in women: what you need to know. *Am. J. Nursing* 97:46–54, 1997.

4. Eng, T. R., and Butler, W. T. (Eds.) *The Hidden Epidemic: Confronting Sexually Transmitted Diseases*. Washington, DC: Institute of Medicine Committee on Prevention and Control of Sexually Transmitted Diseases. 1997.
5. Hooper, R. R., Reynolds, G. H., Jones, O. G., et al. Cohort study of venereal disease, I: the risk of gonorrhea transmission from infected women to men. *Am. J. Epidemiol.* 108(2):136–144 (August) 1978.
6. Hook, E. W. III, and Handsfield, H. H. Gonococcal infections in the adult. In Holmes, K. K., et al. (Eds.) *Sexually Transmitted Diseases*, 3rd ed. New York: McGraw-Hill, 1998, ch. 32.
7. Scholes, D., Daling, J. R., Stergachis, A., Weiss, N. S., Wang, S. P., and Grayston, J. T. Vaginal douching as a risk factor for acute pelvic inflammatory disease. *Obstet. Gynecol.* 81:601–606, 1993.
8. Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines, 2002. *MMWR* 51(No. RR-6) (May 10) 2002.
9. Kurth, A. Promoting sexual health in the age of HIV/AIDS. *J. Nurse-Midwifery* 43(3):162–181 (May/June) 1998.
10. Casey, B. M., Ramin, S. M., and Cox, S. M. Lower genital tract infection. In Copeland, L. J. *Textbook of Gynecology*, 2nd ed. Philadelphia, PA: W. B. Saunders, 2000, ch. 34.
11. Burtin, P., Taddio, A., Ariburnu, O., Einarson, T. R., and Koren, G. Fetus-placenta-newborn: Safety of metronidazole in pregnancy: A meta-analysis. *Am. J. Obstet. Gynecol.* 172(2):525–529 (February) 1995.
12. Overman, B. A. The vagina as an ecologic system: current understanding and clinical applications. *J. Nurse-Midwifery* 38(3):146–151 (May/June) 1993.
13. Lee, R. V. Sexually transmitted infections. In Burrow, G. N., Duffy, T. P., and Kersey, R. *Medical Complications During Pregnancy*, 5th ed. Philadelphia, PA: W. B. Saunders, 1999.
14. U.S. Preventive Services Task Force. *Guide to Clinical Preventive Services*, 3rd ed. Washington, DC: Department of Health and Human Services, Agency for Healthcare Research and Quality, 2000-2002; also 2nd ed., 1996.
15. *Management of Herpes in Pregnancy*. ACOG Practice Bulletin, Number 8, October, 1999.
16. Cunningham, F. G., et al. *Williams Obstetrics*, 21st ed. New York: McGraw-Hill, 2001, ch. 57, pp. 1497–1498.
17. Heaton, C. L. Clinical manifestations and modern management of condylomata acuminata: a dermatologic perspective. *Am. J. Obstet. Gynecol.* 172(4, pt. 2):1344 (April) 1995.
18. Krebs, H-B. Premalignant lesions of the cervix. In Copeland, L. J. *Textbook of Gynecology*, 2nd ed. Philadelphia, PA: W. B. Saunders, 2000, ch. 55.
19. Soper, D. E. Upper genital tract infections. In Copeland, L. J. *Textbook of Gynecology*, 2nd ed. Philadelphia, PA: W. B. Saunders, 2000, ch. 35.

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CHAPTER

16

Family Planning and Contraception

History and Concepts of Family Planning

From earliest times, people have attempted by various means to prevent conception. They have tried magic, potions, and the insertion into the vagina or uterus of a variety of items such as stones, shells, coins, bottle caps, buttons, and jewelry. Bottled carbonated beverages have been used as high-pressure douches, and various materials, such as transparent kitchen wrap (e.g., Saran Wrap), have been wrapped around the penis in attempts to contain sperm as a condom does. These homemade "contraceptives" not only are useless but also are dangerous. Their use can cause mutilation or lead to sterility due to infection. These are not simply examples from antiquity. Many people still use such dangerous, nonmedical, and futile methods. Nearly half (48 percent) of all pregnancies in the United States are unintended [1]. Efforts must be made to replace folklore and ignorance with education and access to safe and effective contraceptive methods.

Great strides were made in the twentieth century in the area of family planning and its related fields. The topics, once taboo in public, are now widely discussed and debated. In 1910 a nurse, Margaret Sanger, began her historical and heroic fight for the right of families to limit their size, the right of women to health and freedom from their biological makeup, and the right of children to the love they receive when they are wanted and planned for.

Before the federal government became involved in family planning, the family planning movement in the United States was spearheaded by Planned Parenthood–World Population. This organization was founded in 1916 by Margaret Sanger as the Planned Parenthood Federation of America. It is a member and major financial supporter of the International Planned Parenthood Federation, which was also established by Sanger. Planned Parenthood–World Population was organized into regional offices and hundreds of family planning centers throughout the United States, operated by local affiliates. The historical concern and involvement of prominent citizens and organizations such as the Ford Foundation, the Rockefeller Foundation, and the Pathfinder Fund during that time greatly facilitated the national and international development and expansion of family planning programs.

National concern was first demonstrated by the Congress and the federal government through the provision of support for both domestic and international family planning programs in 1965. The Department of Health, Education and Welfare at that time created the position of Deputy Assistant Secretary for Population and Family Planning, established the National Center for Family Planning Services, and initiated programs through the Office of Economic Opportunities and various antipoverty programs. The United States Agency for International Development (USAID) has spearheaded the federal international program and is the largest single source of international population assistance.

The terms *birth control*, *contraception*, and *family planning* are often used interchangeably, although they are not identical in meaning. The term *birth control* has been attributed to Margaret Sanger. It refers to regulation of the number of children that are conceived or born. *Contraception* refers to the temporary prevention of pregnancy,

which is accomplished through the use of specific contraceptive, or birth control, methods. *Family planning* has the broadest connotation. It encompasses the additional considerations of the physical, social, psychological, economic, and religious factors that govern a family's attitudes about and influence decisions pertaining to the size of the family, the spacing of children, and the selection and use of a birth control method. The subject of family planning also encompasses the global ramifications of world population and issues of overpopulation, decreasing living space, and limited food; the theological acceptability of various methods of birth control; the physical and physiological hazards to an individual woman caused by continuous, repeated childbearing; maternal mortality; the role of women in a society; disease prevention and health promotion; and the rejection and abuse of unwanted children.

The ability to be effective in helping women or couples with family planning may be enhanced or hindered by the feelings and attitudes of the midwife regarding each of the following as it relates to family planning:

1. sex and sexuality
2. religion
3. race/ethnicity
4. economic status
5. marital status

Midwives, like all those who provide health care to women in a family planning clinic or any other setting, need to scrutinize their own feelings and attitudes in these five areas.

Any accusations that family planning promotes genocide can be averted by focusing on what should be basic rights for every woman:

1. the right to have a baby when she wants one
2. the right to be a healthy mother bearing a healthy baby

Selection of a Contraceptive Method

Before a specific contraceptive method is chosen, an individual or couple must first decide whether to practice family planning. A number of factors may influence this decision, including the following:

1. *Sociocultural factors:* current trends in family size; the effect on an individual of the size of the family in which the individual grows up; the importance the society places on having children; the importance the society places on having a male child to perpetuate the family name; whether the society posits a direct correlation between the number of children a man fathers and his virility; the social value of being a "woman" only if she has "given" a child to her partner.
2. *Occupational and economic factors:* the possibility of lengthy separation during military duty; the need to channel economic resources into school or the beginning of a vocation or business; economic ability to provide prospective children with food, clothing, shelter, medical and dental care, and future education; unemployment; homelessness.
3. *Religious factors:* endorsement of the principle of family limitation and the basic concept of family planning by all major religions.
4. *Legal factors:* elimination of all legal barriers to practicing family planning since the Connecticut state law that prohibited the use of any device for the purpose of preventing conception was declared unconstitutional by the Supreme Court in 1965.
5. *Physical factors:* conditions requiring that a woman not become pregnant for health reasons; age and the ticking of the "biological clock"; unhealthy lifestyles (e.g., alcoholism, drug abuse, cigarette smoking, bulimia, anorexia, gross obesity); use of teratogenic medications.
6. *Relationship factors:* stability of the relationship; the crisis period and innumerable adjustments caused by having a child.
7. *Psychological factors:* the need to have a child to love and be loved by; pregnancy considered proof of being loved (these two factors are common reasons for adolescent pregnancies); the erroneous belief that a child will hold together a disintegrating relationship; fear of childbearing or childrearing; threat to present lifestyle posed by parenthood.
8. *Current health status and genetic history:* the presence of or potential for conditions or diseases that can be passed to the baby (e.g., HIV, AIDS, Tay-Sachs, Huntington's chorea, sickle cell anemia).

If the decision of the individual or couple is to practice family planning, still other factors might influence their choice of a contraceptive method. Selection of a method is a matter of choice by the individual or the couple as long as there are no medical contraindications to the method chosen. This is sometimes called the "cafeteria" approach to family planning. Table 16-1 shows the percent-

TABLE 16-1 Percentage and Number of Women at Risk and Percentage at Risk Currently Using Various Methods, from the 1995 National Survey of Family Growth

	Percent Using among Women at Risk[1]						
Age	*15–44*	*15–19*	*20–24*	*25–29*	*30–34*	*35–39*	*40–44*
Female sterilization	25.6	0.3	3.6	16.0	27.7	38.6	46.7
Pill	24.9	35.4	47.6	36.6	26.8	10.5	5.5
Male condom	18.9	29.7	24.0	22.8	17.3	15.9	11.5
Male sterilization	10.1	0.0	1.0	4.2	9.8	17.6	19.0
No method	7.5	19.3	8.6	6.4	5.7	5.6	6.7
Withdrawal	2.9	3.3	3.0	3.5	2.7	3.0	1.8
Injectable	2.7	7.9	5.6	3.9	1.7	1.0	0.3
Periodic abstinence	2.2	1.1	0.9	1.6	3.0	2.7	2.4
Natural family planning	0.3	0.0	0.1	0.3	0.4	0.5	0.3
Diaphragm	1.7	0.0	0.6	0.8	2.2	2.8	2.5
Implant	1.3	2.2	3.4	1.9	0.6	0.3	0.1
Spermicides	1.3	0.8	1.1	1.6	1.4	1.0	1.8
Intrauterine device	0.7	0.0	0.3	0.7	0.8	0.9	1.2
Other[2]	0.1	0.0	0.1	0.0	0.3	0.1	0.5
Female condom	0.0	0.0	0.1	0.0	0.0	0.0	0.0
	Number of Women in Cohort, Percent and Number at Risk[1]						
Number (millions) of women	60.2	9.0	9.0	9.7	11.1	11.2	10.2
Percent at risk	69.4	36.9	69.4	74.0	77.1	77.2	76.6
Number (millions) at risk	41.8	3.3	6.3	7.2	8.5	8.7	7.8

[1] At risk = those who EITHER are current contraceptive users OR are nonusers who have had sex in the past 3 months and are not trying to become pregnant, are not pregnant, or were not interviewed within 2 months after the completion of a pregnancy and are not sterile. Percentages may not add to 100 due to rounding.

[2] Other methods = cervical cap, sponge, and other unspecified methods.

Source: Reprinted by permission from Hatcher, R. A., et al., *Contraceptive Technology*, 17th rev. ed. New York: Ardent Media, 1998, p. 213.

age of women who are at risk for getting pregnant using each birth control method.

A couple or an individual has a need and a right to know the potential dangers and side effects of the different methods in order to make a decision. This information should be included in the general information presented about each contraceptive method. Many private offices and clinics require that women sign consent forms indicating that they understand the risks involved and acknowledging receipt of the specified method. This procedure is always followed for an IUD.

Barring medical contraindications, the factors that may influence the individual's or couple's selection of a contraceptive method include the following:

1. desire for permanent or temporary birth control
2. effectiveness of a given method; contraceptive method effectiveness varies widely (see Table 16-2). A little over half of women with unintended pregnancies (53%) become pregnant during a month they were using a contraceptive method [2]
3. Influence of the media (emphasis on positive or negative aspects or side effects of a method)
4. Possible side effects and questions of safety related to any method
5. Possible health benefits related to any method
6. Ability of a method to prevent disease (HIV; sexually transmitted diseases; cancer)
7. Length of anticipated use of a contraceptive method
8. Cost
9. Frequency of sexual intercourse
10. Number of sexual partners
11. Social factors (current social trends in the use of various methods)
12. Religious factors (whether a specific method is sanctioned by the religious body to which the couple or individual belongs)
13. Psychological factors (feelings about any aspect of a specific method, e.g., procedure involved,

TABLE 16-2 Percentage of Women Experiencing an Unintended Pregnancy Within the First Year of Typical Use and the First Year of Perfect Use and the Percentage Continuing Use at the End of the First Year: United States

	% of Women Experiencing an Unintended Pregnancy within the First Year of Use		% of Women Continuing Use at One Year[1]
Method	*Typical Use*[2]	*Perfect Use*[3]	
Chance[4]	85	85	
Spermicides[5]	26	6	40
Periodic abstinence			63
Calendar	25	9	
Ovulation method	25	3	
Symptothermal[6]	25	2	
Postovulation	25	1	
Cervical cap with spermicide			
Parous women	40	26	42
Nulliparous women	20	9	56
Sponge			
Parous women	40	20	42
Nulliparous women	20	9	56
Diaphragm with spermicide[7]	20	6	56
Withdrawal	19	4	
Condom without spermicide[8]			
Reality Female polyurethane condom	21	5	56
Male (latex or polyurethane)	14	3	61
Pill			
Progestin only	5	0.5	
Combined	5	0.1	
IUD			
Copper	0.8	0.6	78
Levonorgestrel-releasing	0.1	0.1	81
Progestin injections	0.3	0.3	42[9]
Combined hormone injections	0.2	0.1	
Levonorgestrel-releasing implants	0.05	0.05	88
Female sterilization	0.5	0.5	100
Male sterilization	0.15	0.10	100

Emergency Contraceptive Pills: Treatment with COCs initiated within 72 hours after unprotected intercourse reduces the risk of pregnancy at least 60–75%. Pregnancy rates lower if initiated in first 12 hours.[10] Progestin-only EC reduces pregnancy risk by 85%.

Lactational Amenorrhea Method: LAM is a highly effective, temporary method of contraception.[11]

1 Among couples attempting to avoid pregnancy, the percentage who continue to use a method for 1 year

2 Among typical couples who initiate use of a method (not necessarily for the first time), the percentage who experience an accidental pregnancy during the first year if they do not stop use for any other reason

3 Among typical couples who initiate use of a method (not necessarily for the first time) and who use it perfectly (both consistently and correctly), the percentage who experience an accidental pregnancy during the first year if they do not stop use for any other reason

4 The percentages becoming pregnant in columns 2 and 3 are based on data from populations where contraception is not used and from women who cease using contraception in order to become pregnant. Among such populations, about 89% become pregnant within 1 year. This estimate was lowered slightly (to 85) to represent the percentages who would become pregnant within 1 year among women now relying on reversible methods of contraception if they abandoned contraception altogether

5 Foams, creams, gels, vaginal suppositories, and vaginal film

6 Cervical mucus (ovulation) method supplemented by calendar in the pre-ovulatory and basal body temperature in the post-ovulatory phases

7 With spermicidal cream or jelly

8 Without spermicides

9 The median one-year continuation rate for 10 studies in the 1990s was 42%

10 The treatment schedule is one dose within 72 hours after unprotected intercourse, and a second dose 12 hours after the first dose

11 However, to maintain effective protection against pregnancy, another method of contraception must be used as soon as menstruation resumes, the frequency or duration of breastfeedings is reduced, bottle feeds are introduced, or the baby reaches 6 months of age

Source: Reprinted by permission from Hatcher, R. A., Nelson, A. L., Zieman, M., et al. *A Pocket Guide to Managing Contraception*. Tiger, GA: Bridging the Gap Foundation, 2001, p. 36; and from Hatcher, R. A., et al. *Contraceptive Technology*, 17th rev. ed. New York: Ardent Media, 1998, pp. 216–217.

whether it is associated with the sexual act, unfavorable past experience with a method)

14. Ease of using a particular method (ability of the individual to master the techniques involved in using a specific method, e.g., cervical cap, diaphragm; or what the individual has to undergo to have the method, e.g., IUD, sterilization procedure; or whether the individual is a reliable pill taker)

Effectiveness of a Contraceptive Method

Determining the effectiveness of a contraceptive method is a complex process based on the proportionate reduction in the monthly probability of conception. Since it is not possible to ascertain the proportion of women who would have become pregnant had they not used the contraceptive method under investigation, it is not possible to measure effectiveness directly [3, p. 215]. Instead, failure rates, or probability-of-failure rates, are calculated. Two major factors affect the likelihood that a contraceptive method will fail to protect the user [4]:

1. inherent efficacy of the method itself when used consistently and correctly. This factor is expressed as a "perfect use" statistic.
2. the human factor (user characteristics), including motivation, ability to master any technique required to use a method, inconsistent use, and inconsistent correct use. This factor is expressed as a "typical use" statistic.

The difference between perfect use and typical use yields another piece of information, which is how "forgiving" a method will be of typical or imperfect use. The narrower the margin of difference, the more forgiving a method is; the wider the margin of difference, the less forgiving the method is and the more apt a woman is to become pregnant while using the method.

The efficacy of particular contraceptive methods is addressed in the next several chapters. If a contraceptive method fails as a result of human error, the failure may be due either to improper use of the technique or to weak motivation. Some users may not have sufficient knowledge of pertinent reproductive anatomy and physiology, may not understand the method and how it works, or may not be able to master the skills needed to use the method. For one or all of these reasons, therefore, they do not use the method correctly. Motivation, however, is the dominant factor in human error. How strongly a couple or individual wishes to prevent a pregnancy directly affects the degree of regularity with which a contraceptive is used. Any method will fail if it is not used consistently. A major cause of contraceptive failure due to human error is irregular use of a method. However, in some cases the factors that might lead to human error, such as the individual's or couple's lack of acceptance of the procedure involved, may be counterbalanced by their motivation.

Two basic methods of calculating the effectiveness or failure rate of contraceptive methods have been used: the *Pearl Index* and the *Life-Table Index*. The Pearl Index is a formula, developed by Raymond Pearl in the early 1930s, that calculates the clinical (use) effectiveness of a contraceptive method according to the pregnancy rate per 100 years of exposure (or woman years). The pregnancy rate (pregnancies per woman years) is equal to

$$\text{number of pregnancies} \times 1200 \text{ months}$$

The *number of pregnancies* in the numerator refers to the total of three statistics that are generally available or that can be calculated: the numbers of live births, stillbirths, and abortions among those using a given method. The *1200 months* in the numerator refers to the number of months in 100 years (100 × 12 months). The *months of exposure* in the denominator refers to exposure to the possibility of pregnancy and is determined by deducting those months during which conception was impossible (e.g., months when a couple were physically separated or a woman was already pregnant) from the total months the man and woman were together. For example, suppose that 200 couples used a contraceptive method over an average period of two years and that 60 of the women became pregnant despite its use:

$$\text{Pregnancy rate} = \frac{60 \times 1200}{4800} = \frac{72{,}000}{4800} = 15$$

The effectiveness this contraceptive method is calculated to have is a pregnancy rate of 15 per 100 woman years.

For all sexually active couples not using a contraceptive method, the average pregnancy rate is 90 per 100 woman years. The effectiveness of a contraceptive method is considered to be high if the pregnancy rate is below 10 per 100 woman years (years of exposure); moderate if the pregnancy rate is between 10 and 20; and low if the pregnancy rate is more than 20.

The Pearl Index method of calculating the effectiveness of a contraceptive method has been criticized because it treats all data equally for whatever period of time is studied. The problem with this averaging of data is that the risk of pregnancy with any contraceptive method is highest during the first year of use and declines thereafter.

Today, most researchers use life-table rates to calculate the effectiveness of a contraceptive method, rather than the Pearl Index. Life-table rates treat each month of contraceptive use separately, thus controlling for the decreasing risk of pregnancy over time, and then compute these individual months cumulatively up to whatever point is desired (e.g., 12 months). Life-table rates express effectiveness of a contraceptive method as the number of pregnancies per 100 women in the first 12 months of use, in contrast to the Pearl Index, which expresses effectiveness of a contraceptive method as the number of pregnancies per 100 woman years.

Effectiveness rates estimated by one method cannot be mathematically translated into rates for the other method. The actual rates calculated by the two methods are not that much different for long-term studies but may be more importantly different regarding the first year of use.

In reading the family planning literature, it is important to know which statistical method was used to calculate failure rates or the effectiveness of a given method. Table 16-2 shows life-table calculations of failure and continuing use rates. The sixteenth and seventeenth editions of Hatcher's *Contraceptive Technology* include a series of tables that summarize studies of contraceptive failure by contraceptive method and shows the life-table or Pearl Index rates calculated by the researchers [3, pp. 803–844; 4, pp. 655–687].

Folklore Methods

Individuals or couples should be advised not to use "folklore" methods of contraception. These are either so-called contraceptive methods of long-standing reputation that, because of a basic fallacy in concept and low efficacy, might as well be labeled as folklore or products that, because of misleading advertising or misunderstanding or ignorance on the part of consumers, are thought to be contraceptive in action but are not. Folklore methods include the use of douches, the practice of coitus interruptus, and the use of vaginal cleansing agents.

Douches

One of the most common erroneous ideas is that douching following sexual intercourse is a contraceptive method. The notion is that a woman can flush the semen out of her vagina before the sperm can enter her uterus if she douches immediately following ejaculation. However, the majority of sperm are contained in the first few drops of ejaculate; furthermore, within 90 seconds of the deposit of semen at the cervical os, sperm have entered the cervical canal. The fact that it is almost impossible for a woman to douche within this period of time renders the entire supposition invalid.

Various reports in the past using the Pearl Index stated a pregnancy rate in excess of 30 per 100 years of exposure for couples using douches as a contraceptive method. This rate makes douching better than no contraceptive method at all—however, such low efficacy scarcely recommends the douche as a reliable method of contraception.

Coitus Interruptus

Coitus interruptus, commonly known as "being safe," "being careful," or "withdrawal," is based on the fact that the male can feel when he is about to ejaculate. This method depends on the male's withdrawing his penis from the vagina at exactly this moment and ejaculating outside of the woman's vagina. This action relies on split-second timing and ideal self-control by the male. If the male is late in withdrawing, even by a fraction of a second, the first few drops of semen, which contain the majority of sperm, are deposited in the vagina. The method also may fail if the male ejaculates on the external female genitalia.

Many couples have used coitus interruptus at least occasionally, and it is recommended in the absence of an authentic contraceptive method. Some couples have been satisfied with coitus interruptus as a contraceptive method and have used it successfully. However, coitus interruptus has been blamed for many family planning failures and has received much criticism. The male may not always be psychologically able to withdraw at the climax of sexual intercourse, and men frequently object that coitus interruptus limits full sexual gratification.

Vaginal Cleansing Agents

Vaginal cleansing agents are sometimes advertised as being "for feminine protection." This phrase often is misunderstood to mean protection from

pregnancy, when what is meant is protection from "smelling less than pretty." Not only are such agents unnecessary for female hygiene (and may indeed temporarily mask or worsen vaginitis), they also do not contain any spermicidal ingredients; nor do they even change the pH of the vagina to render it more hostile to sperm.

Sterilization

Sterilization is the surgical interruption or closure of pathways for sperm or ova, which prevents fertilization. The two methods of sterilization are vasectomy and tubal ligation. Although hysterectomy certainly is a permanent form of sterilization, it is a major surgical procedure with associated morbidity, and it is generally not done even in conjunction with cesarean section solely for the purpose of sterilization. Sterilization is considered a permanent birth control method. The midwife refers the woman or man to a physician for the surgical procedure desired.

Female sterilization can be accomplished either by literally blocking the fallopian tubes with a plug or by means of an inflammatory reaction induced by the chemicals in specific drugs or by cutting and interrupting the fallopian tubes so that the ovum and the sperm cannot meet. The blocking methods are as yet beset with a number of insertion or placement problems and side effects ranging from foreign-body reactions (to the silicone plug) to toxic psychosis (induced by the antimalarial drug quinacrine).

There are several methods of female sterilization done by laparoscopy. These include cauterization, silactic bands, and clips. Cauterization has a risk of subsequent fistula development and ectopic pregnancy with a 2.5 percent failure rate [5, 6]. Although the clips provide the greatest possibility for reversibility, the spring clip (Hulka-Clemens clip) also has the highest failure rate [6].

Ligating and then cutting and interrupting the fallopian tubes is by far the most effective means of female sterilization. If the tube is excised, the ends either retract or are deliberately buried in the uterine myometrium (proximal portion) and the broad ligament (distal portion). The procedure can be performed at any time, usually under general anesthesia. There is a large positive association between tubal sterilization and reduced risk of ovarian cancer [7]. Efforts at reversing this permanent sterilization procedure have high failure rates. In vitro fertilization would be the only other possible means for childbearing.

Male sterilization involves the same principles as tubal ligation. In a vasectomy the vas deferens is ligated and then closed by excision, cautery, or mechanical devices. The outpatient procedure is done under local anesthesia.

Vasectomy is safer than tubal sterilization, with less morbidity and mortality. It is simpler because the vas deferens is more easily accessible; it is more effective and less expensive. Men who have a vasectomy need to use a back-up method of contraception until the sperm count reaches zero. Reversibility is possible with microsurgery and will result in pregnancy over half of the time and in a return of sperm in ejaculate in over 90 percent of men [5, pp. 134, 136].

When counseling a woman or a couple about their alternatives for family planning, a midwife should include the permanent methods of birth control along with the temporary methods of contraception. Sterilization is the most popular method of birth control both in the United States and worldwide. However, neither male nor female sterilization is protective against HIV or sexually transmitted diseases. Table 16-1 shows that in the United States over one-quarter of women and just over 10 percent of men between the ages of 15 and 44 use sterilization. For women and men between the ages of 40 and 44, the numbers almost double, with nearly 47 percent of women and 19 percent of men sterilized.

Counseling for sterilization requires a knowledge of local resources and medical practices and should include answers to the following questions:

1. What sterilization methods are available? Where? Performed by whom? Precisely which procedures are used? How long does the procedure take?
2. How much will each method cost? What financial aid is available?
3. What will the surgery really mean in terms of what body structures get touched, changed, or possibly disfigured? How long will the woman/man be unable to work? How long will the woman/man be too uncomfortable for sex? Is the procedure reversible? What are the possible complications?

In addition, counseling should focus on eliciting and talking about the common fears and misconceptions related to sterilization. The most prevalent of these is the fear of "being changed"—experiencing a decrease in sexual desire, functioning, or en-

joyment—which is not true except as affected by the psyche.

The midwife should be thoroughly knowledgeable about the federal, local, and institutional requirements regarding sterilization procedures. These regulations are designed to ensure that no one is sterilized who is mentally incompetent or is not fully informed, and and to ensure adequate time to think about the procedure. Spousal consent is not legally required. The woman who wants a tubal ligation at the time of childbirth or in the immediate postpartum period must sign the informed consent papers early enough during the prenatal period for all the requirements to be met.

Future Methods of Contraception

It is well known and undisputed that the ideal contraceptive method has not yet been developed. The search continues for a method that is 100 percent effective and safe, free from side effects, easy to use, unrelated to the sexual act, and acceptable to all religions. New contraceptive methods are being explored, and existing methods are being studied for improvement. Basic in the research are the causes of side effects, the possible relationship between a given method and disease (safety), and the mechanisms of action. It is important that a means of predicting ovulation time accurately at least four days in advance be developed.

Potential new contraceptive methods that are types of existing methods (e.g., barrier methods, hormonal methods) will be discussed in the relevant chapters. This section will review methods that represent potential new types of contraception.

Vaccines

The immunologic approach to fertility control is fraught with problems, but the major one is finding an antigen that will be unique to the reproductive tract and will not cause a reaction in tissue outside of the reproductive system. Several hormones have been considered, especially human chorionic gonadotropin (hCG), and also substances found on the surface of the ovum or the sperm. The problem with hCG is that its subunits are too similar to other hormones, and the antibodies produced by the body in response to hCG might damage the pituitary gland or the kidney. The development of an antisperm vaccine has been proposed. Nothing is even close to clinical trials.

Male Methods of Contraception

Research on male methods of contraception has always lagged behind research on female methods. A number of possibilities that either are hormones or have an effect on hormones have been discussed:

1. *Melatonin (from the pineal gland):* Suppresses the release of gonadotropin-releasing factor. *Problem:* Melatonin is only produced by the pineal gland in response to darkness.
2. *Gossypol (found in cottonseed oil):* Decreases the percentage of motile sperm, increases the percentage of abnormal sperm, causes a gradual decrease in the number of sperm until the male exhibits azoospermia; may also have an anti-viral/anti-HIV effect. *Problems:* Side effects, lack of reversibility.
3. Tripterigium wilfordii *(plant used in herbal medicine in China):* Experimentation with rats is being carried out to determine what effect the plant has; may also be anti-HIV.
4. *Testosterone injections:* Inhibit spermatogenesis. A limited World Health Organization clinical trial was effective. *Problems:* Requires weekly injection; potential side effects.
5. *Progestins/progestin-androgen combination/antiandrogens:* Inhibit spermatogenesis. *Problems:* Side effects, including decreased libido and potency; inconsistent achievement of azoospermia; loss of secondary sex characteristics.
6. *Inhibin (gonadal peptide hormone):* Suppresses follicle-stimulating hormone (FSH) and inhibits spermatogenesis. *Problem:* Not much is known about the role of FSH in male fertility.
7. *Luteinizing hormone releasing hormone (LHRH):* Has four possible contraceptive actions. *Problems:* Side effects, including decrease in libido and in secondary sex characteristics; decreased testosterone.
8. *Male vaccine:* Uses antigens in the reproductive tract to stimulate the production of antibodies affecting hormones produced in the testes, pituitary gland, or hypothalamus.

References

1. Trussell, J., and Vaughan, B. Contraceptive failure, method-related discontinuation and resumption of use: results from the 1995 national survey of family growth. *Fam. Plan. Perspectives* 31(2):64–73 (March/April) 1999.
2. Henshaw, S. K. Unintended pregnancy in the United States. *Fam. Plan. Perspectives* 30(1):24–30 (January/February) 1998.

3. Hatcher, R. A., et al. *Contraceptive Technology*, 17th rev. ed. New York: Ardent Media, 1998, p. 213.
4. Hatcher, R. A., et al. *Contraceptive Technology*, 16th rev. ed. New York: Irvington Publishers, 1994, pp. 118–123.
5. Hatcher, R. A., Nelson, A. L., Zieman, M., et al. *A Pocket Guide to Managing Contraception*. Tiger, GA: Bridging the Gap Foundation, 2001, p. 129.
6. U.S. Collaborative Review of Sterilization. The risk of pregnancy after tubal sterilization. *Am. J. Obstet. Gynecol.* 174:1161–1170, 1996.
7. Hankinson, S. E., et al. Tubal ligation, hysterectomy, and the risk of ovarian cancer. *JAMA* 270:2813–2818, 1993.

• • • Bibliography

Contraceptive Technology Update. Contraception choices for women over age 35: Focus on benefits and risks. III(2):4–9 (May) 1992.

Contraceptive Technology Update. Tubal ligation can reduce risk of ovarian cancer. 15(5):67–70 (May) 1994.

Contraceptive Technology Update. Future contraceptive methods. V(4):4–12 (September) 1994.

Contraceptive Technology Update. What to expect in the next five years? Innovative contraceptive delivery. 22(5):49–51 (May) 2001.

Franklin, M. Recently approved and experimental methods of contraception. *J. Nurse-Midwifery* 35(6):365–376 (November/December) 1990.

Hankinson, S. E., et al. Tubal ligation, hysterectomy, and the risk of ovarian cancer. *JAMA* 270:2813–2818, 1993.

Hatcher, R. A., et al. *Contraceptive Technology*, 16th rev. ed. New York: Irvington Publishers, 1994.

Hatcher, R. A., et al. *Contraceptive Technology*, 17th rev. ed. New York: Ardent Media, 1998.

Hatcher, R. A., Nelson, A. L., Zieman, M., et al. *A Pocket Guide to Managing Contraception*. Tiger, GA: Bridging the Gap Foundation, 2001.

Henshaw, S. K. Unintended pregnancy in the United States. *Fam. Plann. Perspectives* 30(1):24–30 (January/February) 1998.

Kost, K., Forrest, J. D., and Harlap, S. Comparing the health risks and benefits of contraceptive choices. *Fam. Plan. Perspectives* 23(2):54–61, 1991.

Peterson, H. B., Jeng, G., Folger, S. G., et al. For the U.S. Collaborative Review of Sterilization Working Group. *N. Eng. J. Med.* 343:1681–1687, 2000.

Piccinino, L. J., and Mosher, W. D. Trends in contraceptive use in the United States: 1982–1995. *Fam. Plann. Perspectives* 30(1):4–11 (January/February) 1998.

Rosenberg, M. J., and Gollub, E. L. Commentary: Methods women can use that may prevent sexually transmitted disease, including HIV. *Am. J. Public Health* 82(11):1473–1478 (November) 1992.

Trussell, J., and Vaughan, B. Contraceptive failure, method-related discontinuation and resumption of use: results from the 1995 national survey of family growth. *Fam. Plann. Perspectives* 31(2):64–73 (March/April) 1999.

U.S. Collaborative Review of Sterilization. The risk of pregnancy after tubal sterilization. *Am. J. Obstet. Gynecol.* 174:1161–1170, 1996.

WHO Task Force on Methods for the Regulation of Male Fertility. Contraceptive efficacy of testosterone-induced azoospermia in normal men. *Lancet* 336:955–959, 1990.

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CHAPTER

17

Natural Methods of Family Planning

CARMELA CAVERO, CNM, MS, FACNM

The term *natural family planning* (NFP) describes methods of planning or preventing pregnancy based on periodic abstinence. NFP describes methods whereby couples may achieve, prevent, or space pregnancies based on their understanding of their fertility and the timing of intercourse. The World Health Organization defines natural family planning as

> . . . methods for planning or avoiding pregnancies by observation of the natural signs and symptoms of the fertile and infertile phase of the menstrual cycle. It is implicit in the definition of natural family planning, when used to avoid conception, that drugs, devices and surgical procedures are not used, there is abstinence from sexual intercourse during the fertile phase of the menstrual cycle and the act of intercourse, when it occurs, is complete. This definition of natural family planning indicates that there are two separate components involved. The first of these is fertility awareness; the second is the application of this knowledge to help in planning one's family, what we term the methodologies. [1]

Currently the most effective methods of natural family planning are (1) the ovulation method (Billings method; Creighton model) and (2) the sympto-thermal method. Other methods of natural family planning include (1) the calendar method, (2) the basal body temperature method, and (3) the lactation amenorrhea method.

The terms *natural family planning*, *rhythm*, *safe period*, *fertility awareness*, and *periodic abstinence* are sometimes used synonymously. However, the different terms may evoke different philosophical and psychological responses.

As noted in the World Health Organization definition, the natural methods of family planning are nonmechanical and nonchemical. They are often vastly misunderstood. Misunderstanding, when combined with a lack of commitment to abstinence from coitus during the fertile days, may render them ineffective for preventing pregnancy. However, when a couple properly understand the method, make a commitment to each other to abstain during the fertile days, jointly participate in determining the fertile days and the safe days, and develop nongenital expressions of love, then the effectiveness of natural family planning is equal to or better than that of the barrier methods of contraception (see Table 16-2, page 464).

It is important to note that the natural methods of family planning are suited only for use by a monogamous couple in a stable relationship who are willing to assume joint responsibility for their fertility and are motivated to apply natural family planning in their relationship. When couples become familiar with the methodology, they can use it to truly plan their family and bring about pregnancy when they feel the time is right—simply by switching from abstinence to intercourse on the fertile days.

At a conference held at Georgetown University in 1997, participants listed strategies for mainstreaming and expanding NFP usage. They suggested that family planning providers could enhance quality of care by adding fertility awareness education and NFP to the choice of methods offered [2]. Among women with access to all methods of contraception, the number choosing natural family planning is small. However, an increasing number of couples are turning to the natural meth-

ods of family planning, motivated either by religious or philosophical beliefs or by concern about the potential risks, side effects, and unknown long-term effects of artificial contraception.

The effectiveness of natural family planning methods depends not only on the willingness of the couple to apply what they know faithfully but also on proper instruction by certified instructors. A thorough understanding of natural family planning and of all the nuances that can make the difference between success and failure is acquired only through intensive training. In an effort to standardize the approach to teaching natural family planning methods, the World Health Organization, the Diocesan Development Program for Natural Family Planning, and other NFP providers have written requirements and guidelines for NFP teachers. On completion of an education program, the prospective instructor must pass an examination in order to become certified.

This chapter is intended to provide the midwife with an overview and basic knowledge of the different methods of natural family planning. It cannot, however, provide the expertise that comes from the extensive training and experience in these methods found in the standardized courses that lead to certification as an instructor in natural family planning. For the midwife who has not obtained this additional specialized training there is a list of resources at the end of the chapter. These organizations will help a midwife locate the nearest certified natural family planning instructor. The midwife can then refer a woman to whom she is providing primary care to a certified NFP instructor for the individualized instruction, counseling, and follow-up necessary for success in natural family planning.

The Calendar Method (Rhythm Method)

Research in the 1930s led to the development of the earliest of the natural family planning methods, the "rhythm" method, also known as the calendar method. The method was based on the finding that ovulation occurs on a single day approximately 14 days prior to the onset of the menstrual period; based on this finding, a woman's fertile period can be identified.

This method has many limitations because of the wide variation in the length of menstrual cycles. Because a fairly regular menstrual cycle is essential to any reliable estimation of the time of ovulation, the following women cannot depend on the calendar method: women with menstrual cycles shorter than 25 days, women with irregular menstrual cycles, women with menstrual cycles that vary in length by 8 days or more, postpartum women, women who are lactating, and women in the perimenopause.

The calendar method can only predict the days in a menstrual cycle during which a woman is more likely to get pregnant. This prediction is based on the projected time of ovulation as determined by calendar calculations made from the history of the length of the last 8 to 12 cycles. A woman must keep a record of menstrual cycles to identify the longest and shortest cycles so that all possible fertile days may be projected. The calculations used today allow for a variation factor of ±2 days around the approximately 14 days prior to the onset of the next menstrual period, 2 to 3 days for sperm survival, and 1 day (24 hours) for ovum survival, for a minimum total of 9 fertile days.

The woman subtracts 20 days from the length of her shortest cycle to determine her first predicted fertile day and 10 days from the length of her longest cycle to determine her last predicted fertile day. The couple then abstain from sexual intercourse during the projected fertile days to prevent conception.

Although this method may be selected by some couples in the United States and is still used in many countries, it has been supplanted by modern natural family planning methods that have proved to be more effective and require fewer days of abstinence. The latter methods differ from the calendar (rhythm) method in that they are based on clinical indicators of hormonal changes and identify the times of fertility and infertility as they occur in each and every cycle. These biological signs can be observed and interpreted by women and their partners.

The Ovulation Method (Cervical Mucus Method; Billings Method; Creighton Model)

The ovulation method is based on the recognition of changes in the cervical mucus during the menstrual cycle, which define both the fertile phase of the cycle and the time of maximum fertility within the fertile phase. The woman is taught to recognize changes in the characteristics of the cervical mucus and in the pattern of sensation at the vulva (wetness; feeling of lubrication; dryness) throughout the cycle.

The ovulation method was developed in the 1950s by two Australian physicians, Drs. Evelyn and John Billings, and introduced into the United States in the early 1970s. Validation of the method was conducted by correlating women's observations of the changing mucus, detectable at the vulva, and the rise in estrogen levels in the follicular phase of the cycle. The identifiable pattern showed that women can predict ovulation quite accurately without recourse to basal body temperature.

Changes in the cervical mucus during the menstrual cycle, thus, are under the influence of estrogen. The infertile pattern is detected in both the preovulatory phase and the postovulatory phase of the cycle. When the ovaries are in a relatively quiescent state, there is a lower level of estrogen and progesterone. The result is the absence of a sensation or mucus at the vulva.

The woman observes the sensation at the vulva and the presence of mucus throughout the day as she goes about her daily activities. She records her observation at the end of the day. During the first cycle of charting, abstinence is necessary in order for the woman to become familiar with her sensation and mucus. Then she must learn to distinguish her cervical mucus from semen, normal sexual lubrication, and vaginal discharges. She should not douche as this would eliminate vaginal secretions.

The cervical mucus changes throughout the cycle are as follows (see Figure 17-1):

1. There are a number of days immediately after menstruation during which the woman has an

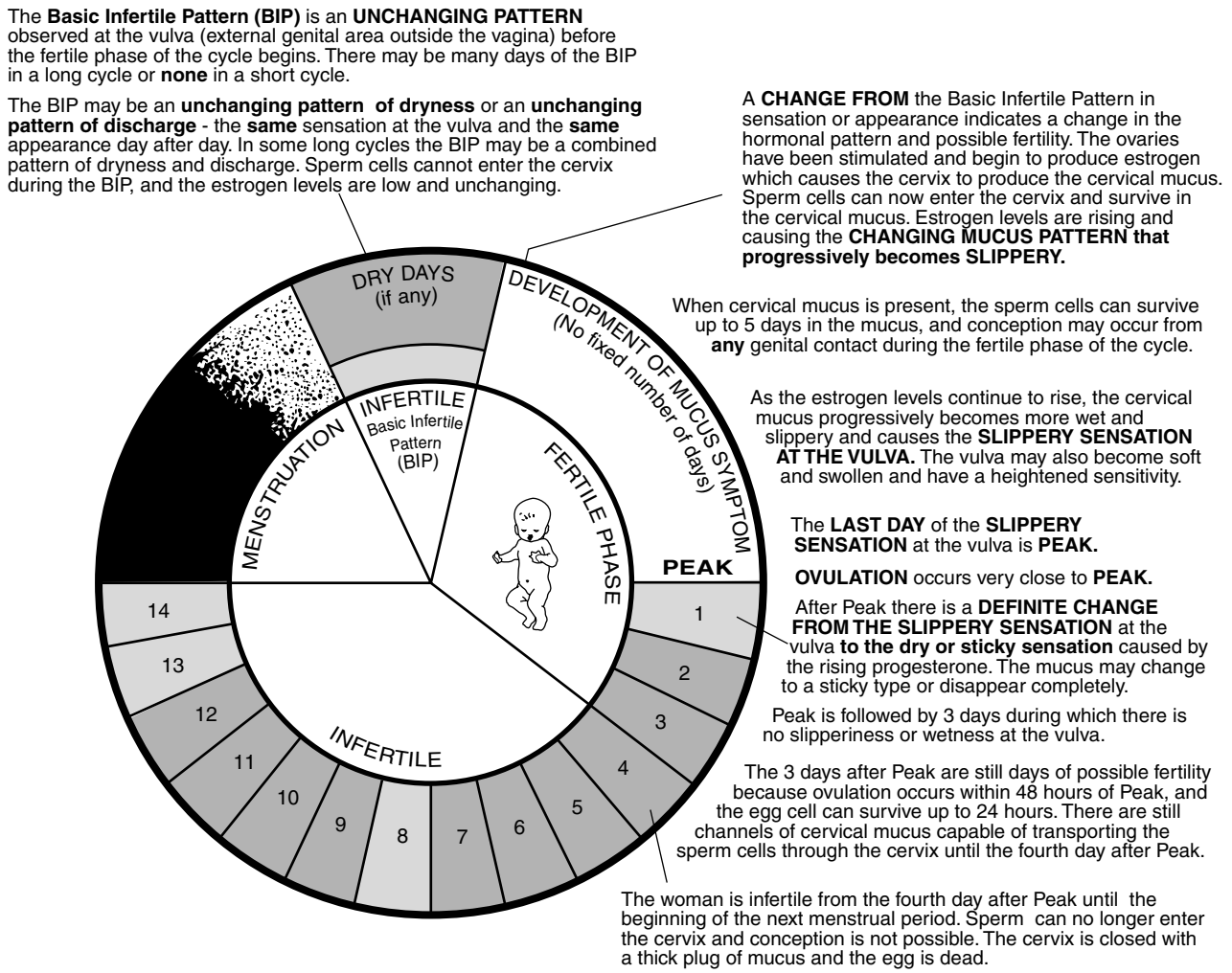

FIGURE 17-1 The Billings Ovulation Method of Natural Family Planning, 2000.

Source: Reproduced with permission of the Billings Family Life Centre. For further information visit www.woomb.org.

unchanging pattern of dryness at the vulva. Some women experience the appearance of discharge but characteristically this has the same appearance day after day. This is identified as the Basic Infertile Pattern (BIP). The number of days varies, being more in a long cycle and fewer in a short cycle. These are considered infertile days.

2. The preovulatory phase follows. The woman notices a change from the Basic Infertile Pattern in the sensation at the vulva or appearance of mucus. This change identifies the beginning of the fertile phase of the cycle. A changing sensation from wet to slippery is noted at the vulva. The mucus increases in volume and becomes clear and stretchy, with an egg-white consistency (spinnbarkeit). The last day of the slippery sensation at the vulva is called the Peak day. This is true even if mucus is not seen. This is the maximally fertile phase. The sensation changes to dry or sticky. The three days after the Peak day are still days of possible fertility because ovulation occurs within 48 hours of the Peak day and the ovum survives up to 24 hours.
3. The postovulatory infertile days begin on the fourth day after the Peak day and continue until menstruation. Menstruation will occur 11 to 16 days after the Peak day.

Couples who wish to avoid pregnancy must follow these rules:

1. The Early Day Rules
   a. Intercourse is to be avoided during the days of heavy menstrual bleeding. Mucus may be undetectable in the presence of the menstrual blood.
   b. Intercourse is permissible every other night as long as the observations indicate the Basic Infertile Pattern. The day after intercourse is considered a fertile day because the presence of seminal fluid may mask the mucus observation.
   c. When a change from the Basic Infertile Pattern is noted, the couple abstains that day and any other day of change as well as three more days when the BIP returns. "Wait and see 1, 2, and three."
   d. Usually the change from the BIP indicates the beginning of the fertile phase. These changes continue until the Peak day.
2. The Peak Day Rule: Intercourse is avoided until the fourth day after the Peak day has been identified. From this time until the end of the cycle, the couple may have intercourse every day and at any time.

A record of the observations is made on a chart with symbols or color-coded stamps: red is for bleeding, green is for dryness, white with a baby is for possible fertility, and yellow is for discharge. The couple then choose to have sexual intercourse during the fertile or infertile phases of the woman's menstrual cycle, depending on their family planning intention.

A modification of the Billings ovulation method is the Creighton Model of Natural Family Planning (CrM NFP). This model uses the same theory but has a standardized teaching plan and a code system for charting. The model is based on intensive education of the instructors and natural family planning clients and rooted in basic principles of fertility appreciation.

The Basal Body Temperature Method

The basal body temperature method detects when ovulation occurs. This is possible because progesterone, released by the corpus luteum, causes an increase in basal body temperature. Before a basal body temperature shift is considered ovulatory, the temperature must be at least 0.4°F above the previous six temperatures prior to the shift. Detection of this rise in temperature thus identifies the luteal, or postovulatory, phase of the menstrual cycle. The rise in basal body temperature occurring with ovulation may be abrupt (1 to 2 days), may occur as a slow rise extending over several days, may occur in a staircase pattern of sequential slight increases (0.2°F) every 2 to 3 days, or may occur in a zigzag pattern of sequential and progressively greater increases and decreases over a period of several days (e.g., an increase of 0.4°F, decrease of 0.2°F, increase of 0.4°F, etc.). In all temperature elevation patterns a sustained level of increase is evident. Occasionally a sharp dip in temperature precedes the rise in basal body temperature occurring with ovulation. The pattern of the rise in temperature may vary both from woman to woman and from cycle to cycle for the same woman.

The fertile days from ovulation through the postovulatory phase of the menstrual cycle are determined by considering that the fertile days continue either until there has been a sustained elevation or plateau of the temperature for 3 days

or until there have been 5 days of progressive increase (e.g., the zigzag, staircase, or slow rise pattern). The infertile days follow and continue through the luteal, or postovulatory, phase of the menstrual cycle until menstruation. The basal body temperature method, by itself, is only for determining when ovulation occurs and identifying the subsequent postovulatory fertile and infertile days. This method cannot predict the time of ovulation or determine the preovulatory fertile and infertile days.

Instructions for taking one's temperature are usually found on the back of the graph used for plotting the temperature and must be rigorously followed for the information to be of greatest usefulness. These instructions include how and when to take the temperature, what data to record, and how to record the data on the temperature record throughout the menstrual cycle. A basal body temperature, or ovulation, thermometer is most useful for detecting temperature change, increasing accuracy, and interpreting records. Such thermometers are calibrated in gradations of 0.1°F rather than the standard gradations of 0.2°F found on regular, or fever, thermometers. Basal body temperature thermometers may be purchased in most drug stores. The daily temperature reading should be recorded on graph paper, preferably paper designed for plotting tenths of a degree.

The woman should take her temperature every day—at the same time every day, if possible, and after 5 to 6 hours of uninterrupted sleep. Since any activity may raise the basal body temperature, the woman should take her temperature upon awakening and before doing anything else (e.g., talking, eating, drinking, kissing, smoking, getting out of or moving around in bed). The woman may select how she wishes to take her temperature—orally or, for greatest accuracy, rectally. Whichever way she chooses to take her temperature, she should always use the same site thereafter, since temperature readings vary from site to site.

Besides the phase of the menstrual cycle and the activities mentioned in the preceding paragraph, the following factors may affect the basal body temperature and possibly render the month's record invalid.

1. Illness
2. Emotional tension or upset; stress
3. Travel
4. Lack of sleep or irregular sleeping hours
5. Use of electric blankets
6. Sedatives
7. Gastrointestinal disturbances
8. Immunizations
9. Alcohol intake
10. The time of day
11. The climate

If a woman is aware of these factors and notes their existence on the temperature graph, she will be able to make a much more critical analysis and accurate interpretation of the record.

The Sympto-Thermal Method

The sympto-thermal method utilizes all the signs and symptoms that ovulation is impending or has occurred. Thus, it encompasses mucus observation and the basal body temperature method and adds other indicators of ovulation, as shown in Figure 17-2. Other signs and symptoms of impending ovulation or its occurrence experienced by some women are as follows:

1. Mittelschmerz. This midcycle pain encompasses a number of signs and symptoms, including
   a. pain located just off center in the lower abdomen and caused by the rupturing follicle
   b. spotting or breakthrough bleeding
   c. bearing-down or dragging pains
   d. general tenderness in the lower midabdomen and pelvic area
2. Increase in sexual interest (libido). This may also occur at other times during the cycle, however.
3. Mood changes. Feelings of depression or mercurial mood swings are more common during the postovulatory (luteal) phase of the cycle.
4. Cervical mucus ferning. Detection requires microscopic examination of dried cervical mucus. A fernlike pattern of the cervical mucus is observable during the days of the menstrual cycle when estrogen is predominant. Ferning is most pronounced at the time of ovulation. The fern pattern is readily distinguishable and is different from the beadlike pattern that replaces it during the postovulatory (progesterone) phase of the menstrual cycle. Under the influence of estrogen, cervical mucus also exhibits a prop-

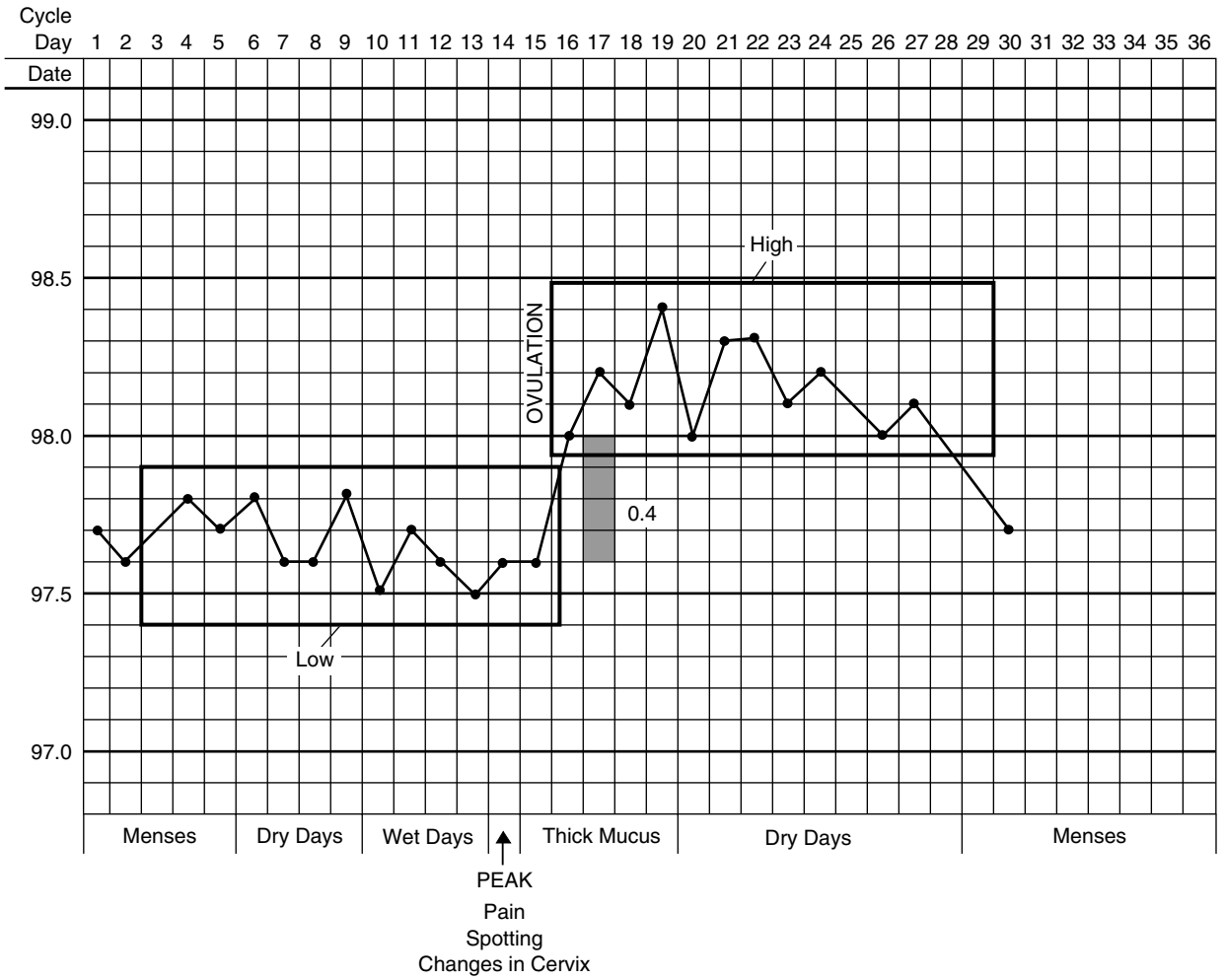

FIGURE 17-2 Sympto-thermal method.

Source: The Human Life and Natural Family Planning Foundation.

erty known as spinnbarkeit, which was mentioned previously as a distinctive characteristic of the "wet days."

5. Cervical changes. These changes include softening, slight dilatation of the cervical os, and a change in position to higher in the vaginal canal as ovulation approaches. After ovulation the cervix again becomes firm, closed, and lower in the vaginal canal. Detection of the cervical position is an optional sign.
6. Breast tenseness and tenderness. These symptoms occur during the postovulatory (luteal) phase of the cycle under the combined influence of estrogen and progesterone.

Other means of determining the time of ovulation are known (e.g., endometrial biopsy, hormonal assay of urine or blood, ultrasound examination of the ovaries), but practicalities prohibit their use for contraceptive purposes. There are also a number of commercial ovulation detection and hormone monitoring kits on the market. They vary widely in price, efficacy, and failure rates. Data are largely anecdotal.

The observations are entered on a specifically designed cycle chart (see Figure 17-3). As with the ovulation method, the effectiveness of the sympto-thermal method is dependent on good instruction by competent teachers, understanding of the method, and steadfast application of the rules.

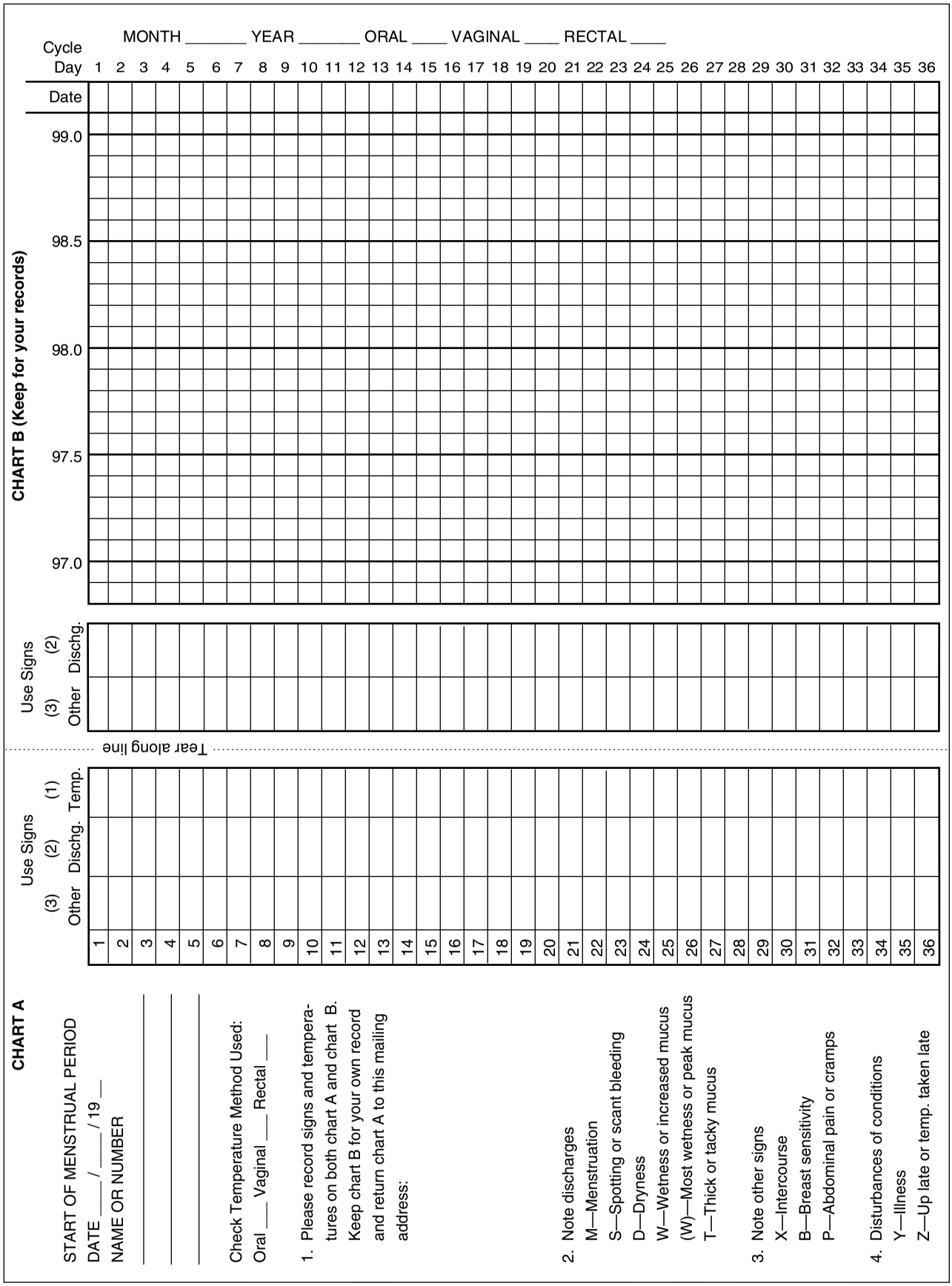

FIGURE 17-3 Chart for recording sympto-thermal method observations.

Source: The Human Life and Natural Family Planning Foundation.

Lactation Amenorrhea Method

The lactation amenorrhea method (LAM) was probably used in developing countries long before studies confirmed that pregnancies are rare during the first 6 months postpartum among women who practice full or nearly full breastfeeding. Ovulation is inhibited by the high levels of prolactin. A summary of 13 studies from eight countries gave rise to a conclusion, known as the Bellagio Consensus Statement, "that breastfeeding provides more than 98 percent protection from pregnancy during the first 6 months postpartum if the mother is fully or nearly fully breastfeeding and has not yet experienced vaginal bleeding after the 56th day postpartum" [2].

The guidelines for the use of LAM are as follows:

1. The baby must be less than 6 months old.
2. The woman has no vaginal bleeding after 56 days postpartum.
3. Breastfeeding must be the exclusive source of nourishment for the baby.

There is a 2 percent pregnancy rate among women who follow these guidelines for the first 6 months postpartum. It is recommended that the natural protection afforded by LAM be incorporated into the teaching of natural family planning. The woman should continue to be aware of and observe symptoms that alert her to the possibility of approaching fertility. Both the ovulation and the sympto-thermal methods include special instructions in regard to lactation and weaning.

Client/Couple Instruction

The instructional program for any of the methods of natural family planning consists of a series of classes as well as follow-up visits for chart review and clarification and reinforcement of the method. Ultimately, the goal is for the couple to develop sufficient confidence in their own observations and interpretations that they achieve autonomy in using their chosen method. Many women also feel a sense of great empowerment in learning to know their own bodies and to work successfully to fulfill their own fertility goals.

Technology and Natural Family Planning

Accelerated research in developing tests for predicting ovulation has produced some home monitoring products. If these products continue to be refined and meet the criteria of accuracy and ease of use, they will be valuable adjuncts to learning natural family planning for women who have problems identifying the signs and symptoms of ovulation or for women who would like a more objective manner of assessing fertility [3]. A number of small, handheld microscopes have been developed and marketed for the purpose of self-observation of fern-ing patterns in either saliva or cervical-vaginal mucus. Variable results were obtained and the conclusion of some published studies were that further research needs to be conducted to evaluate the use of these microscope fertility monitors [4–6].

References

1. World Health Organization. *Natural Family Planning: A Guide to Provision of Services*. Geneva, Switzerland: WHO, 1988, p. 1.
2. Kennedy, K. I., Rivera, R., and McNeilly, A. S. Consensus statement on the use of breastfeeding as a family planning method. *Contraception* 39:477–496, 1989.
3. Cavero, C. Using an ovarian monitor as an adjunct to natural family planning. *J. Nurse-Midwifery* 40(3):269–276 (May/June) 1995.
4. Barbato, M., Pandofi, A., and Guida, M. A new diagnostic aid for natural family planning. *Adv. in Contraception* 9:335–340, 1993.
5. Fehring, R., and Gaska, N. Evaluation of the Lady Free Biotester in determining the fertile period. *Contraception* 57:325–328, 1998.
6. Guida, M., Barbato, M., and Bruno, P., et al. Salivary ferning and the menstrual cycle in women. *Clin. Exp. Obstet. Gynecol.* 20:48–54, 1993.

Bibliography

Barbato, M., Pandofi, A., and Guida, M. A new diagnostic aid for natural family planning. *Adv. Contraception* 9:335–340, 1993.

Billings, E., and Westmore, A. *The Billings Method*, rev. ed. Victoria, Australia: Anne O'Donovan

Pty. (distributed in Australia by Penguin Books, Australia), 1992.

Billings, E. L., et al. Symptoms and hormonal changes accompanying ovulation. *Lancet* 1:282, 1972.

Billings, J., Billings, E., and Cataranich, M. *Atlas of the Ovulation Method*, 5th ed. Melbourne, Australia: Ovulation Method Research and Reference Centre of Australia, 1989.

Brown, J. B. *Studies on Human Reproduction: Ovarian Activity and Fertility and the Billings Ovulation Method*. Melbourne, Australia: Ovulation Method Research and Reference Centre of Australia (July) 2000.

Cavero, C. Using an ovarian monitor as an adjunct to natural family planning. *J. Nurse-Midwifery* 40(3):269–276 (May/June) 1995.

Clubb, E., and Knight, J. *Fertility: Fertility Awareness and Natural Family Planning*, 3rd ed. Trowbridge, England: Redwood Books, 1996.

Contraception during breastfeeding. *The Contraception Report* IV(5):7–11 (November) 1993.

Davis, M. S. Natural family planning. *NAACOG's Clinical Issues in Perinatal and Women's Health Nursing* 3(2):280–290, 1992.

Elstein, M., Jennings, V., Queenan, J. T., et al. (Eds.) Natural family planning and reproductive health awareness: expanding options and improving health. Proceedings of a conference. *Advances in Contraception* 13(2/3):81–384 (July/September) 1997.

Fehring, R. New technology in natural family planning. *J. Obstet. Gynecol. Neonatal Nurs.* 20:199–205, 1991.

Fehring, R., and Gaska, N. Evaluation of the Lady Free Biotester in determining the fertile period. *Contraception* 57:325–328, 1998.

Guida, M., Barbato, M., and Bruno, P., et al. Salivary ferning and the menstrual cycle in women. *Clin. Exp. Obstet. Gynecol.* 20:48–54, 1993.

Hilgers, T. W., Abraham, G. E., and Cavanagh, D. Natural family planning: the peak symptom and estimated time of ovulation. *Obstet. Gynecol.* 52:575–582, 1978.

Kambic, R. Natural family planning use—effectiveness and continuation. *Am. J. Obstet. Gynecol.* 165(6):2046–2048, 1991.

Kennedy, K. I., Rivera, R., and McNeilly, A. S. Consensus statement on the use of breastfeeding as a family planning method. *Contraception* 39:477–496, 1989.

Labbock, M. H., Perez, A., and Howie, P. W. Overview and summary: the interface of breastfeeding, natural family planning, and the lactation amenorrhea method. *Am. J. Obstet. Gynecol.* 165(6):2013–2026, 1991.

McCarthy, J. J., Martin, M., and Gildenhorn, M. *The Sympto-Thermal Method*. Washington, DC: Human Life and Natural Family Planning Foundation of America, 1977.

Odeblad, E. Cervical mucus and their functions. *J. Ir. Coll. Physicians Surg.* 26(1)27–32 (January) 1997.

Queenan, J. T., and Moghissi, K. S. Natural family planning: Looking ahead. *Am. J. Obstet. Gynecol.* 165:1979–1980, 1991.

Queenan, J. T., et al. (Ed.), Natural family planning: Current knowledge and new strategies for the 1990s. Proceedings of a conference. *Am. J. Obstet. Gynecol.* 165(6-Supplement) (December) 1991.

Ryder, R. E. J. "Natural family planning": effective birth control supported by the Catholic Church. *Br. Med. J.* 307:723–726 (September 18) 1993.

Weschler, T. *Taking Charge of Your Fertility: The Definitive Guide to Natural Birth Control and Pregnancy Achievement*. New York: Harper Perennial, 1995.

World Health Organization. *Natural Family Planning: A Guide to Provision of Services*. Geneva, Switzerland: WHO, 1988.

World Health Organization Task Force for the Determination of the Fertile Period. A prospective multicentre study of the ovulation method of natural family planning: II. The effectiveness phase. *Fertil. Sterility* 36:591–598, 1981.

Resources

Billings Ovulation Method Association (BOMA)
Sue Ek, Director
Office of NFP
PO Box 16206
St. Paul, MN 55116
(888) 637-6371 or (651) 699-8139
(651) 699-8144 (FAX)
boma-usa@msn.com
[*ovulation method*]

Centro Billings de Los Angeles
610 Cypress Ave.
Los Angeles, CA 90065
(213) 251-3214
[*ovulation method—Spanish*]

Couple-to-Couple League
John and Sheila Kippley, Founders
Mark Hayden, Director
PO Box 111184
Cincinnati, OH 45211-1184
or
4290 Delhi Pike
Cincinnati, OH 45238
(513) 471-2000 or (513) 557-2449 (FAX)
ccli@ccli.org
www.ccli.org
[*sympto-thermal method*]

Family of the Americas Foundation
Mercedes Wilson, Executive Director
PO Box 1170
Dunkirk, MD 20754
(301) 627-3346 or (301) 627-0847 (FAX)
family@upbeat.com
familyplanning.net
[*ovulation method*]

Northwest Family Services, Inc.
Rose Fuller, Executive Director
4805 N.E. Glisan St.
Portland, OR 97213
(503) 215-6377 or (503) 215-5967 (FAX)
nfs@teleport.com
www.nwfs.org
[*sympto-thermal method*]

Pope Paul VI Institute for the Study of Human Reproduction
Thomas Hilgers, MD, Executive Director
6901 Mercy Rd.
Omaha, NE 68106
(402) 390-6600 or (402) 390-9851 (FAX)
PopePaulVI.com
[*ovulation method: Creighton Model Fertility Care System*]

For updates of this list, as well as international referrals, contact the Diocesan Development Program for Natural Family Planning, 3211 4th St. NE, Washington, DC 20017-1194. Tel. (202) 541-3240; www.nccbuscc.org.

CHAPTER

18

Nonhormonal Contraceptive Methods

Spermicidal Preparations

The active agent in most spermicidal preparations is nonoxynol-9, which inactivates sperm but has *not* been shown to be an effective vaginal microbicide [1]. Because spermicidal chemicals are toxic to normal vaginal epithelial cells, frequent or long-term use of a spermicidal preparation can damage the vaginal epithelium, and vaginal irritation and ulceration can result. In such an event a woman is more susceptible to the HIV virus [1, 2]. Allergies to nonoxynol-9 contraindicate the use of spermicidal preparations.

The greater part of a spermicidal preparation is an inert base, which acts as the vehicle. This nonreactive base also serves as a mechanical block to the cervical os. Most spermicidal preparations have an acid pH of 4.5 and thus create a hostile vaginal environment for the mildly alkaline semen. This is particularly important at the external cervical os because the cervical secretions become slightly alkaline at the time of ovulation and therefore receptive to the sperm.

Some spermicidal preparations are made, and are so designated in the accompanying literature, to be used with a condom alone and not in conjunction with a diaphragm. Others are made to be used only with the diaphragm or cervical cap and should not be used with condoms. Oil-based preparations increase the possibility of condom breakage and reduce the integrity of the condom. The midwife should emphasize to the woman the importance of reading the literature that accompanies each commercial spermicidal preparation.

All spermicidal preparations exhibit certain common features: ability to immobilize and kill sperm, widespread vaginal distribution with the initial thrust of the penis, and formation of a surface film on the inside of the vagina that withstands coital activity. The spermicidal preparation is inserted near the cervix, and coital movements distribute it throughout the vagina and over the cervix. However, the possibility of contraceptive failure due to inadequate distribution is inherent in the method.

In addition to these features, each preparation has its own specific characteristics. These are enumerated with each type of preparation: jellies and creams, aerosol foam, suppositories, sponges, and film. Two other types of spermicidal preparations, rarely used and difficult to find in the United States, are widely used in other countries and are presented here for general information: vaginal foam tablets and the sponge and foam.

Jellies and Creams

The jellies and creams are packaged in tubes. The kits in which they are sold also contain an applicator and instructions. Since these preparations can be diluted by vaginal secretions, an adequate amount of the preparation must be inserted in accord with the instructions. To facilitate depositing the spermicidal preparation near the cervix, the woman should lie on her back, insert the applicator in a downward and backward direction the full length of the vagina, and then withdraw it about half an inch before pushing the plunger. (See "Instructions for the Use of Spermicides," later in this chapter.)

Aerosol Foam

In aerosol form, the spermicidal agent is under pressure in a container with an inert gas. Foam, a vari-

ation of the cream spermicidal preparation, is released into an applicator when the applicator is pressed against the container. The procedure for inserting a spermicidal foam is the same as that for jellies and creams. (See "Instructions for the Use of Spermicides.")

Suppositories

Products advertised for feminine hygiene should not be mistaken for contraceptive suppositories. Contraceptive suppositories are cone-shaped and contain a spermicidal ingredient incorporated into a cocoa butter or glycerogelatin base. Their melting point is slightly below body temperature. This makes them a poor choice of method in areas where the weather is hot and refrigeration is lacking.

The average melting time of the suppository at body temperature is around 10 minutes; therefore the suppository should be inserted into the vagina at least 15 minutes before coitus, and some brands instruct users to wait 30 minutes. Some couples find this waiting period objectionable. Other couples object to the excessive messiness that can be associated with this method. The suppository is one of the least effective of the spermicidal preparations.

Vaginal Contraceptive Sponge

The vaginal contraceptive sponge, Today Sponge, was introduced to the market as an over-the-counter female contraceptive in 1983. Production was suspended in March 1994 and discontinued in January 1995. At issue were production costs and Food and Drug Administration (FDA) manufacturing requirements [3]. As of this writing, the Today Sponge is about to be reintroduced in Canada and the United States by a different manufacturing company. The Today Sponge is made of a soft polyurethane foam that contains 1000 mg of nonoxynol-9 that is continuously released into the vagina for a period of 24 hours. It also serves as a trap to absorb semen and as a physical barrier between sperm and the cervix. The sponge is wet with tap water and squeezed to activate the spermicide and produce a large amount of suds to facilitate insertion. It is left in place for 24 hours and no more than 30 hours to include a waiting period of 6 hours after the last act of intercourse. It has an attached loop that facilitates removal. The Today Sponge is contraindicated for use during menstruation or immediately after childbirth or abortion, or by a woman with a history of toxic shock syndrome.

Vaginal Contraceptive Film (VCF)

Vaginal contraceptive film is a water-soluble product that contains nonoxynol-9. Each piece of film is approximately 2 in. square and is inserted to cover the cervical os at least 5 to 15 minutes prior to sexual intercourse to give it time to dissolve. It remains effective for at least 1 hour after it has dissolved. Film can be used by itself or with a condom or placed inside a diaphragm or cervical cap.

Film can be bought across the counter and is easy for a woman to carry with her. It can be inserted with one finger, which should be dry. A new film should be inserted with each act of intercourse. Contraindications include sensitivity and allergy.

Vaginal Foam Tablets

The 1-gram vaginal foam tablet is round, flat, and white and contains a spermicide, a bacteriostatic agent, and ingredients that, when moistened, produce a carbon dioxide foam. The woman lies on her back and moistens the tablet with a little water or saliva. She waits to see or hear it fizz. If the tablet does not fizz when it is moistened, it should be discarded and another tablet used. When the tablet fizzes, the woman immediately inserts it into her vagina, pushing it in as far as she can with her finger. A 5-minute interval must be allowed between insertion and sexual intercourse for the initial foaming action to distribute foam throughout the vagina. The tablet further dissolves and there is additional foaming action at the time of ejaculation.

Women have complained about an irritative vaginal reaction, and both men and women have complained about a burning sensation during the foaming process. Women may object to this method if they have an aversion to inserting a finger into their vagina.

The vaginal foam tablet is considered one of the least effective of the spermicidal methods. However, it has been accepted by some women who are poorly motivated or minimally educated because of the simplicity of the technique involved. Because of their greater willingness to use it, they may use the vaginal foam tablet with increased regularity. Thus, for these women, it may be a more effective protection from conception than other contraceptive methods.

Sponge and Foam

In the sponge and foam method, a spermicidal powder or liquid is applied to a small water-moistened sponge. The sponge is squeezed gently so

that the powder or liquid forms a foam, and then the sponge is inserted into the vagina with as little loss of content as possible.

Reserve foaming power permits sexual intercourse any time within 6 hours after insertion. Within this period, coital movements produce more foam. If more than 6 hours elapse from the time of insertion to the time of sexual intercourse, the sponge must be removed and additional spermicidal powder or liquid applied; then the sponge is reinserted. The sponge should not be removed until at least 6 hours after sexual intercourse. If during this 6 hours the woman wishes to have intercourse again, another smaller sponge is inserted in addition to the first sponge.

The sponge and foam method is one of the least effective of the spermicidal contraceptive methods. Nevertheless, it is a simple method, and some women gain confidence that they are using an effective method when they see the sponge filled with foam.

Effectiveness, Complaints, and Management

It is imperative that users of spermicides other than the Today Sponge and the sponge and foam method observe the following principles if the preparations are to be an effective method of family planning.

1. Reapplication of the method if the woman gets up, walks around, or goes to the bathroom after insertion but before sexual intercourse.
2. Reapplication of the method if sexual intercourse does not occur within 60 minutes of the time of insertion.
3. Reapplication of the method before each act of sexual intercourse.
4. No douching until at least 6 hours after the last act of sexual intercourse. Douching prior to this time may dilute or remove the spermicidal preparation before the sperm have been completely inactivated, thereby rendering the method ineffective.

These principles may be rephrased and reiterated as instructions for the woman in using a spermicidal method. (See "Instructions for the Use of Spermicides.") They become the most important element of the care provided by the midwife when a woman chooses to use spermicidal preparations with or without condoms.

Table 16-2 (page 464) shows that there is considerable difference between the percent of failures of spermicides with perfect use and with typical use. The higher rate with typical use suggests that women using spermicidal preparations may be less well motivated than users of other methods to use a contraceptive method routinely. This may in turn reflect infrequent or inconsistent sexual contact. Spermicidal preparations are readily available in drug stores without prescription, and they are easy to use. Their cost varies according to type and brand, but it generally is not prohibitive. The Today Sponge, film, tablets, and sponge and foam are not good contraceptive choices for a woman who objects to inserting her finger in her vagina.

The messiness of spermicidal preparations has been the major complaint of couples using them. Postcoital leakage of some degree is common to all of the spermicidal preparations except film. One of the advantages of the aerosol foam is that it creates less postcoital leakage because a smaller amount (by weight) of foam is required than of jelly or cream. The least esthetic choice is the suppository since, when it is adequately dissolved, the spermicide drains freely over the perineum both during coitus and postcoitally. The woman's sexual pleasure may be lessened if she finds postcoital drainage annoying. The woman can control postcoital drainage by placing a clean towel or tissues between her legs against the perineum; this will absorb moisture and she will feel more comfortable.

Another objection has been from couples who enjoy oral-genital sexual activity as part of their lovemaking. Their complaint is that the spermicidal preparations do not taste good. This problem is increased as the amount of drainage increases.

Finally, some couples feel negative about having to watch the clock and time their actions in relation to the action of the spermicidal preparation.

Instructions for the Use of Spermicidal Foam, Cream, or Jelly

Instructions are central to counseling for contraceptive method effectiveness. The following instructions are for women who plan to use spermicidal foam, cream, or jelly.

1. Practice filling and inserting the applicator in the dark before actually using it for contraception.
2. If using foam, shake the can 15 times before filling the applicator.
3. Fill the applicator.
4. Lie down and insert the spermicide when and where you plan to have intercourse. If you get up, walk around, go to the bathroom, and so forth after insertion of the spermicidal preparation but before sexual intercourse, the method

is rendered invalid because a large portion of the spermicide will drain out as you change position. In this circumstance, if contraception is desired, another applicatorful of the spermicidal preparation must be inserted before sexual intercourse (again, while you are lying down). For the same reason you should not get up and go to the bathroom to insert a spermicidal preparation.

5. Insert the applicator into the vagina as far as it will go by pressing downward and inward.
6. Withdraw the applicator $^1/_2$ inch and then push the plunger. This will deposit the spermicidal preparation at the cervical os.
7. If coitus does not take place within 60 minutes of insertion of the spermicidal preparation, insert another applicatorful before sexual intercourse if contraception is desired.
8. Be sure to insert another applicatorful of spermicidal preparation prior to each act of repeated sexual intercourse if contraception throughout is desired.
9. Keep in mind that douching is not necessary or encouraged. However, if you douche, do *not* douche for at least 6 to 8 hours after the last sexual intercourse. The contraceptive protection of the spermicidal preparation may be lost if you douche earlier than this.
10. Use a small towel, tissues, or a panty liner between your legs to catch drainage and reduce messiness.
11. For greatest effectiveness in protecting against pregnancy, use the spermicidal preparation method of contraception in conjunction with a condom.

Condoms

The Male Condom

The male condom is a sheath of strong, thin, elastic rubber (latex), polyurethane (plastic), or collagenous material. It is unrolled down over the erect penis to catch the semen during ejaculation and prevent its being deposited in the vagina. Latex and polyurethane condoms also are effective in preventing transmission of HIV and reducing the risk of sexually transmitted diseases. However, male condoms do not cover all exposed areas, and according to the CDC "they are likely to be more effective in preventing infections transmitted by fluids from mucosal surfaces (e.g., gonorrhea, chlamydia, trichomoniasis, and HIV) than in preventing those transmitted by skin-to-skin contact (e.g., herpes simplex virus [HSV], human papillomavirus [HPV], syphilis, and chancroid) [2]. Natural membrane condoms, while preventing pregnancy, do not prevent HIV, hepatitis B, or herpes simplex virus infection.

Effectiveness, Complaints, and Management

Three techniques will enhance the efficacy of a condom:

1. The condom must be in place before the penis approaches the female genitalia because the HIV virus is found in the pre-ejaculatory fluid. Contrary to what was believed for decades, sperm are not found in the pre-ejaculatory fluid [4].
2. When a plain-ended condom is used, an overlap of $^1/_2$ inch should be allowed for collection of the semen, to decrease the possibility that the condom might break at the time of ejaculation (see Figure 18-1).
3. Because the penis becomes flaccid following ejaculation, it is important that the male withdraw from the vagina immediately following ejaculation while securely holding the edge of the condom so that there is no leakage of semen from the open end of the condom and so that the condom does not slip off into the vagina while the male is withdrawing.

These three techniques form the major portion of the vital instructions that both a woman and her partner should be given (see "Instructions for Use of the Condom").

If the condom is used consistently and correctly, the only reason for contraceptive failure is defects in the condom itself. Defects include weakness of material, which might allow the condom to break from the force of ejaculation, or minute holes,

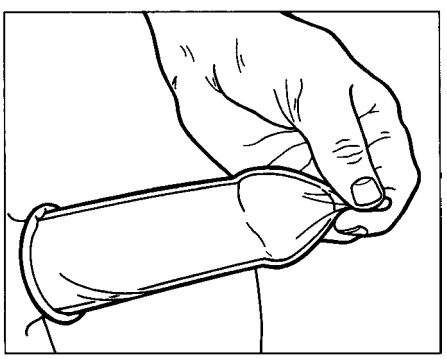

FIGURE 18-1 Leaving $^1/_2$ in. of empty space when using a plain-ended condom.

Source: Drawing reproduced by permission from *The Contraception Report*, Emron, Inc.

which render it ineffective. Condoms made in the United States are unlikely to have imperfections because they are manufactured under the supervision and quality control of the Food and Drug Administration. A condom can be tested by overdistending it with water or air and then checking for leakage, but testing it in this manner may weaken the condom and cause it to break when it is actually used. A condom is used once and thrown away. There is a combined average rate of approximately 4 percent for breakage and slippage [5]. The large discrepancy in the rates of failure for perfect use and typical use of the male condom (see Table 16-2, page 464) probably results from a combination of poor technique and inconsistent usage.

Condoms, variously known as "rubbers," "safes," "sheaths," or "prophylactics," are readily available. The cost varies with the brand, but generally condoms are not expensive. There are over 100 brands of condoms, of different sizes (length and width), shapes (tapered; straight), thickness, texture (smooth; ribbed), and color or translucency; with or without a reservoir tip or nipple tip; with or without scent; with or without a lubricant (a dry condom is usually preferred for oral sex); and with or without a spermicide (inside, outside, or both). A condom with a spermicide (either sold as a spermicidal condom or with a spermicide applied to its surface) is *not* considered a double method and is not recommended [2]. Spermicide applied to the outside of a condom (which may leach into the condom) is not nearly as effective at preventing pregnancy as a vaginal spermicide inserted separately at the cervical os. The combination of a condom and an intravaginal spermicidal preparation provides added protection, particularly if the condom breaks or there is leakage of sperm when the male withdraws.

Although it is widely used, many couples have negative feelings about the condom. Some couples feel it dulls sensation; others feel it creates a barrier between them at a time when they desire the feeling of oneness that can be attained during sexual intercourse. The objection that sexual foreplay is interrupted in order to put the condom on the penis can be eliminated if the woman puts the condom on the man as part of their foreplay.

Instructions for Use of the Condom

1. Put the condom on the penis *before* it approaches the woman's external genitalia or is inserted into the vagina.
2. Check condoms not made in the United States before use.
3. If the man is not circumcised, the foreskin should be pulled back before unrolling the condom.
4. Unroll the condom down over the erect penis all the way down to the hair at the base of the penis.
5. If the condom has a plain end rather than a nipple end, leave an overlap allowance of $^1/_2$ inch for collection of the semen. This overlap space should have no air in it. Form the empty space by holding the end of the condom in a collapsed state while starting to roll it down over the penis.
6. Be sure there is adequate lubrication on the exterior of the condom, as it is more apt to tear from friction if there is insufficient lubrication. If using a latex condom and you need lubrication, use either water or a water-based lubricant; oil-based lubricants may rot the rubber. Most household "lubricants" are oil-based and should not be used (e.g., baby oil, cooking oils, margarine/butter, mineral oil, petroleum jelly, suntan cream/oil); the one exception is egg white. Vaginal therapeutics such as Monistat also are not safe to use with latex condoms. With a polyurethane condom it does not matter what kind of lubricant you use.
7. Following ejaculation, the man must withdraw his penis before it becomes flaccid.
8. To prevent the condom from falling off or leaking fluid while withdrawing, the man should hold on to the rim of the condom near the base of his penis.
9. Remove the condom from the penis away from the woman without spilling any semen and throw it away.
10. For greatest effectiveness in protecting against pregnancy, use the condom in conjunction with a spermicidal preparation.

A spermicidal preparation and condom may also be used as a backup method "to cover" another primary method of contraception at times when the primary method may not be as effective, such as in the following circumstances:

1. During the first month of initiating oral contraceptive pills
2. When a woman fails to take an oral contraceptive pill during a pill cycle
3. When a woman uses medication known to decrease the effectiveness of the oral contraceptive pill
4. During the first month after insertion of an intrauterine contraceptive device

The Female Condom

The Reality Female Condom was approved for use in the United States by the Food and Drug Administration in 1993 but did not reach the general public until August of 1994. It is made of a thin sheath of polyurethane with a flexible and movable inner ring on the closed end that is inserted into the vagina and a larger fixed ring on the outer open end that remains outside the vagina and covers the introitus (see Figure 18-2). The female condom comes in only one size and does not have to be fitted by a health care professional. It is prelubricated and comes with extra lubricant. Additional lubricants or spermicidal preparations may be used with it. The female condom is designed for one-time use only and costs between $3 and $4.

Effectiveness, Complaints, and Management

The female condom not only protects the woman against pregnancy but also offers effective protection against HIV, gonorrhea, chlamydia, and trichomoniasis when used correctly. When compared to the male condom, it may also provide a greater reduced risk of skin-to-skin sexually transmitted diseases such as human papilloma virus (HPV/genital warts), herpes simplex virus (HSV), syphilis, and chancroid, because it covers a larger exposed area and is a barrier between the introitus and vulva and the base of the penis [6]. The large discrepancy between failure rates with perfect use and with typical use (see Table 16-2, page 464) no doubt reflects problems mastering the technique involved and inconsistent use. Even after a program of education involving a video, counseling, and model practice, 25 percent of 1144 study participants did not insert the female condom correctly on the initial try in a self-insertion practice session. Additional instruction enabled all but 3 percent to succeed with two or three attempts [7]. Even though fitting is not needed, time for instruction and practice should be provided for women who choose this contraceptive method. Success in insertion is necessary for the female condom to be effective and for a woman to continue to use it.

To insert, the ring inside the closed end is compressed, and the closed end of the sheath is inserted into the vagina as far as the woman can get it past the pubic bone, where the sheath covers the cervix and adheres to the entire vaginal canal. The open ring remains outside the vagina and partially covers the vulva and perineum (see Figure 18-3). The penis is inserted into the open end of the sheath. The female condom can be inserted up to 8 hours prior to sexual intercourse but must be in place before the penis comes near the woman's external genitalia if it is to provide protection from pregnancy and infection. After intercourse, but before standing up, the woman squeezes and twists the outer ring to keep the semen inside the condom, and then gently pulls out the condom and throws it away (see Figure 18-4).

Complaints about the female condom include that both partners can feel the inner ring during use,

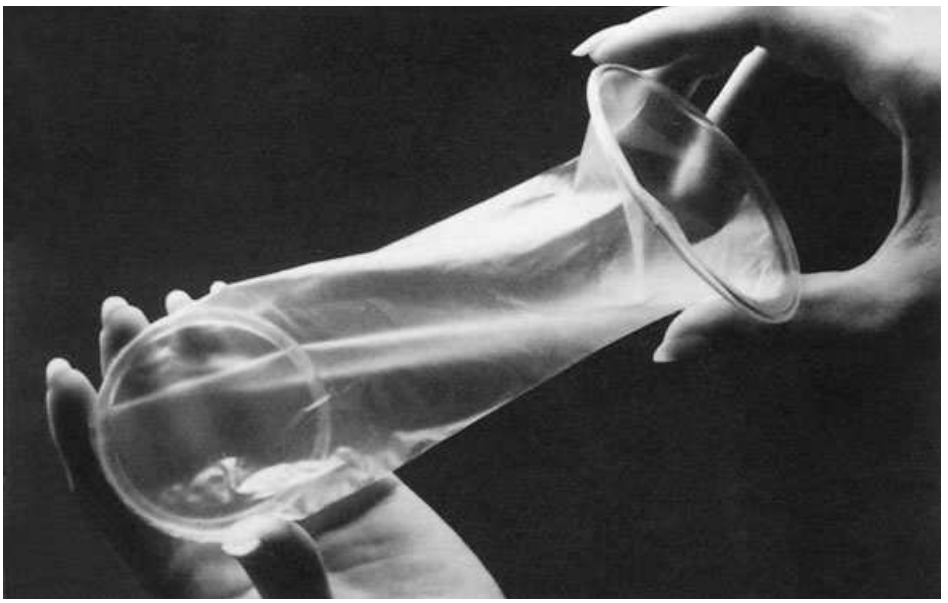

FIGURE 18-2 Female condom.

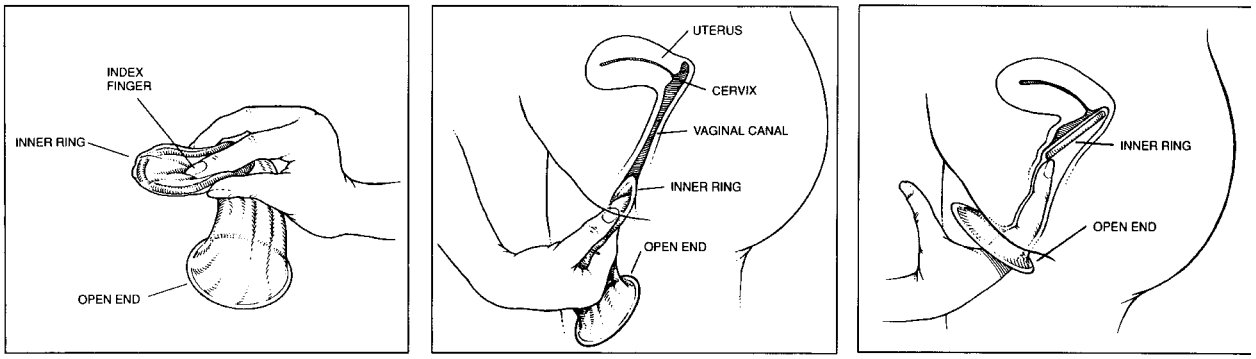

FIGURE 18-3 Inserting the female condom.

Source: Reproduced with permission from *The Contraception Report*, Emron, Inc. From Reality Female Condom, The Female Health Company, division of Wisconsin Pharmacal Co.

that the outer ring presses into the woman, that the sheath sticks to and moves with the penis, and that the outer ring moves with penile thrusting during intercourse. Checking for correct placement and adding more lubricant takes care of most problems. Although the female condom costs more than the male condom, 36 states provide reimbursement by Medicaid or other similar programs [8]. The female condom is also available free or at a reduced price at many public or nonprofit clinics [8].

A positive aspect of the female condom is that it gives the woman a way to protect herself from HIV and sexually transmitted diseases without having to rely on her male partner. Some couples prefer the feel of the polyurethane compared to that of latex male condoms. Some men prefer the freedom of movement given by the looseness of the female condom compared to the male condom. Some women have reported that the edge of the outer ring provides clitoral stimulation.

FIGURE 18-4 Removal of the female condom.

Source: Reproduced with permission from *The Contraception Report*, Emron, Inc.

Diaphragms

Description, Effectiveness, and User Response

The diaphragm provides a mechanical barrier between the sperm and ovum. It is dome-shaped, made of somewhat thicker latex rubber than the condom, and has a flexible metal spring encased in the rim. The spring permits compression of the diaphragm for insertion, yet allows the diaphragm to regain its shape and fit snugly against the vaginal tissues when in place. When the diaphragm is in proper position, with the dome side down and the rim snug against the anterior and lateral vaginal walls, it completely covers the cervix like a cup into which the cervix is suspended. The resulting barrier, combined with spermicidal jelly or cream spread around the rim and inside the dome of the diaphragm, denies sperm entry into the cervical os and access to an ovum, thereby preventing pregnancy. The diaphragm also provides some protection against cervical sexually transmitted diseases such as chlamydia and gonorrhea and resulting cervical dysplasia and pelvic inflammatory disease. The diaphragm does *not* protect women from HIV infection.

The dome of the diaphragm is approximately $1\,^1/_2$ in. deep at its apex. Each woman's vaginal size and contour is individual; thus the diameter of a diaphragm may vary from $5\,^1/_2$ to 10 cm (about $2\,^1/_4$ to 4 in.). Diaphragms are sized in increments of 5 mm

as measured across the diameter of the rim. They are available in sizes from 55 to 105 mm.

There are four types of diaphragms, which differ in the construction of the metal spring in the rim and in the width of the rim:

1. *Flat spring:* The spring in this diaphragm is a flat band made of lightweight stainless steel.
2. *Coil spring:* The spring in this diaphragm is a flexible circular coil of moderate strength.
3. *Arcing spring:* The spring in this diaphragm is a combination of a flat spring and a coil spring.
4. *Wide-seal rim:* Available in either coil or arcing spring, this diaphragm differs from the other types in that it has a flexible $1\,^1/_2$ cm wide flange attached to the inner edge of the rim.

The diaphragm is inserted into the vagina either by hand or with a mechanical inserter. (A mechanical inserter can be used only with a flat spring or a coil spring diaphragm.) To cover the cervix effectively, the diaphragm should be positioned as follows: posteriorly, the rim of the diaphragm fits behind the cervix into the posterior vaginal fornix; anteriorly, the rim of the diaphragm rests snugly against the soft tissues posterior to the symphysis pubis; and the diaphragm's entire circumference rests against the vaginal walls. It is important that the woman check to make sure the diaphragm is properly positioned after insertion. Proper positioning is not possible if the diaphragm no longer fits as a result of changes in the size, shape, or position of the pelvic structures. Therefore, a woman should be rechecked for both fit and possible change in size or type of diaphragm (1) a few weeks after her first sexual experiences; (2) after each pregnancy, regardless of the gestational age of the fetus and whether the pregnancy ends in abortion (spontaneous or therapeutic) or birth; (3) as part of her annual health care examination; and (4) if she has a weight gain or loss in excess of 10 lb (according to the manufacturer). One study has been done that suggests that refitting the diaphragm after weight gain or loss is unnecessary [9].

A spermicidal jelly or cream applied to the diaphragm greatly enhances its effectiveness because it provides double protection. The spermicidal preparation, which is made specifically for use with a diaphragm, is applied to the diaphragm before it is inserted by putting 1 to 2 teaspoonfuls in the dome and also spreading some around the rest of the inside of the diaphragm and around the rim. Approximately 6 hours are needed for the spermicidal preparation or vaginal secretions to immobilize and kill the sperm; therefore the diaphragm must remain in position for at least 6 hours following coitus. The diaphragm should be left in position if sexual intercourse is repeated within 6 to 8 hours, and an additional applicatorful of spermicidal jelly or cream should be inserted for each act of intercourse. Although douching is not recommended, women who wish to douche should wait at least 6 hours following the final act of intercourse to do so if they want to remain protected. Half of the douche should be used prior to removing the diaphragm; the remaining half should be used after removal.

The woman should check her diaphragm periodically for pinholes, wear, and brittleness of the rubber. It should be usable for at least two years if it is properly cared for by washing and thoroughly drying. Deodorant or perfumed soap should not be used on the diaphragm, nor should powders or talc. If a woman insists on using some form of powder, she may use cornstarch without harming the diaphragm. Oil-based lubricants will rot the rubber and should be avoided. Face creams and hand lotions are oil-based, so a woman should wash her hands thoroughly between using these and putting in her diaphragm. Most vaginal therapeutics for monilia and vaginal hormonal creams are oil-based and should not be used simultaneously with a diaphragm.

There are various potential reasons that a diaphragm might fail as a contraceptive method. Inherent in the method is the possibility of the diaphragm's becoming dislodged during sexual intercourse. Other major reasons for failure are improper positioning of the diaphragm upon insertion, negligence in using the spermicidal cream or jelly that accompanies the diaphragm, and inconsistent use.

Inconsistent use itself may result from any one or a combination of objections to the method. Some women have an aversion to touching themselves internally, as they must do to insert the diaphragm, check its position, and remove it. Other women object to what they consider the nuisance of inserting the diaphragm nightly or daily, as is recommended for consistent conception protection, or to the inconvenience of leaving it in for 6 to 8 hours after the last act of sexual intercourse. Although the diaphragm usually cannot be felt during sexual intercourse, some couples believe it creates a barrier between them. Some women state they lose all feeling of the anterior vaginal wall, which decreases their sexual pleasure. The taste of the spermicidal

jelly or cream is objectionable for those who enjoy oral sex during their lovemaking. On the other hand, an advantage of the diaphragm is that it catches menstrual flow, thus making coitus during menstruation less messy than it would be otherwise.

As shown in Table 16-2 (page 464), perfect use of the diaphragm with a spermicide has a 6 percent failure rate; the rate triples for typical use. This figure is for all women using this method. However, Trussell et al. distinguished between women who had intercourse fewer than three times weekly and those who had intercourse three times or more per week. They found that for those who had intercourse more frequently (who were usually younger), the risk of getting pregnant while using the diaphragm with spermicide was almost three times greater [10]. This finding has implications for counseling, which should take into account frequency of intercourse.

It was thought in the past that failure rates reflected the fact that some women found the techniques of the diaphragm method too difficult to learn, since a good understanding of female reproductive anatomy is beneficial. This idea has been thoroughly discredited with simple, clear instruction; supervision of practice in proper insertion, placement, and removal; and patience, time, and encouragement for this learning.

The cost of the diaphragm may be in addition to the cost of necessary examination for evaluation of pelvic structures and determination of the proper size and type of diaphragm. The cost varies according to the size of the diaphragm but is not high. The diaphragm usually comes in a kit that contains the diaphragm, an instruction pamphlet, a mechanical inserter (whose use is optional), and a tube of spermicidal jelly or cream. Periodic replenishing of the spermicidal preparation adds somewhat to the cost.

Contraindications and Side Effects

The diaphragm is contraindicated in the presence of any of the following:

1. Severe uterine prolapse (descensus) (second or third degree)
2. Severe cystocele (second or third degree)
3. Severe anteversion or retroversion of the uterus
4. Vesicovaginal or rectovaginal fistulas
5. Known allergy to the rubber of the diaphragm or to the accompanying spermicidal preparation

The first three conditions are contraindications because they render proper fit of the diaphragm difficult or impossible. Another contraceptive method is better if a good fit cannot be obtained with the diaphragm. The presence or absence of these contraindications is ascertained during the pelvic examination, as described in Chapter 61.

While a history of urinary tract infections is not a contraindication, it requires special attention as an association between diaphragm use and urinary tract infections has long been thought to exist. This association is most likely due to the pressure of the rim of the diaphragm against the urethra behind the symphysis pubis. Bacteria may be transferred to the urethra during vaginal intercourse. Pressure of the diaphragm rim on the urethra may hinder clearing these bacteria from the urinary tract. The woman should be taught to deliberately urinate after intercourse in an effort to reduce colonization of the bladder with vaginal bacteria.

Side effects include possible allergic reactions to either the rubber of the diaphragm, the spermicidal preparation, or both. In addition to concerns about urinary tract infections, women should be warned against wearing the diaphragm for prolonged periods of time or during menstruation to reduce any risk of toxic shock syndrome.

Management Plan for Use of the Diaphragm

Management of the care of the woman or couple selecting a diaphragm as the method of family planning consists of the following components:

1. Taking a general history, conducting physical and pelvic examinations, and obtaining laboratory tests and adjunctive studies (see Chapter 2)
2. Screening for any deviations from normal and for contraindications to the woman's use of the diaphragm (see Chapter 61)
3. Determining the type and size of the diaphragm for the individual woman
4. Teaching the woman how to insert, place, check, and remove her diaphragm
5. Scheduling her return visits
6. Instructing her in the use and care of the diaphragm

Fitting the Diaphragm The type of diaphragm to be used depends on vaginal size and contour, the position of the uterus, the amount of vaginal muscular support, and the depth of the arch behind the symphysis pubis. The different types of diaphragms are correlated with these anatomical characteristics as follows:

Flat spring: Used with normal vaginal size and contour, strong vaginal support, normal uterine

position, a shallow arch behind the symphysis pubis.

Coil spring: Used with either normal or unusual vaginal size and contour, strong vaginal support, normal uterine position, an average or deep arch behind the symphysis pubis.

Arcing spring: Used with unusual vaginal size and contour, poor vaginal support including first degree uterine prolapse or first degree cystocele, or mild displacements of the uterus (which could cause the rim of the flat spring or coil spring diaphragm to slide out of the posterior fornix into the anterior fornix, thereby leaving the cervix exposed). An arcing spring diaphragm is indicated for women who have had a vaginal delivery, as they will have at least some amount of a first degree cystocele.

The size of the diaphragm has to be determined individually for each woman, since the distance from the posterior fornix to the posterior aspect of the symphysis pubis varies from woman to woman. Generally, a nulligravida will be fitted with size 65, 70, or 75; a multipara with size 75, 80, or 85; and a grand multipara with size 85 or greater.

A woman can be fitted for her diaphragm either with fitting rings or with sets of the various sizes and types of diaphragms. The latter approach is far superior to using fitting rings because the rings are of no use in patient teaching and give no idea of the type of diaphragm appropriate for the woman.

In fitting a woman, start with a size in the middle of the probable range of sizes for her parity. With experience, you will be able to interpret mentally with a fair amount of accuracy what your fingers feel as a size during pelvic examination. Hatcher et al. give another way of estimating diaphragm size:

1. Insert your index and middle fingers into the vagina until your middle finger reaches the posterior wall of the vagina.
2. Use the tip of your thumb to mark the point at which your index finger touches the pubic bone.
3. Remove your fingers and place a diaphragm rim on the tip of your middle finger. The opposite rim of the potential right size diaphragm should lie just in front of your thumb tip. [11]

Remember that as a woman becomes accustomed to having a diaphragm in place and to the necessary digital manipulation, the resulting relaxation may require refitting her with a larger size diaphragm.

When fitting, lubricate the rim of the diaphragm with the same lubricant you use for performing a pelvic examination. Compress the sides of the diaphragm with the fingers and thumb of one hand, and introduce it into the vagina in the same way that you insert a speculum. Be sure to direct it downward and inward, thereby applying pressure against the posterior vaginal wall and avoiding the more sensitive anterior structures. Once the diaphragm is in the vagina, double-check its placement to be sure that the rim of the diaphragm is in the posterior fornix, the circumference is against the lateral vaginal walls, the rim is tucked up behind the symphysis pubis, and the cervix is covered, which can be felt through the rubber of the diaphragm.

To check the fit of the diaphragm, insert the tip of your index finger so that the pad of your finger is facing you between the rim of the diaphragm and the symphysis pubis. Then rub your fingers along the rim, pressing against the lateral vaginal walls. End by running your fingers behind the cervix and feeling the rim in the posterior vaginal fornix. The diaphragm is too small if you observe any of the following:

1. There is more than enough space for the flat portion of your fingertip between the rim of the diaphragm and the symphysis pubis.
2. The diaphragm moves about freely in the vagina.
3. The diaphragm is not large enough to tuck up behind the symphysis pubis.
4. The diaphragm comes out when the woman coughs or bears down.

The diaphragm is too large if you observe any of the following:

1. The rim of the diaphragm fits tightly against the symphysis pubis, thereby not allowing the flat portion of your fingertip to fit between the rim of the diaphragm and the symphysis pubis.
2. The rim of the diaphragm buckles forward against the lateral vaginal walls.
3. The edge of the diaphragm bulges out the vaginal introitus.
4. Tucking the rim of the diaphragm up behind the symphysis pubis causes it to buckle forward against the lateral vaginal walls.
5. The woman feels discomfort when the diaphragm is in place.
6. The woman experiences any or all of the following after the diaphragm is in place for an hour or more:
   a. abdominal pain
   b. back pain
   c. difficulty in urinating

d. rectal pain
e. cramps in her thighs

The diaphragm is the right size and type if you observe the following:

1. The diaphragm fits snugly in the vagina without buckling forward against the lateral vaginal walls.
2. There is just enough room for the flat portion of your fingertip to fit between the rim of the diaphragm and the symphysis pubis.
3. The diaphragm covers the cervix.
4. The diaphragm tucks both into the posterior fornix and up behind the symphysis pubis.
5. The woman can feel the diaphragm but it does not cause discomfort when it is in place.
6. The diaphragm causes no discomfort after it has been in place for an hour or more.
7. The diaphragm remains tucked up behind the symphysis pubis when the woman bears down or coughs.

Teaching the Woman How to Insert, Place, Check, and Remove Her Diaphragm

Once the woman has been fitted for type and size of diaphragm, an essential component of management is to teach the woman how to insert her diaphragm, check it for placement, and remove it. Whether the woman is comfortable with her ability to perform these techniques may well determine whether she will actually use her diaphragm.

Pelvic models are invaluable in teaching a woman the landmarks (i.e., symphysis pubis, cervix, posterior fornix, lateral vaginal walls) she needs to know in order to place the diaphragm properly. In addition, the pelvic models will give her some idea of the depth and direction of the vagina and the proximity of the pelvic organs and reassure her that the vagina is a dead end and, therefore, a diaphragm cannot travel somewhere else inside her body or escape through the cervical opening (which obviously is too small). She should practice insertion and removal of the diaphragm with the model until she is ready to practice on herself. It is important, when she practices with the model, that the woman hold the diaphragm in such a way that the manipulative techniques will be the same as when she actually inserts her own diaphragm—she should not insert the diaphragm into the model from the direction of an outside examiner.

The next step is for the woman to wash her hands and then insert her middle finger into her vagina and explore until she has located and identified her symphysis pubis and cervix. To do this she needs to be supported in an upright sitting position while her feet remain on the same horizontal level as her hips (i.e., on the bed or examining table, or in stirrups). This portion of the teaching may also take place either before or after you have fitted the diaphragm. It helps if you have already done your pelvic examination so you can help her locate her cervix if necessary.

Finally the woman practices insertion, placement, and removal of the diaphragm on herself. Wash and dry the fitting diaphragm you used that fit her. Place it on something clean such as a paper towel. Have her hold it, dome side down, with one hand while with the other hand she squeezes from the tube and evenly spreads approximately 1 to 2 teaspoonfuls of spermicidal cream or jelly around the inside of the cup and around the rim of the diaphragm. Emphasize that the spermicidal cream or jelly is an inherent part of the diaphragm method and the diaphragm should not be used without it. This is because the vaginal vault expands with female orgasm and sperm may escape around the rim of the diaphragm. The woman would then be without protection unless the spermicidal jelly or cream were there to continue blocking the sperm from entering the cervix. Without the spermicidal cream or jelly, the effectiveness of the diaphragm method is reduced.

Have the woman assume the same position she was in when she explored her anatomical structures. Then have her compress the sides of the diaphragm between her thumb and fingers, with her hand on top of the diaphragm. With the hand not holding the diaphragm, she spreads her labia and introduces the end of the diaphragm in front of her thumb and index finger into her vagina in a downward and inward direction. In order to keep the rims of the diaphragm together during insertion and push it into the vagina at the same time, she should use the hand she used for separating the labia to push the diaphragm in by placing it behind the hand compressing the diaphragm and pushing until the rim of the diaphragm is under the symphysis pubis. She can then tuck the rim up behind her symphysis pubis with a finger of whichever hand she chooses. She then checks the placement of the diaphragm, feeling the rim behind the symphysis pubis and the cervix, which is now covered by the rubber of the diaphragm. You should check to make sure she has placed the diaphragm correctly. The woman removes the diaphragm by inserting a

finger into her vagina, bearing down, grasping the upper edge of the diaphragm posterior to the symphysis pubis, and pulling the diaphragm down and out. She should compress the sides of the diaphragm as it comes out in order to reduce the diameter. This makes the insertion and removal procedures more comfortable. Large doses of encouragement and praise throughout this process are helpful.

Have the woman practice until both you and she are sure of what she is doing and she is able to prepare, insert, check placement of, and remove the diaphragm correctly without any help from you. Then have her get up and insert the diaphragm in the alternative positions: (1) standing with one foot on a chair (at home she might place one foot on the edge of the bathtub or on the toilet lid) and (2) while in a squatting position. Check her placement each time. Then have her remove the diaphragm while she stays in the same position she was in when she inserted it. She may find one or both of these positions more convenient or easier than the in-bed position.

After the woman has practiced the techniques described above, you should instruct her on the use and care of the diaphragm (see "Instructions in the Use and Care of the Diaphragm").

The Return Visits After being fitted for her diaphragm and having learned the techniques of preparation, insertion, checking, and removal, the woman should leave the clinic or office with her diaphragm in place. Instruct her to leave it in place for several hours. If the diaphragm is too large, she will develop discomfort/pain in her abdomen, back, rectum, or thighs during this time. In this case she should take the diaphragm out, use condoms and a spermicidal cream or jelly for contraception, and make an appointment to be refitted as soon as possible.

The woman should make an appointment for her first revisit two weeks after being fitted. During these two weeks she is to practice using her diaphragm daily or nightly whether or not she has sexual intercourse. For contraception during this two-week practice time she should rely on the combination of a spermicidal preparation and condoms. Ask her to return for her revisit with her diaphragm in place.

At her two-week revisit, the following history related to the diaphragm should be elicited:

1. How many times she wore it
2. The longest period of time she left it in place
3. Whether she had any abdominal pain, back pain, rectal pain, cramps in her thighs, or difficulty in voiding after the diaphragm had been in place for several hours
4. Whether she had any difficulties with the preparation, insertion, checking, or removal techniques
5. What position she is using for insertion and removal
6. Whether she likes the method and why or why not
7. What her sexual partner thinks about the method

A pelvic examination is done to evaluate the following:

1. Whether the diaphragm is placed properly
2. Whether the fit, type, and size of the diaphragm are still correct
3. Presence or absence of any pelvic pain
4. Presence or absence of any vaginal irritation

If all is well, the midwife reviews the instructions with the woman and gives her an appointment for her annual examination (general screening history, physical and pelvic examinations, Pap smear, and other routine laboratory tests).

Instructions in the Use and Care of the Diaphragm

1. Insert the diaphragm prior to sexual foreplay so that you need not interrupt your lovemaking or feel pressure to hurry (possibly making insertion difficult) or to neglect using it.

   If coitus always happens at a certain time, then make the insertion of the diaphragm part of your daily routine prior to this time. For example, if coitus occurs only at night, then before going to bed, wash your face, brush your teeth, and insert your diaphragm—every night.

   If you teach your partner how to prepare, insert, and check the diaphragm, these steps can become part of sexual foreplay before the penis comes in contact with your genitals or is inserted into your vagina.
2. Empty your bladder and wash your hands with soap and water.
3. Shake excess cornstarch (if any) off your diaphragm.
4. Put 1 to 2 teaspoonfuls of spermicidal cream or jelly in the dome of the diaphragm; also, spread some spermicidal cream or jelly around the rim and the inside of the diaphragm.

   Spermicidal cream and jelly are equally effective. The jelly may be both more lubricating and more messy. Which is used will depend on

your need for lubrication and your preference. Always make sure you use *contraceptive* jelly or cream.

5. Compress the sides of the diaphragm, and insert it dome side down.
6. Tuck the rim of the diaphragm up behind the symphysis pubis, and check to be sure that the cervix is covered.
7. You can walk around, bathe, and urinate with your diaphragm in place because it will neither get lost in your body nor fall out. However, if you have a bowel movement, check the position of your diaphragm afterwards and reposition it if necessary. It may have slipped out of the posterior fornix, thus leaving the cervix exposed.
8. If more than 2 hours elapse between insertion of your diaphragm and sexual intercourse, insert an applicatorful of spermicidal jelly or cream in the vagina, without removing the diaphragm, before intercourse.
9. If coitus is repeated, add another applicatorful of spermicidal jelly or cream, without removing the diaphragm, before each act of sexual intercourse.
10. Leave the diaphragm in place for at least 6 to 8 hours after the last act of sexual intercourse. This is because it takes 6 to 8 hours for either the spermicidal preparation or the hostile vaginal environment, or both, to kill the sperm.
11. Douching is not necessary or encouraged. However, if you wish to douche, do so when you remove the diaphragm. Half of a body-temperature, tap water douche is taken prior to removing the diaphragm; use the other half of the douche after removing the diaphragm. The douche is divided into these two portions on the outside chance that any semen containing sperm remains in the vagina. Douching has a tendency to encourage sperm to move inward through the cervical os rather than outward from the vagina. Any such semen is thus washed out before the protective barrier is removed.
12. Remove the diaphragm by bearing down, catching hold of the rim of the diaphragm behind the symphysis pubis and pulling it down and then out, compressing the sides as it comes.
13. Care for your diaphragm according to the following instructions:
    a. Do the following after each use:
        (1) Wash with a mild, nonperfumed soap.
        (2) Rinse with clear water.
        (3) Dry thoroughly.
        (4) It is not necessary to powder the diaphragm; do not use perfumed powders or talcum powder, as they will rot the rubber. If you feel you must use a powder, use cornstarch, which will not harm the diaphragm.
        (5) Store in a dry container away from heat (heat will rot rubber); use either the case the diaphragm came in or a clean cardboard box.
    b. Periodically check the diaphragm for areas of rubber deterioration, weakening, or holes by holding it up to light and gently stretching the rubber.
    c. Replace the diaphragm every two years because the rubber will weaken and deteriorate.
    d. Never use petroleum jelly with a diaphragm, as it may rot the rubber.
14. Make an appointment to be refitted for a diaphragm in the event of any of the following:
    a. if you are just beginning to be sexually active (after approximately 20 to 30 acts of coitus)
    b. after having a baby
    c. after having an abortion
    d. after any pelvic surgery
    e. after a weight gain or loss of 20 lb or more
15. Make an appointment before your annual examination in the event of any of the following:
    a. You lose your diaphragm.
    b. Your diaphragm is damaged or deteriorating.
    c. Your diaphragm needs to be refitted.
    d. You or your sexual partner is no longer happy with this method of contraception.

Cervical Caps

The Prentif Cavity Rim cervical cap was approved for use in the United States by the Food and Drug Administration in 1988. The round cone-shaped latex rubber cervical cap with a thick rim fits over the cervix and, because of suction created between the dome of the cap and the cervix, settles snugly, but not tightly, into the cervicovaginal fornices. In principle, the cervical cap is not unlike the diaphragm in that it creates a barrier to the sperm by covering the cervix and also holds spermicide to protect against pregnancy. It reduces the risk of cervical sexually transmitted diseases but does *not* protect againt HIV.

In comparison to the diaphragm, the cervical cap is associated with a smaller incidence of urinary

tract infections, as the rim does not press against the urethra. However, the cervical cap cannot be worn during menstruation. A common complaint with the cervical cap is the increased vaginal discharge it creates and what is called "cap odor." This odor may depend on how long the cap is left in place, particularly after sexual intercourse, or may reflect the presence of bacterial vaginosis [12]. The failure rate for typical use of the cervical cap by nulliparous women is similar to the failure rate among women using the diaphragm; the rate jumps enormously for parous women [10]. As shown in Table 16-2 (page 464), it is important to note that even with perfect use, 26 percent of parous women will experience an accidental pregnancy within the first year of cervical cap use. There is as yet no rational explanation for this finding, but it has serious implications for counseling about contraceptive methods which should take into account a woman's parity.

Contraindications to use of the cervical cap include the following:

1. Current abnormal Pap smear
2. Known or suspected uterine or cervical malignancy
3. History of toxic shock syndrome
4. Current vaginal or cervical infection
5. Allergy to latex
6. Allergy to spermicides
7. Cervical irregularities that will interfere with cap suction or ability to be properly fitted (e.g., multiple Nabothian cysts, deep cervical lacerations, malformations such as those seen in DES daughters, exceptionally long or short cervix)
8. Inability of the woman to insert and remove the cap correctly

In addition, the cervical cap should not be used in the following situations:

1. During menstruation, with intermenstrual bleeding, or during the postpartum or postabortion period for the following reasons:
   a. the bloody discharge may interfere with suction
   b. concern with the theoretical possibility of toxic shock syndrome
   c. the need to be refitted after pregnancy
   d. to prevent injury by a too tight cervical cap during times when the cervix is engorged or stretched to a larger size
2. Following procedures that involve the cervix (e.g., cryotherapy, cauterization, laser surgery) until healing has taken place and a Pap smear is negative
3. After events and procedures that dilate the cervix (e.g., birth, spontaneous or therapeutic abortion, dilatation and curettage, endometrial biopsy, hysteroscopy) until the woman has been refitted

In fitting a cervical cap you first should observe the size, shape, and position of the cervix during the pelvic examination. This information enables you to rule out contraindicating cervical irregularities and determine the size of the cap. The cap, when properly positioned, should completely cover the cervix but not touch the cervical os (to allow room for spermicide) and be sealed 360° around the rim in the cervicovaginal fornices (see Figure 18-5).

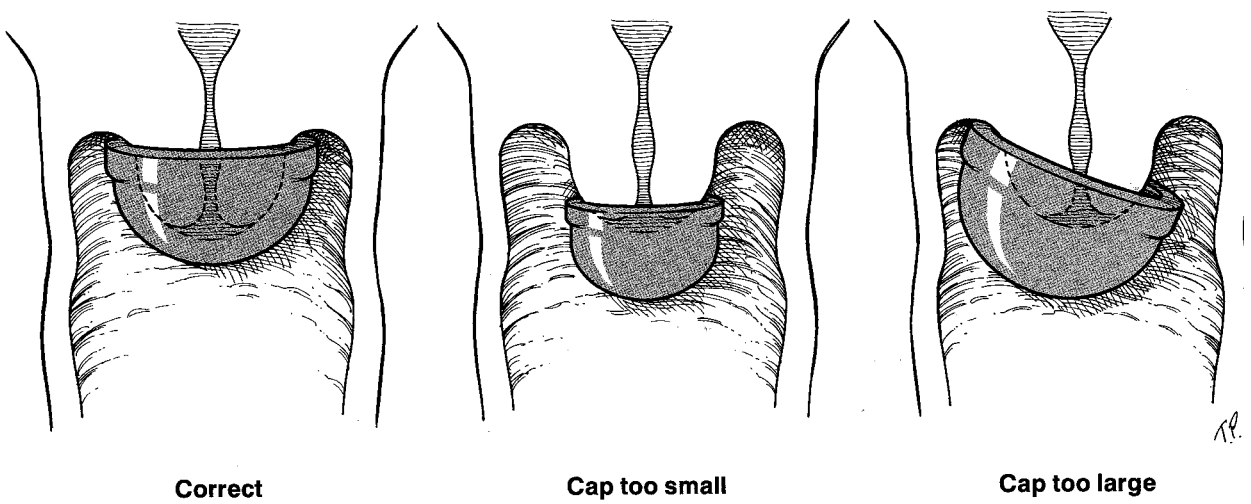

FIGURE 18-5 Proper and improper fit of the cervical cap: The cap should completely cover the cervix with the rim in the cervicovaginal fornices.

Source: Reproduced with permission from *Contemporary OB/GYN* (January 1993), p. 100.

Prentif Cavity Rim cervical caps are available in 22 mm, 25 mm, 28 mm, and 31 mm sizes; the numbers denote the diameter of the internal aspect of the rim. Estimates of the percentage of women who cannot be properly fitted with a cap range from 6 percent to 40 percent. As with the diaphragm, you should try two or more sizes to determine the most appropriate fit. The cap is compressed and inserted into the vagina. When the cap is released over the cervix, the suction that is created often draws the cap onto the cervix; if not, you may place the cap on the cervix. To remove the cervical cap you push/pull firmly against the rim to tip the cap and break the seal and then grasp the cap with your fingertips and bring it out. Ask the woman to bear down to help bring the cap within reach.

The fit of the cervical cap is checked by running your finger around the circumference of the rim. The cap should be sealed in the cervicovaginal fornices all the way around. If any of the cervix is exposed, the cap is not up into the fornices, or you are unable to rotate it, then the cap is too small (see Figure 18-5). Too small a cap will cause damage to the cervical tissue. The cervical cap is too large if you are able to dislodge it easily by pushing at it with a fingertip, if you find gaps between the cervix and the cap, or if it rotates too easily or falls off when you rotate it. A cap that is too large will not have an adequate seal and will not protect against either pregnancy or disease. (See Figure 18-5.)

To use the cervical cap, the woman fills the dome at least one-third full with a spermicide prior to insertion. Insertion should be at least half an hour before sexual intercourse, as the suction will have created a better seal by that time. The woman should check herself after insertion to make sure the cap is properly located on and over the cervix. She should also check herself between acts of sexual intercourse, as the cervical cap sometimes becomes dislodged as a result of penile thrusting.

Care of the cervical cap is the same as for a diaphragm. The cap differs from the diaphragm in the length of time it can be left in. The diaphragm should be removed 6 to 8 hours after the last act of intercourse and no longer than 24 hours after insertion. The cervical cap can be left in for as long as 48 hours, although there may be a foul odor after 24 hours. One concern with leaving the cap in so long is toxic shock syndrome, which has occurred in a few women who left diaphragms in place for 36 to 48 hours. To date no incidence of toxic shock syndrome with the cervical cap has been reported, but caution is indicated.

Follow-up care includes an appointment in two to four weeks to check the fit of the cervical cap and the woman's ability to use the cap and to assess her satisfaction with the method. In accord with a recommendation from the FDA, the woman should return in 3 months and 12 months for a Pap smear. If the Pap smear remains negative, the woman should make an appointment for her annual health assessment, which should include checking the fit of her cervical cap.

Instructions in the Use and Care of the Cervical Cap

1. Insert the cervical cap at least 30 minutes prior to intercourse to allow a good suction to form. You can insert it several hours ahead of time.
2. Empty your bladder and wash your hands with soap and water.
3. If you keep your cervical cap in cornstarch, shake the excess cornstarch off.
4. Fill the dome of the cap one-third full of contraceptive cream or jelly. Do *not* spread the cream or jelly on the rim of the cap, as that might prohibit the formation of a seal.
5. Compress the sides of the cervical cap, and insert it into your vagina.
6. Keep pushing the cap into the vagina until it touches your cervix; then release the cap and place it over your cervix.
7. Check the position of the cap. Make sure it covers your cervix and is sealed all around the rim.
8. You can walk around, bathe, urinate, and have a bowel movement with your cervical cap in place because it will neither get lost in your body nor fall out.
9. You do not need to add more spermicidal cream or jelly for repeated intercourse. If you decide that you want to add more spermicide, insert an applicatorful into your vagina. Do *not* remove your cap to add spermicidal cream or jelly.
10. Check the position of the cervical cap after each act of sexual intercourse if you are having repeated intercourse.
11. Leave the cap in for at least 6 to 8 hours after the last act of sexual intercourse in order to ensure that the sperm have died.
12. You can leave your cervical cap in for up to 48 hours, but you will probably want to remove it before 24 hours to avoid the development of a foul odor.
13. Douching is not necessary or encouraged. However, if you are going to douche, then do it

when you remove your cervical cap. Use half of a body-temperature tap water douche before removing the cervical cap; use the other half of the douche after removing your cervical cap. The douche is divided into these two portions on the outside chance that any semen containing sperm remains. Douching has a tendency to encourage sperm to move inward through the cervical os rather than outward from the vagina. Any such semen is thus washed out before the protective barrier is removed.

14. Check the position of the cervical cap before removing it. Contact your midwife if you find it out of position.
15. To remove the cervical cap, bear down to bring your cervix closer to the outside, locate the cap with your finger, push/pull on the rim to break the seal, take the cap off your cervix, and remove it from your vagina.
16. Follow these instructions for care of your cervical cap:
    a. After each use, do the following:
        (1) Wash with a mild, nonperfumed soap.
        (2) Rinse with clear water.
        (3) Thoroughly dry the cap (preferably air dry).
        (4) Dust with cornstarch, but never with talcum powder or any kind of perfumed powder, as this will rot the rubber.
        (5) Store the cap in a dry container away from heat and sunlight (heat rots rubber).
    b. If an odor develops, be sure to remove the cap daily for cleaning. Soak the cap in a vinegar solution (1 tsp apple cider vinegar to 1 qt water) to neutralize the odor without harming the cap. (This process will turn the cap brown.)
    c. Periodically check your cervical cap for areas of rubber deterioration, weakening, holes, or tears.
    d. Never use petroleum jelly (Vaseline) or any other oil-based products or lubricants.
17. Make an appointment to have your cervical cap checked or to be refitted in the event of any of the following:
    a. after having a baby
    b. after having an abortion (spontaneous or therapeutic)
    c. if you have any procedures done on your cervix
    d. if you have any intrauterine procedures done that involve going through your cervical canal
18. Make an appointment before your annual examination in the event of any of the following:
    a. You lose your cervical cap.
    b. Your cervical cap is damaged or deteriorating.
    c. You need to be refitted.
    d. You or your sexual partner is no longer happy with this method of contraception.

Other Vaginal Contraceptive Barrier Methods

Lea's Shield

Lea's Shield is a 55-mm diameter, one-size device made of silicone rubber that a woman does not have to have fitted. A study of the safety and efficacy of Lea's Shield found it to have high levels of safety and acceptability; when used with a spermicide, it compares well in efficacy with other barrier methods [13].

FemCap

The FemCap has widespread approval in Europe but is not yet approved by the FDA. A type of cervical cap, it is made of nonallergic silicone rubber. It fits over the cervix and has a wide brim (resembling a sailor's cap) that creates a groove between the dome and the brim. The brim seals the FemCap against the vaginal walls and directs the semen into the groove. A comparison study with the diaphragm showed significantly fewer urinary tract infections with the FemCap but considerably greater difficulty with removal even though it has a removal strap. Insertion and dislodging of the FemCap during coitus were also problematic, and the risk of pregnancy was greater [14].

References

1. Richardson, B. A. Nonoxynol-9 as a vaginal microbicide for prevention of sexually transmitted infections: it's time to move on. *JAMA* 287(9):1171–1172 (March 6) 2002.
2. Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines 2002. *MMWR* 51(No. RR-6):3–4, 2002.
3. Contraceptive sponge discontinued. *The Contraception Report* VI(1):14 (March) 1995.

4. Researchers find no sperm in pre-ejaculate fluid. *Contraceptive Technol. Update* 14(10):29–31 (October) 1993.
5. Steiner, M. J., Cates, W. Jr., and Warner, L. The real problem with male condoms is nonuse. *Sex. Transm. Dis.* 26(8):459–462 (September) 1999.
6. McNamee, K. The female condom. *Aust. Fam. Physician* 29(6):555–557 (June) 2000.
7. Artz, L., Demand, M., Pulley, L. V., Posner, S. F., and Macaluso, M. Predictors of difficulty inserting the female condom. *Contraception* 65:151–157, 2002.
8. Sherman, Holly. Personal communication. Chicago: Reality Female Condom, The Female Health Company, a division of Wisconsin Pharmacal Company. September 15, 1995.
9. Kugel, C., and Verson, H. Relationship between weight change and diaphragm size change. *JOGNN* 15(2):123–129 (March/April) 1986.
10. Trussell, J., Strickler, J., and Vaughan, B. Contraceptive efficacy of the diaphragm, the sponge, and the cervical cap. *Fam. Plann. Perspect.* 25(3):100–105, 135, 1993.
11. Hatcher, R. A., Trussel, J., Stewart, F., et al. *Contraceptive Technology*, 17th rev. ed. New York: Ardent Media, 1998, ch. 18, p. 391.
12. Secor, R. M. C. The cervical cap. *NAACOG's Clin. Issues* 3(2):236–245, 1992.
13. Mauck, C., Glover, L. H., Miller, E., et al. Lea's Shield: a study of the safety and efficacy of a new vaginal barrier contraceptive used with and without spermicide. *Contraception* 53:329–335, 1996.
14. Mauck, C., Callahan, M., Weiner, D. H., Dominik, R., and the FemCap Investigators' Group. A comparative study of the safety and efficacy of FemCap, a new vaginal barrier contraceptive, and the Ortho All-Flex diaphragm. *Contraception* 60:71–80, 1999.

• • • Additional References

Artz, L., Macaluso, M., Brill, I., et al. Effectiveness of an intervention promoting the female condom to patients at sexually transmitted disease clinics. *Am. J. Public Health* 90(2):237–244 (February) 2000.

Chalker, R. *The Complete Cervical Cap Guide*. New York: Harper and Row, 1987.

Female condom becomes available nationwide. *The Contraception Report* V(6):11–13 (January) 1995.

Future methods of contraception. *The Contraception Report* V(4):4–12 (September) 1994.

Gollub, E. L., and Stein, Z. A. Commentary: The new female condom—item 1 on a women's AIDS prevention agenda. *Am. J. Public Health* 83(4):498–500 (April) 1993.

New barrier methods for women in development. *Contraceptive Technol. Update* 15(11):143, November, 1994.

Now that U.S. women have their own condom, will they use it? *Contraceptive Technol. Update* 15(11):141–145 (November) 1994.

Rosenberg, J. J., Waugh, M. S., Solomon, H. M., and Lyszkowski, A. D. L. The male polyurethane condom: a review of current knowledge. *Contraception* 53:141–146, 1996.

Rosenberg, M. J., and Gollub, E. L. Commentary: Methods women can use that may prevent sexually transmitted disease, including HIV. *Am. J. Public Health* 82(11):1473–1478 (November) 1992.

Summerhayes, L., and Chez, R. A. Clinical dialogue: fitting the cervical cap. *Contemp. OB/GYN* 38(1):99–104 (January) 1993.

Weiss, B. D., Bassford, T., and Davis, T. The cervical cap. *Am. Fam. Pract.* 43(2):517–523 (February) 1991.

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CHAPTER

19

Intrauterine Contraceptive Devices

Description, Effectiveness, User Response, and Noncontraceptive Benefits

Although intrauterine contraceptive devices (IUCDs or IUDs) are used by less than 1 percent of women at risk for pregnancy in the United States (see Table 16-1), they are the most commonly used reversible contraceptive in the world [1, 2]. Such devices are made of a variety of materials in various shapes. Usually the basic material is polyethylene, an inert plastic. The material used must be (1) noninflammatory in the normal uterus, (2) flexible for insertion and removal, and (3) able to retain its "memory" so as to resume its shape when in position.

IUDs have a cervical appendage in the form of threads. The threads facilitate removal, enable a woman to check herself periodically to ascertain if the IUD is still in place, and permit an examiner to identify quickly the presence of the IUD.

IUDs are either medicated or nonmedicated. Medicated IUDs are those in which a chemical has been added to the basic material to enhance effectiveness by decreasing pregnancy rates, decreasing expulsion rates, and minimizing side effects. The two IUDs currently available in the United States are both medicated: the Copper T 380A (ParaGard) and the levonorgestrel-releasing intrauterine system (LNG-IUS/Mirena). Nonmedicated IUDs include the well-known Lippes Loop, which is still used in Indonesia [2] but has not been available in the United States since 1985, and a stainless steel ring used mostly in China. Historically IUDs have been named after the individual who developed them or for some feature of the IUD or the shape itself.

A number of IUDs are no longer on the market because they presented one problem or another. These include the so-called closed devices (e.g., Hall-Stone ring, Birnberg bow), removed from the market because of possible strangulation of a loop of intestine if they perforated the uterus; the Majzlin spring, removed from the market because of possible imbedding in the endometrium and myometrium; and the Dalkon shield, removed from the market because of association with spontaneous second trimester septic abortions.

The mechanism of action of the IUD is primarily by preventing fertilization. Copper ions from copper IUDs change the content of tubal and endometrial fluids, which impairs tubal transport and function of the sperm [3 ,4]. Hormonal IUDs impair tubal motility and thicken the cervical mucus, making it viscous, largely impenetrable to sperm, and impairing sperm mobility. IUDs also have a secondary mechanism of action of a local foreign body reaction that makes the endometrium unfavorable for implantation and is probably what makes the IUD efficacious for emergency contraception. With the IUD already in place, however, the primary mechanism of action is not abortifacient.

Research and statistics evaluating IUDs generally emphasize pregnancy, expulsion, removal, continuation, bleeding/pain, and infection rates. There is very little difference between perfect use and typical use rates for the IUD (see Table 16-2, page 464), and that difference probably can be attributed to unrecognized expulsion of an IUD. IUDs are second only to Norplant in the percent of women who continue use after one year, and they rival the hormonal methods in effectiveness.

The cost of IUDs varies depending on the device but generally is approximately $300. Added to this cost is the cost of examinations, laboratory

tests, and the insertion. The total cost of an IUD for a woman who is self-paying can run as high as $1000. However, it is a long-term method, which makes it cost effective when used over a period of five to ten years. The device comes in a sterile package, which includes not only the IUD but also a disposable inserter, insertion instructions, patient information, and informed consent brochures.

Many users have a favorable response to the IUD because this method of contraception is quite unassociated with the sexual act itself. An additional advantage is that the woman does not have to think about it daily or monthly or purchase supplies. Women who have an aversion to inserting a finger into their vagina may object to checking for the cervical appendage after each menstrual period. Some people object to the possible side effects associated with IUDs, and some women simply don't like the idea of having something inside of them.

Both copper and hormonal IUDs have noncontraceptive benefits. Copper-bearing and nonmedicated plastic IUDs convey probable protection against endometrial cancer [1]. Hormonal IUDs, specifically the LNG-IUS, reduce the number of days of menstrual bleeding, increase hemoglobin concentration, are an effective treatment for menorrhagia, and prevent or treat anemia [1]. Because of the action of the progestin levonorgestrel, many women develop amenorrhea or oligomenorrhea. No IUD provides protection against HIV or sexually transmitted diseases; this is why the IUD is recommended only for couples who are disease free and mutually monogamous. Otherwise, the use of condoms in addition to the IUD is necessary.

Contraindications and Side Effects

Contraindications [5–8]

The following are contraindications to the insertion of an intrauterine contraceptive device in a woman by a midwife:

1. Pregnancy
   - **a.** confirmed
   - **b.** suspected
   - **c.** possible (i.e., the woman has had coitus without a valid contraceptive method since the last normal menstrual period)
2. Pelvic inflammatory disease (PID)
   - **a.** history of chronic PID
   - **b.** presence of acute or subacute PID
   - **c.** history of PID within the past 3 months, including postpartum endometritis or an infected abortion
3. Cervical or uterine carcinoma (known or suspected)
   - **a.** unresolved, abnormal Pap smears (class III, CIN I, or greater)
   - **b.** unexplained or abnormal uterine bleeding
4. History or presence of valvular heart disease (contraindication because persons with this condition have increased susceptibility to subacute bacterial endocarditis). This does not include mitral valve prolapse.
5. Presence of myomata, congenital malformations, or developmental anomalies that distort the uterine cavity
6. Known or suspected allergy to copper or diagnosis of Wilson's disease (genetically inherited abnormal copper metabolism that allows fatal accumulation of copper in various organs)—contraindications only for IUDs with copper
7. Uterine sound measurements outside the limits stated in the most recent insertion instructions from the manufacturer (as of this writing, the uterus should sound to a depth of 6 to 9 cm for both ParaGard and Mirena).
8. High risk for sexually transmitted diseases (i.e., multiple sexual partners or partner with multiple sexual partners)
9. History of ectopic pregnancy or condition that would predispose to ectopic pregnancy—contraindication only for hormonal IUDs
10. Acute cervicitis or vaginitis (until diagnosed and successfully treated), especially with a recent or recurrent history of chlamydia or gonorrhea infection or bacterial vaginosis. Pelvic infection with an IUD, for reasons other than sexually transmitted diseases, is most likely due to the introduction of an organism into the uterine cavity during the insertion procedure.
11. Genital actinomycosis
12. Increased susceptibility to infection (e.g., chronic corticosteroid therapy, diabetes, blood dyscrasias, HIV/AIDS, leukemia, and IV drug abuse)
13. A previously inserted IUD that has not been removed
14. Acute liver disease, including active viral hepatitis, or liver tumor (benign or malignant)—contraindication only for hormonal IUDs
15. Known or suspected carcinoma of the breast—contraindication only for hormonal IUDs
16. Current deep vein thrombosis/pulmonary embolism—contraindication only for hormonal IUDs

17. Migraine headaches with focal neurologic symptoms—contraindication only for hormonal IUDs

The midwife should also carefully evaluate the presence and the implications of either of the following conditions and then decide whether to insert an IUD.

1. History of previous unsuccessful use or problems with an IUD
2. History of severe vasovagal response

Side Effects and Complications

The following side effects and complications are those most commonly identified with intrauterine contraceptive devices:

1. Vasovagal syncope with insertion
2. Immediate postinsertion spotting and cramping
3. Cramping, low back pain, or both for several days after insertion
4. Continuing severe pain from uterine cramping
5. Dysmenorrhea, especially for the first 1 to 3 months after insertion
6. Menstrual changes/disorders (menorrhagia, metrorrhagia, amenorrhea, oligomenorrhea)
7. Severe or prolonged bleeding
8. Anemia
9. Strings missing, too long, or too short
10. Embedment of IUD in the endometrium or myometrium
11. Expulsion of the IUD
12. Pregnancy, either with the IUD in place or subsequent to unnoticed expulsion of the IUD
13. Ectopic pregnancy
14. Spontaneous septic abortion
15. Cervical or uterine perforation
16. Pelvic inflammatory disease (PID)
17. Ovarian cysts—hormonal IUDs only
18. Danger from medical diathermy (short-wave and microwave) in the abdominal, sacral, or pelvic areas—copper IUDs only

There is no evidence that IUDs are carcinogenic.

Management Plan for the IUD

Management of the care of the woman with IUD contraception consists of the following components:

1. Informing the woman of the effectiveness rates, providing her with product information, discussing potential side effects and complications, and having her sign the informed consent form in the brochure provided by the manufacturer
2. Conducting a general history, physical and pelvic examinations, and laboratory tests including pregnancy test, Pap smear, chlamydia and gonorrhea cultures, and hemoglobin/hematocrit (see Chapter 2)
3. Screening for any deviations from normal and for any contraindications to insertion of an IUD
4. Selecting the IUD appropriate for the individual woman
5. Inserting the IUD
6. Teaching the woman how to check for her IUD
7. Giving the woman instructions regarding her IUD and follow-up care
8. Scheduling and managing return visits
9. Managing the possible side effects and problems related to an IUD
10. Removing the IUD when indicated

Insertion of an IUD is a two-visit process. The first visit encompasses the first four components of the management plan and is a pre-insertion visit. During the first visit, after the woman decides she wants an IUD, a history, physical, and pelvic examination are performed and laboratory tests done to rule out any contraindications. Together, you and the woman then determine which IUD would be best for her. Anticipatory guidance and counseling are done at this visit preparatory for both the insertion procedure and for possible side effects during the first 3 to 6 months. Questions are answered until the woman is satisfied and fully informed. She then is given an appointment to return for the insertion itself immediately after the lab results are back. This appointment can be at any time during the menstrual cycle so there is no reason for delay. She is also counseled regarding staying pregnancy- and infection-free until that time. Pending laboratory results, the second visit is for the insertion procedure.

Selection of the Appropriate IUD

The following comments about each IUD are designed to give the midwife information that will be helpful in selecting the IUD most appropriate for an individual woman.

Copper T 380A (ParaGard) The ParaGard is a T-shaped piece of polyethylene wrapped with copper wire on the stem and with copper sleeves on each of

the transverse arms. A monofilament polyethylene thread, tied so that there are two strands, serves as the transcervical appendage. Barium sulfate is added to the device to make it visible on x-ray. In 1994 the Food and Drug Administration extended to ten years the length of time the Copper T 380A could effectively remain in utero [9]; after ten years the IUD should be replaced.

To reiterate some key features of the Copper T 380A:

1. It can be used for long-term contraception.
2. It can also be used for emergency contraception.
3. It protects against endometrial cancer.
4. It is a good option for those women who cannot or do not want to use hormones.
5. All copper IUDs are contraindicated in women with allergies to copper or diagnosed with Wilson's disease.
6. Although there is less bleeding as a side effect with the copper IUDs than there was with the nonmedicated IUDs, bleeding can still pose a problem.
7. The return of fertility is rapid when it is removed.
8. It does *not* protect against sexually transmitted diseases or HIV infection.

Levonorgestrel Intrauterine System (LNG-IUS or Mirena)

The Levonorgestrel Intrauterine System is a modified T-shape (the horizontal bar is slightly curved and bent on the ends) made of polyethylene with a cylinder of polydimethylsiloxane around the stem. The polyethylene is compounded with barium sulfate to make it visible on x-ray. The cylinder contains a reservoir of 52 mg of levonorgestrel, a progestogen also used in oral contraceptive products, a small amount of which is released daily into the uterine cavity over a period of 5 years. To reiterate some key features of the LNG-IUS:

1. Basically it is a hormonal method with all the same contraindications, benefits, cautions, and side effects that go with other forms of progestin-only hormonal contraceptives.
2. It is one of the most effective contraceptive methods, including sterilization (see Table 16-2, page 464).
3. It increases hemoglobin concentration and can be used to treat menorrhagia and anemia.
4. It causes the menstrual bleeding pattern to be altered and irregular. During the first 3 to 6 months, the number of bleeding and spotting days are irregular and may increase. During the second 6 months, the number of bleeding and spotting days are still irregular but decrease. Amenorrhea develops in approximately 20 percent of women by the end of the first year.
5. The return of fertility is rapid when it is removed.
6. It does *not* protect against sexually transmitted diseases or HIV infection.

Timing of IUD Insertion

The midwife must be certain that the woman is not pregnant and that she is free of any vaginal or uterine infection at the time of insertion. Many clinicians prefer to insert an IUD during a woman's menstrual period. Carrying out the procedure during the woman's period eliminates the risk of inserting an IUD into a pregnant uterus. However, a woman may be more susceptible to developing an infection from an IUD insertion during her menses. Also, if there is too much of a wait or she does not like the idea of an examination and a pelvic procedure being done while she is menstruating, a woman may not return. In fact, IUD insertion can take place on any day of the menstrual cycle. However, the midwife must be convinced of the woman's sexual intercourse and contraceptive history since her last normal menstrual period before making a decision to insert an IUD at any time other than during her menses or a few days immediately following. Both removal and expulsion rates are lower when IUDs are not inserted during menses [8, p. 80].

Although some authors list immediate postpartum and postabortion IUD insertion as an option, the midwife should be cautious and, if possible, provide the woman with an interim contraceptive method and wait to insert the IUD until completion of involution or until the 4- to 6-week postpartum or 2-week postabortion visit. The insertion procedure immediately postpartum or postabortion is a bit tricky because of the softness of the uterus. Unless the midwife is very skilled in the procedure and very familiar with the intrauterine feel of the immediate postpartum uterus, there is a higher risk of perforation. Because of the process of involution there is also a higher rate of expulsion.

Medications for Insertion

Before the procedure, some clinicians like to offer the woman some medication, especially if she is tense and anxious or has a history of dysmenorrhea. Such medication might include a nonsteroidal anti-inflammatory drug (NSAID) or oral analgesic

1/2 to 1 hour prior to the procedure. Another option is to use a local anesthetic at the tenaculum insertion sites or a paracervical block. Generally speaking, this is not necessary and not done. Prophylactic antibiotics to prevent postinsertion infection no longer are thought to be beneficial [10–12] and are less important than proper screening of candidates for IUDs, maintaining asepsis, using strict sterile technique, and cleaning the cervix (see Step 7 below).

Procedure for Insertion of the IUD

The insertion of an IUD varies in specific details according to the device and the inserter made for it. You should study the manufacturer's instructions prior to inserting an IUD unfamiliar to you. There are, however, some steps in the technique of inserting an IUD that should be followed, regardless of which IUD is being inserted. These are as follows:

1. Obtain the woman's signed informed consent.
2. Ascertain that the Pap smear and chlamydia and gonorrhea diagnostic testing done at the initial (preinsertion) IUD visit (discussion; review of informed consent; screening history, examination, laboratory tests) are negative and that her hemoglobin/hematocrit and any other tests are within normal limits.
3. Ensure by history, examination, and/or pregnancy test that the woman is not pregnant.
4. Explain the procedure to the woman (pelvic examination, speculum, tenaculum, and IUD insertion).
5. Perform a bimanual examination. Do not trust anyone else's bimanual examination findings prior to inserting an IUD. Specific findings prior to an IUD insertion are to
   a. rule out pregnancy
   b. rule out acute pelvic inflammatory disease
   c. determine position, size, shape of uterus
6. Insert the speculum and adjust for greatest visualization and exposure.
7. Thoroughly clean the cervix with an antiseptic solution such as povidone-iodine (Betadine) or benzalkonium chloride (Zephiran) to decrease the risk of infection. Ask the woman if she is allergic to iodine before using an antiseptic solution that contains iodine.
8. Apply a tenaculum to the cervix.
   a. Apply a single-tooth tenaculum to the anterior cervix at 10 and 2 o'clock, approximately 1.5 to 2 cm (about 3/4 in.) from the level of the external os.
   b. Angle the tenaculum from above downward so the bite will not be so shallow that the tenaculum is in danger of tearing out of the cervix when pulled on or so deep that the cervical canal is obstructed.
   c. You may find it easier to manipulate the tenaculum if you use both hands, with one hand for control of each side of the tenaculum.
   d. Close the tenaculum *slowly*, one notch at a time. Forewarn the woman that she may feel a short, sharp pain at this time. If she does experience pain, wait until it passes before proceeding to the next step of sounding the uterus.
   e. The tenaculum can also be applied at 8 and 4 o'clock if the posterior cervix is more accessible than the anterior cervix.
   f. The tenaculum should never be applied at 3 or 9 o'clock, as the major blood vessels to the cervix are positioned at these locations and excessive bleeding might result.
9. Sound the uterus to confirm the position of the uterus, rule out uterine canal obstructions, and measure the depth of the uterine cavity.
   a. Forewarn the woman that she may feel a cramp when the uterine sound passes through the internal cervical os.
   b. Hold the sound between your thumb and your first two fingers as you would a pencil or a fork. This gives you more delicate, sensitive control of the uterine sound.
   c. Pull steadily and strongly on the tenaculum in order to straighten out the axis of the uterus.
   d. Using gentle pressure, insert the sterile uterine sound into the cervical canal until you feel the resistance of the internal os. At this time one of three things will happen:
      (1) The sound will slip easily through the internal os, and you will have felt slight to no resistance from the internal os.
      (2) The internal os will resist the tip of the sound, requiring the application of steady, mild pressure against the os to cause it to open and admit the sound into the uterine cavity. Take care not to apply too forceful a pressure so when the os opens the sound does not plunge into, and possibly through, the uterus.
      (3) The internal os will resist the mild pressure of the tip of the sound against it and will not open readily. (In fact it will open—but patience is required.) This situation usually occurs in women who

are quite nervous and focused on the procedure.

Position yourself comfortably. While continuing to apply steady, firm (but not forceful) pressure against the internal os, distract the woman by conversing with her on any subject unrelated to health care, IUDs, and so forth. This works best if the woman does the talking. Get her to tell you about her daily routine and ask questions about such things as her home, job, schooling, and children. As she talks, suddenly you will feel the internal os relax and open, and the sound will slip into the uterine cavity. This may take from several seconds to a few minutes to accomplish.

You will probably have to repeat this process when inserting the IUD in its inserter through the internal os later.

e. Let the sound find its own way in the uterine cavity once it has passed the internal os; do not try to push it in in accord with what you think the uterine position is. Use the sound to validate or reject your bimanual findings.

f. Once the uterine position has been confirmed or determined, gently push the sound until it meets resistance. You should be at the top of the fundus. Tap against it. This should evoke a cramp; ask the woman if she felt one. If not, you may not be at the top of the fundus. Pull hard on the tenaculum to straighten the uterine axis, and again guide the sound until it meets resistance. Tap again; you should be at the top of the fundus now.

g. Measure the depth of the uterine cavity:

(1) When the tip of the sound is touching the fundus, place a sterile cotton-tipped applicator next to the sound, with the applicator tip at the external cervical os.

(2) Remove the sound and the applicator from the uterus and vagina at the same time.

(3) Measure the depth of the uterine cavity by measuring the length of the sound from where the tip of the applicator touches the sound to the tip of the sound.

h. If the speculum exam, bimanual exam, and measurements are all within the realm of normal, proceed with the next step.

10. Load the IUD into its inserter. This is a sterile procedure. This step is done just prior to inserting the IUD, because plastic devices start to lose their "memory" (shape retention ability) as soon as they are loaded. The less time the IUD is in the inserter, the less memory loss there will be to resume its shape.

11. Insert the IUD into the uterine cavity.

a. Forewarn the woman that she may feel a cramp at this time.

b. First pull firmly and steadily on the tenaculum to again straighten the uterine axis. Maintain this traction until the IUD is inserted.

c. Insert the IUD in its inserter into the cervical canal and through the internal os, as described in 9(d) above.

d. Insert the IUD into the uterine cavity by removing it from its inserter in accord with proper procedure for the IUD being used. Be sure of the procedure being used for the device you are inserting; some are pushed into the uterine cavity, others are placed in the fundus and then the sheath of the inserter is withdrawn.

Insertion of the device from its inserter should be done *slowly* in order to reduce the possibility of vasovagal syncope.

Undue force should never be needed. If undue force seems to be required, *STOP* and reevaluate. Never forcibly push an IUD into a uterine cavity—you risk pushing it into the uterine wall instead.

12. Remove the inserter and the plunger in accord with proper procedure for the IUD being used.

13. If there are strings to be cut, cut them no shorter than approximately $1^1/_2$ to 2 in. (3.75 to 5 cm) from the external cervical os. This leaves enough string that, as the IUD resumes its shape and as the uterus resumes its usual position (both of which cause some of the string to be taken up into the uterus), there will still be enough to be seen and felt. If the strings are still too long at the woman's first revisit, they can be shortened at that time.

14. Remove the tenaculum. If there is bleeding from the application sites, apply pressure with a sponge stick or with a 4×4 gauze on a ring forceps until the bleeding stops. Some clinicians do not do this, believing that with removal of the speculum the vaginal walls will apply sufficient pressure to stop the bleeding.

15. Remove the speculum.

16. Wipe off the woman's perineum.

17. Allow the woman to rest and recover if she needs to.

18. Teach the woman how to check for her IUD (see next section).

19. Give her a perineal pad to wear, and have her get dressed.

20. Chart all findings. Include the type of IUD inserted, whether you had any difficulty with the insertion, the measured depth of the uterine cavity, the position of the uterus, and the length of the strings.
21. Answer any questions the woman may have, and give instructions regarding the IUD and follow-up care (see below).

Safety Features in IUD Insertion Procedure There are a number of safety features to the insertion of an IUD. When strictly adhered to, these safety features reduce considerably the risk of perforating the uterus or introducing intrauterine infection during insertion.

1. Careful selection of the woman: taking of history, physical, pelvic and laboratory tests to rule out any contraindications to the use of the IUD
2. Use of only sterile instruments (including the speculum) and strict adherence to sterile technique throughout the procedure
3. Thorough cleaning (scrubbing) of the cervix with antiseptic solution
4. Careful bimanual examination to determine uterine position
5. Proper application and use of the tenaculum on the cervix
6. Careful sounding of the uterus and measurement of its depth
7. Slow and gentle pace

Instructions Regarding the IUD and Follow-Up Care

Review the following with the woman:

1. The information on the card you give her:
   a. the name of the IUD she has
   b. the date it was inserted
   c. where to call for help, information, or removal of her IUD
2. How long she can keep the IUD:
   a. If she has a Copper T 380A, it must be replaced in 10 years to remain fully effective.
   b. If she has a LNG-IUS, it must be replaced every 5 years to remain fully effective.
3. How to check herself for the IUD strings. In addition to giving her the following instructions on periodically checking for her IUD, give her some trimmed strings to feel so she knows what to check for and have her feel for the strings of her IUD now.
   a. Wash your hands.
   b. Lie down in bed, sit on the toilet or the edge of a chair, or squat.
   c. Insert your middle finger into your vagina in a downward and inward direction, and locate your cervix.
   d. Feel for the strings of the IUD at the end of your cervix; do not pull on the strings.
   e. Check for your IUD at the end of each menstrual period and as often as you want between these monthly checks.
   f. Immediately call and make an appointment to be seen as soon as possible if either you cannot feel the strings or you feel the end or a portion of the device. In the meantime consider yourself unprotected and use a spermicidal preparation and condoms.
4. The date of her first revisit in 6 weeks
5. The effectiveness rate, side effects, and danger signs associated with her IUD and when to call you immediately with a problem or for an appointment. She should call if she experiences any of the following:
   a. suspicion of pregnancy
   b. foul smelling discharge
   c. known exposure to a sexually transmitted disease
   d. fever associated with severe cramps
   e. dyspareunia, pelvic pain, or tenderness
   f. unusual vaginal bleeding or spotting
   g. unable to feel strings, or feel them shorter or longer, or feel the end of the IUD

In addition, the following information and instructions should be given:

1. You may have some spotting or bleeding and cramping for a day or so after insertion of your IUD. Take over-the-counter analgesics every 3 to 4 hours for pain.
2. Avoid sexual intercourse for the first 24 hours after insertion of your IUD.
3. There is an adjustment period to your IUD of approximately 3 months.
   a. During this time your menstrual periods may be longer and heavier than they were before you had an IUD inserted.
   b. The length and amount of menstrual flow you have by the third month after insertion of your IUD will probably be what your normal menstrual period will be like with an IUD.
   c. You may have some cramping, especially with your menstrual periods. This is more likely if you have not had a baby. If you did not experience cramps when your IUD was inserted or immediately afterward, you most likely will not have cramps later. Cramps

may be alleviated with over-the-counter analgesics.

4. If your IUD comes out spontaneously, it is most likely to do so during a menstrual period. Therefore, in addition to checking for the strings of your IUD after each menstrual period, you should do the following:
   a. Look for your IUD on your sanitary pads or tampons before discarding them (it is alright to use a tampon after the first 48 hr after insertion of your IUD).
   b. Check yourself for your IUD after any time you have some abdominal cramping.
   c. If you find your IUD externally, if you are unable to feel the strings, or if you feel the device coming through your cervix, you should
      (1) make an appointment to be seen as quickly as possible
      (2) consider yourself unprotected from becoming pregnant
      (3) use another contraceptive method until your appointment
5. Use a spermicidal preparation and condoms for the first month after insertion of your IUD.
6. If you should get pregnant with your IUD still in, you should have the IUD removed in order to decrease the risk of serious infection. The chance of spontaneous abortion if the IUD is removed is half what it is if the IUD is left in. A therapeutic abortion is possible if you wish to terminate the pregnancy.
7. The IUD is inserted in accord with the angle of your uterus. Therefore, you should obtain medical help to have your IUD removed when desired. You may injure yourself if you or your sexual partner pulls on the IUD strings.
8. Remember to be seen annually, no matter what type of IUD you have, for a physical and pelvic examination, including a Pap smear.

Return Visits

After the woman has her IUD inserted, she should be instructed to use a spermicidal preparation and condoms for the first month. This more fully protects her from conception while the IUD is rendering the cervix, uterus, and Fallopian tubes inhospitable for fertilization and implantation and during the time when the IUD is more likely to be expelled spontaneously.

The woman should return for her first revisit in approximately 6 weeks. This visit is deliberately timed to be after her first postinsertion menstrual period. By this time the first month of higher incidence of spontaneous expulsion will be over; the IUD can be checked to determine that it remains correctly positioned. In addition, the woman should have had experience with checking for her IUD herself and some of the immediate side effects should have diminished. The revisit provides an opportunity to answer questions and to encourage and reassure the woman, which results in an increased user rate. The following data pertinent to the IUD are elicited at this revisit:

History

1. Menstrual period (compare with pre-IUD menses)
   a. date
   b. length
   c. amount of flow
   d. pain
2. Intermenstrual (compare with pre-IUD)
   a. spotting or bleeding: how long, how much
   b. cramping: how long, how severe
   c. back pain: where, how long, how severe
   d. vaginal discharge
      (1) how long
      (2) color
      (3) odor
      (4) itching
      (5) burning on urination (before or after starting flow)
3. String checks
   a. date of last string check
   b. strings felt by partner during sexual intercourse
4. Satisfaction with method (both woman's and partner's)
5. Any medicines being taken: which ones, why
6. Any visits to a doctor or emergency room since IUD inserted: why
7. Use of spermicidal preparation and condoms: when, any problems
8. Presumptive signs of pregnancy if indicated

Physical examination

1. Abdominal examination for lower abdominal tenderness
2. Check for CVA tenderness if indicated for differential diagnosis
3. Probable signs of pregnancy if indicated

Pelvic examination

1. Speculum examination
   - **a.** visualization of strings
   - **b.** length of strings; trim if indicated
   - **c.** vaginal discharge; note characteristics and do cultures and wet mount if indicated
2. Bimanual examination
   - **a.** pain with movement of cervix or uterus
   - **b.** uterine tenderness
   - **c.** uterine enlargement
   - **d.** adnexal tenderness
   - **e.** probable signs of pregnancy if indicated

Laboratory

1. Hemoglobin or hematocrit
2. Routine urinalysis if indicated for differential diagnosis
3. Cervical cultures and wet mount if indicated
4. Pregnancy test if indicated

If the results of the above examinations are satisfactory, the woman is given an appointment for her annual examination, which will include a general screening history, physical and pelvic examinations, Pap smear, chlamydia and gonorrhea cultures, other routine laboratory tests (see Chapter 2), and a repetition of the IUD revisit outlined above. Instructions on checking her IUD, and when to call with a problem or for an appointment prior to her annual appointment, are reviewed with the woman during this return visit as well.

Management of Side Effects and Problems

Vasovagal Syncope (Fainting) Although it is infrequent, syncope may occur during or immediately following insertion of the IUD. The cause is thought to be excessive pain, especially in a woman who is quite nervous, fearful, or emotional at the time of insertion. Gentle manipulation of the instruments and handling of the uterus combined with slow insertion of the IUD may forestall or reduce the incidence of syncope. Abrupt, hurried, rough actions may enhance its occurrence.

In the rare event of syncope, place the woman in as much of a Trendelenburg position as possible (remove the pillow from under her head and place it instead under her hips and raise her legs), be sure she has an open airway, and keep her warm. If necessary, administer an aromatic (smelling salts). If syncope is severe and constitutes an emergency, administer 0.4 to 0.5 mg of atropine intramuscularly. Atropine acts as a respiratory and circulatory stimulant.

Immediate Postinsertion Spotting and Subsequent Menstrual Patterns and Bleeding Forewarn the woman about immediate postinsertion spotting and give her a perineal pad to protect her clothes. Heavier than usual menses and intermenstrual spotting or bleeding are not uncommon during the initial months with either copper bearing or hormonal IUDs. Immediately following insertion, women usually experience varying amounts of spotting or bleeding. Spotting may continue for a few days, and some women have light intermenstrual bleeding during the first menstrual cycle. Women with the Copper T 380A usually have two or three longer and heavier menstrual periods and then their periods gradually return to what the woman had before insertion or remain slightly heavier than her pre-IUD periods; four- or five-day periods are not uncommon. Women with the LNG-IUS generally experience menstrual irregularities and an increased number of days with frequent spotting or light bleeding for the first 3 to 6 months. Some women will have heavier menstrual periods than their normal. Thereafter the number of spotting and bleeding days decreases, usually to one day of bleeding from 8 months on, but continues to be irregular. Approximately 20 percent of women will become amenorrheic [13].

All women, regardless of type of IUD, should be counseled before insertion on what to expect their menstrual periods to be like postinsertion. Women are much less likely to discontinue the method when they know what to expect. Women who become amenorrheic on the LNG-IUS need reassurance that they are not pregnant. After a negative pregnancy test, a woman can find continuing reassurance by feeling the IUD strings and having no signs and symptoms of a pregnancy (which you have taught her). Women with the Copper T 380A should have their hemoglobin/hematocrit closely monitored, especially if they were borderline anemic pre-insertion; iron should be prescribed for the first 2 to 3 months if they have heavy bleeding.

Women with severe or prolonged bleeding, menorrhagia and/or metrorrhagia after the initial uterine adjustment to the IUD should be evaluated for partial expulsion and cervical and uterine pathology. Partial expulsion of an IUD is ascertained as follows during speculum examination:

1. Note if the strings of the IUD are longer than expected.
2. Look for protrusion of the IUD from the external cervical os.
3. If you are unable to see the IUD at the external cervical os, do the following:

a. Apply a tenaculum to the cervix as described earlier in this chapter.
b. Explore the cervical canal with a uterine sound in an effort to locate the IUD in the canal or at the internal cervical os.

If the bleeding is not caused by the partial expulsion of the IUD, the midwife should proceed to evaluate the woman for cervical and uterine pathology (see Chapter 14).

If the IUD is partially expelled, remove it and replace it if the woman is not pregnant, does not have an infection, and wants another IUD. In these circumstances, if she is not contraindicated for progestogen hormones, she would be a good candidate for an LNG-IUS, which is used for treatment of menorrhagia and anemia as well as contraception. Because of all the manipulation involved in removing and replacing an IUD, a course of prophylactic antibiotics is indicated: doxycycline 100 mg po every 12 hours for 7 days. If the woman is allergic to tetracyclines, substitute erythromycin 500 mg po QID for 7 days.

A hemoglobin/hematocrit determination should be done and compared with previous findings to see if the blood loss has been such that the woman is becoming anemic and a prescription for iron is indicated. A woman may consider that heavy bleeding in the absence of pathology is sufficient reason to request that her IUD be removed and to select another contraceptive method.

Cramping, Low Back Pain, Dysmenorrhea Women usually experience varying amounts of cramping after IUD insertion. Cramps, which range from light and of brief duration in multiparas to severe and lasting several days in nulligravidas, occur when the uterus contracts in an effort to expel the IUD. The woman should be forewarned of this possibility and advised to take over-the-counter analgesics for the pain. If the insertion induced continuing painful cramping, prescribe ibuprofen (Motrin; Advil) 400 mg po every 4 hours as needed.

Dysmenorrhea for the first 1 to 3 months after insertion is not uncommon. It is worse in those already afflicted with dysmenorrhea. The usual comfort measures (e.g., lying down, warm soaks in the bathtub, heat to the lower abdomen or back) and analgesics are in order. Use of the LNG-IUS may lessen dysmenorrhea in about one-third of users [13].

If the woman continues to experience severe pain from uterine cramping, PID and perforation must be ruled out. Also consider ovarian cysts if the woman has an LNG-IUS and has severe lower abdominal pain. These tend to spontaneously resolve [13, 14]. A woman may consider severe, unremitting cramps without pathology sufficient reason to request that her IUD be removed and to select another contraceptive method.

Pregnancy A woman who becomes pregnant with her IUD in situ should be informed of the risks involved if the pregnancy continues with the IUD in place. These risks include intrauterine infection, sepsis, spontaneous abortion, spontaneous septic abortion, placenta previa, and premature labor. Women who become pregnant with their IUD in place should be evaluated for ectopic pregnancy as the incidence of such a pregnancy is higher in these women.

If the strings of the IUD are not visible at the cervical os or accessible in the cervical canal, an ultrasound should be done to ascertain whether the IUD is in the uterus, outside of the uterus, or missing entirely. If the IUD is missing, you must assume that there was an unnoticed expulsion and either provide prenatal care or referral for abortion in accord with the woman's decision regarding continuation of the pregnancy. If the IUD is there, the option of a therapeutic abortion should be discussed with the woman or couple. Her risk of a life-threatening spontaneous septic abortion in the second trimester is vastly increased if the IUD is left in place. If the decision is in favor of a therapeutic abortion, the midwife should help the woman make arrangements or refer her to someone who can do so.

If the strings of the IUD are visible, the IUD should be removed whether or not the woman or couple wish to terminate the pregnancy. The IUD should be removed because the incidence of spontaneous abortion is lower in women whose IUDs are removed than in those whose IUDs remain in during the pregnancy and because the risks enumerated above are minimized with removal of the IUD. Approximately 25 percent of women abort spontaneously following removal of the IUD. The incidence of spontaneous abortion is approximately 50 percent for women whose IUDs are left in situ. If a woman wishes to terminate her pregnancy, remove the IUD and then refer her for a therapeutic abortion. Removing the IUD immediately eliminates the possibility of a septic spontaneous abortion in the interim prior to the therapeutic abortion.

Pelvic Inflammatory Disease (PID) The current prevailing thought about IUDs and pelvic inflamma-

tory disease (PID) is that PID is most likely associated with the introduction of organisms at the time of insertion of the IUD and not with the IUD itself, as was previously thought and debated [15, 16]. It is important for the midwife to exactly follow rules of cleanliness in performing pelvic examinations; to adhere strictly to sterile technique in the intrauterine procedures involved in inserting, checking, and removing IUDs; to instruct the woman in hygienic measures related to the perineum and vagina; to screen for, identify, and treat sexually transmitted diseases (especially chlamydia and gonorrhea) before they develop into PID; and to screen for the signs and symptoms of PID. (See Chapter 15 for a discussion of the signs, symptoms, and treatment of PID.)

If a woman shows any signs and symptoms of PID, antibiotic therapy should be started immediately and the IUD removed. Some clinicians prefer to wait a couple of days before removing the IUD in order to achieve therapeutic blood levels of the antibiotics prior to removal. She should be given an alternative contraceptive method. The woman should be told the signs and symptoms of a worsening condition, the need to take her medication absolutely as prescribed, and when and how to call you. If the woman is considering the possibility of having another IUD inserted, you need to review carefully with her any history that would place her at risk for developing another infection. Even under the most benign circumstances another IUD should not be inserted for at least 3 months after successful therapy for PID. The woman should be encouraged to use a different primary contraceptive method.

Missing IUD Strings The woman herself is usually the first to notice that IUD strings are missing, when she is unable to feel them when checking herself. In such a situation there are four possible reasons why the strings cannot be felt or seen on speculum examination:

1. The strings were cut too short and retreated fully into the cervical canal as the device assumed its original shape, the uterus resumed its usual position after being pulled down by use of the tenaculum, and uterine contractions caused the strings to be sucked in.
2. The woman is pregnant.
3. The IUD has perforated through the uterus.
4. The IUD was spontaneously expelled without the woman's being aware that this happened.

When managing a woman whose IUD strings are not visible, you must *first* ascertain whether she is pregnant *before* doing any further search for the IUD. This determination is made on the basis of history, physical and pelvic examination for the signs and symptoms of pregnancy, and a pregnancy test (see Chapter 21). Additional history you need includes the following:

1. When the IUD was inserted
2. Type of IUD inserted
3. Any previous problems with IUD expulsion
4. Normal pattern of checking herself for IUD strings
5. When she last felt the IUD strings
6. Length of time between when she last felt the IUD strings and when she first was unable to feel them
7. Number of times she had coitus during this period of time and subsequently
8. Use of any other contraceptive method since she was unable to feel the IUD strings

If there is no evidence of pregnancy, you may proceed with your search for the IUD. Using sterile instruments and technique, position the speculum and apply a tenaculum to the cervix (see the procedure for IUD insertion earlier in this chapter). Explore the cervical canal for the strings of the IUD, using a narrow sponge forceps or long Kelly clamp. If you find the strings, remove the IUD, replace it (being careful to leave the strings long), and prescribe prophylactic antibiotics (e.g., doxycycline 100 mg po every 12 hr for 7 days).

If no strings can be found, insert a uterine sound into the uterus and feel for the IUD with the sound. If you find the IUD and cannot bring any strings into view to use for removal, remove the IUD using alligator forceps. Replace the IUD if the woman so desires, if there has been no other problem with the IUD, and if there is no reason to suspect a contraindication. (Again, be careful to leave the strings long on the replacement IUD.) Prescribe prophylactic antibiotics as described above.

If you are unable to feel the IUD with the uterine sound, obtain an ultrasound. If no IUD is present, determine whether the woman wants another IUD and insert one if she does. If the IUD can be seen but it is not clear whether it is in the uterus, contact your consulting physician for further methods of identifying the location of the IUD. If x-ray films are taken, some means must be used to identify whether the IUD, if visible, is within the uterus

or outside the uterus in the abdominal cavity. This is done in one of the following ways:

1. A marker IUD (an IUD of a different type or shape) is inserted into the uterine cavity for purposes of identifying whether the missing IUD is in utero, is in the abdominal cavity, or was expelled.
2. A uterine sound or catheter filled with radiopaque dye is inserted into the uterus.
3. A hysterogram is made (an x-ray film is taken immediately after injection of a radiopaque dye into the uterus via the cervical os); this procedure is contraindicated if there is intrauterine infection or PID.

The midwife will need to refer the woman to the consulting physician for removal of an IUD that is partially or wholly outside of the uterine cavity.

Procedure for Removal of the IUD

The usual reasons for removal of an IUD are a woman's desire to become pregnant; replacement of a medicated device; severe, unremitting cramps; and heavy, lengthy menses with or without intermenstrual bleeding. Other reasons include partial expulsion of the IUD, PID, and pregnancy with visible IUD strings.

After the procedure is explained to the woman and a bimanual examination is performed, a sterile speculum is inserted, the cervix is cleaned, and the tenaculum is applied to the cervix as described in steps 4 through 8 of the procedure for insertion of an IUD detailed earlier in this chapter. Then do the following:

1. Clamp a long-handled forceps or needle-holder on the strings.
2. Pull steadily and strongly on the tenaculum to straighten the uterine axis.
3. Exert a steady, pulling traction on the strings.

If no strings are visible, then use alligator forceps and proceed as follows:

1. Pull steadily and strongly on the tenaculum to straighten the uterine axis.
2. Insert the alligator forceps into the uterine cavity (as detailed in step 9, parts (a) through (e), in the description of the procedure for inserting a uterine sound earlier in this chapter).
3. Grasp the IUD with the alligator forceps.
4. Pull steadily and strongly on the tenaculum to straighten the uterine axis.
5. Pull evenly and steadily with the alligator forceps to remove the IUD from the uterine cavity.

If you meet with great resistance during the removal, *STOP!* Contact your consulting physician before you either break off the IUD strings or (if the strings were unavailable to start with) find yourself coping with a situation you can't handle (such as an imbedded IUD or an IUD partially perforating the uterus that was missed on ultrasound).

References

1. Hubacher, D., and Grimes, D. A. Noncontraceptive health benefits of intrauterine devices: a systematic review. *Obstet. Gynecol. Survey* 57(2):120–128 (February) 2002.
2. Worldwide perspective on IUD use. *The Contraception Report* 9(4):4–8 (September) 1998.
3. Hatcher, R. A., Trussel, J., Stewart, F., et al. *Contraceptive Technology*, 17th rev ed. New York: Ardent Media, 1998.
4. IUDs: understanding their mechanisms of action. *The Contraception Report* 9(5):4–6, 16 (November) 1998.
5. *ParaGard T 380A Prescribing Information, rev.* Raritan, NJ: Ortho-McNeil Pharmaceutical (February) 2002.
6. *Merena Prescribing Information*. Montville, NJ: Berlex Laboratories (December) 2000.
7. World Health Organization, *WHO Medical Eligibility Criteria for Starting Contraceptive Methods*. Geneva, Switzerland: WHO, 2001.
8. Hatcher, R. A., Nelson, A. L., Zieman, M., et al. *A Pocket Guide to Managing Contraception*. Tiger, GA: Bridging the Gap Foundation, 2001.
9. TCR news: copper IUD use extended to 10 years. *The Contraception Report* V(4):12 (September) 1994.
10. Sinei, S. K. A., Schulz, K. F., Lamptey, P. R., et al. Preventing IUCD-related pelvic infection: the efficacy of prophylactic doxycycline at insertion. *Br. J. Obstet. Gynaecol.* 97:412–419, 1990.
11. Walsh, T., Grimes, D., Frezieres, R., et al. Randomised controlled trial of prophylactic antibiotics before insertion of intrauterine devices. *Lancet* 351:1005–1008, 1998.
12. Antibiotics unnecessary at IUD insertion. *The Contraception Report* 9(4):12–13 (September) 1998.
13. Kaunitz, A. M. The levonorgestrel intrauterine system: an effective new contraceptive option. *Contraceptive Technol. Rep.* BB #458 (May) 2001.

14. Zinger, M., and Thomas, M. A. Using the levonorgestrel IUS. *Contemp. OB/GYN* (5):35–48 (May) 2001.

15. Ebi, K. L., Piziali, R. L., Rosenberg, M., and Wachob, H. F. Evidence against tailstrings increasing the rate of pelvic inflammatory disease among IUD users. *Contraception* 51(1):25–32 (January) 1996.

16. Beerthuizen, R. J. Pelvic inflammatory disease in intrauterine device users. *Eur. J. Contraception Reprod. Health Care* 1(3):237–243 (September) 1996.

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CHAPTER

20

Hormonal Contraception

Hormonal contraception takes a number of different forms:

1. Pills
   a. Combination
   b. Progestin-only
2. Emergency contraception
3. Injectables
4. Implants
5. Intravaginal ring
6. Transdermal contraceptive patch
7. Intrauterine device. The hormonal IUD, LNG-IUS (Mirena), is discussed in Chapter 19.

Hormonal contraception consists of a combination of an estrogen and a progestin or of a progestin only.

It has been known for some time that any of the sex hormones can suppress the production of the pituitary gonadotropins (specifically, for contraception, follicle-stimulating hormone [FSH] and luteinizing hormone [LH]). This suppression results when the sex hormone produces a negative feedback action on the hypothalamus, which inhibits secretion of the hypothalamic-releasing factor, which in turn suppresses FSH and LH. The administration of synthetic steroid preparations thus effectively inhibits the development of a graafian follicle and subsequent ovulation. Without ovulation, there is no ovum to be fertilized.

However, the antifertility effect of steroids is not wholly dependent on the inhibition of ovulation. High doses of estrogen postcoitally inhibit implantation of a fertilized egg because estrogen alters the usual progestational development of the endometrium. Thus oral hormones are also used to provide emergency postcoital contraception. Progestins also have the following contraceptive effects:

1. Creation of a hostile cervical mucus that is thick and largely impenetrable by sperm, thus decreasing sperm penetration, transport, and survival
2. Prohibition of the process of capacitation in the sperm resulting from changes in the cervical fluid, which would normally activate this process, thereby rendering the sperm unable to penetrate the ovum
3. Production of an atrophic endometrium that will not support implantation

Combination Pills

Description, Effectiveness, and User Response

The mechanism of action of the pill is a combination of the contraceptive action of estrogens and the contraceptive action of progestins. Three varieties of the combination pill are currently available:

1. *Monophasic:* The same amount and type of estrogen and progestin are taken each day for 20 or 21 days, followed by 7 days of no hormonal intake.
2. *Biphasic:* The estrogen dosage and type remain constant and the type of progestin remains the same but the level of progestin changes between the first and second week of the 21-day cycle of pills, which is followed by 7 days of no hormonal intake.
3. *Triphasic:* The estrogen type remains the same but the level may remain constant or may change in concert with the progestin; the progestin type remains the same but has three dif-

ferent levels during a 21-day cycle of pills, followed by 7 days of no hormonal intake.

In 2002 there were over 45 combination pills on the market in the United States. Many more were on the market worldwide.

The combination pill was the first type of hormonal contraception to be developed. Its name is derived from the fact that each pill contains a combination of an estrogen and a progestin. The main variations among the different formulations of the combination pill are the dosages, the relative proportions of the estrogenic and progestational components, and which estrogenic substance (ethinyl estradiol or mestranol) is used with which of the available progestins. The result is a variety of pills with somewhat different side effects, which allows for a certain amount of changing from pill to pill when necessary in order to best accommodate the individual woman's adjustment to the hormonal therapy.

The contraceptive steroids in the pill do not occur naturally but rather are drugs that produce a pharmacologic rather than a physiologic state. In reality, the menstruation of a woman on the pill is a pseudomenstruation, which is produced by the administration and then withdrawal of the hormonal pharmacologic drugs. A more precise term is *withdrawal bleeding*. The combined estrogen-progestin pill produces stromal edema, predeciduation, and some degree of glandular involution which, after a few cycles, yields a thin, hypoplastic-appearing endometrium. This accounts for the characteristic shorter duration and scantier flow often noticed by women taking the combination contraceptive pills.

There are two synthetic estrogens presently utilized in the combination contraceptive pills: ethinyl estradiol and mestranol. Each brand-name pill contains one or the other. Both are pharmacologic drugs different from naturally occurring estradiol, but they act in the same way. Mestranol is actually a derivative of ethinyl estradiol and is biologically inactive in the human body until converted metabolically into ethinyl estradiol by the liver. The conversion, however, is not 100 percent efficient, which means that ethinyl estradiol and mestranol are not bioequivalent microgram for microgram. Mestranol 50 mcg is bioequivalent to 35 mcg of ethinyl estradiol. Pills containing 50 mcg of mestranol, thus, are not high-dose pills as they are sometimes classified [1]. However, all the pills with less than 50 mcg of estrogen utilize ethinyl estradiol, whereas both ethinyl estradiol and mestranol are used in pills with 50 mcg of estrogen.

Seven progestins are presently utilized in the more common combination pills. Each brand name of pills contains one type of progestin. Each progestin varies in its estrogenic, progestational, and androgenic potency. Each brand-name pill thus varies in its estrogenic, androgenic, and progestational potency as determined by which estrogen is combined with which progestin. Table 20-1 lists the seven progestins and two estrogens and their comparative biological potency. Table 20-2 lists the progestin and estrogen utilized in the more common combination pills. This information is used to determine which pill to use to alleviate side effects.

Like the barrier methods and natural family planning, oral hormonal contraception has differ-

TABLE 20-1 Comparative Biological Potency of the Estrogens and Progestins in the More Common Oral Contraceptive Pills

Steroid	Estrogenic Activity	Androgenic Activity	Progestational Activity	Endometrial Activity
Estrogens				
Ethinyl estradiol	100.0	0.0	0.0	0.0
Mestranol	67.0	0.0	0.0	0.0
Progestins				
Desogestrel	0.0	3.4	9.0	8.7
Ethynodiol diacetate	3.4	0.6	1.4	0.4
Levonorgestrel	0.0	8.3	5.3	5.1
Norethindrone	1.0	1.0	1.0	1.0
Norethindrone acetate	1.5	1.6	1.2	0.4
Norgestimate	0.0	1.9	1.3	1.2
Norgestrel	0.0	4.2	2.6	2.6

Source: Adapted from Dickey, R. P. *Managing Contraceptive Pill Patients*, 10th ed. Dallas, TX: Essential Medical Information Systems, 2000, table 3, pp. 86–87. Used with permission.

TABLE 20-2 Progestin and Estrogen Content of the More Common Combination Contraceptive Pills

Name	Progestin	mg	Estrogen	mcg
Monophasic				
Alesse	Levonorgestrel	0.1	Ethinyl estradiol	20
Brevicon	Norethindrone	0.5	Ethinyl estradiol	35
Demulen 1/35	Ethynodiol diacetate	1.0	Ethinyl estradiol	35
Demulen 1/50	Ethynodiol diacetate	1.0	Ethinyl estradiol	50
Desogen	Desogestrel	0.15	Ethinyl estradiol	30
Levlen	Levonorgestrel	0.15	Ethinyl estradiol	30
Levlite	Levonorgestrel	0.1	Ethinyl estradiol	20
Levora	Levonorgestrel	0.15	Ethinyl estradiol	30
Loestrin 1.5/30	Norethindrone acetate	1.5	Ethinyl estradiol	30
Loestrin 1/20	Norethindrone acetate	1.0	Ethinyl estradiol	20
Lo/Ovral	Norgestrel	0.3	Ethinyl estradiol	30
Low-Ogestrel	Norgestrel	0.3	Ethinyl estradiol	30
Mircette	Desogestrel	0.15	Ethinyl estradiol	20
Modicon	Norethindrone	0.5	Ethinyl estradiol	35
Necon 0.5/35	Norethindrone	0.5	Ethinyl estradiol	35
Necon 1/35	Norethindrone	1.0	Ethinyl estradiol	35
Necon 1/50M	Norethindrone	1.0	Mestranol	50
Nelova 0.5/35E	Norethindrone	0.5	Ethinyl estradiol	35
Nelova 1/35E	Norethindrone	1.0	Ethinyl estradiol	35
Nelova 1/50M	Norethindrone	1.0	Mestranol	50
Nordette	Levonorgestrel	0.15	Ethinyl estradiol	30
Norethin 1/35E	Norethindrone	1.0	Ethinyl estradiol	35
Norethin 1/50M	Norethindrone	1.0	Mestranol	50
Norinyl 1/35	Norethindrone	1.0	Ethinyl estradiol	35
Norinyl 1/50	Norethindrone	1.0	Mestranol	50
Norlestrin 1/50	Norethindrone acetate	1.0	Ethinyl estradiol	50
Ogestrel	Norgestrel	0.5	Ethinyl estradiol	50
Ortho-Cept	Desogestrel	0.15	Ethinyl estradiol	30
Ortho-Cyclen	Norgestimate	0.25	Ethinyl estradiol	35
Ortho-Novum 1/35	Norethindrone	1.0	Ethinyl estradiol	35
Ortho-Novum 1/50	Norethindrone	1.0	Mestranol	50
Ovcon 35	Norethindrone	0.4	Ethinyl estradiol	35
Ovcon 50	Norethindrone	1.0	Ethinyl estradiol	50
Ovral	Norgestrel	0.5	Ethinyl estradiol	50
Zovia 1/35	Ethynodiol diacetate	1.0	Ethinyl estradiol	35
Zovia 1/50	Ethynodiol diacetate	1.0	Ethinyl estradiol	50
Multiphasic				
Estrostep	Norethindrone acetate	1.0(5)	Ethinyl estradiol	20(5)
	Norethindrone acetate	1.0(7)	Ethinyl estradiol	30(7)
	Norethindrone acetate	1.0(9)	Ethinyl estradiol	35(9)
Jenest	Norethindrone	0.5(7)	Ethinyl estradiol	35(7)
	Norethindrone	1.0(14)	Ethinyl estradiol	35(14)
Necon 10/11	Norethindrone	0.5(10)	Ethinyl estradiol	35(10)
	Norethindrone	1.0(11)	Ethinyl estradiol	35(11)
Nelova 10/11	Norethindrone	0.5(10)	Ethinyl estradiol	35(10)
	Norethindrone	1.0(11)	Ethinyl estradiol	35(11)
Ortho-Novum 7/7/7	Norethindrone	0.5(7)	Ethinyl estradiol	35(7)
	Norethindrone	0.75(7)	Ethinyl estradiol	35(7)
	Norethindrone	1.0(7)	Ethinyl estradiol	35(7)
Ortho-Novum 10/11	Norethindrone	0.5(10)	Ethinyl estradiol	35(10)
	Norethindrone	1.0(11)	Ethinyl estradiol	35(11)
Ortho Tri-Cyclen	Norgestimate	0.180(7)	Ethinyl estradiol	35(7)
	Norgestimate	0.215(7)	Ethinyl estradiol	35(7)
	Norgestimate	0.250(7)	Ethinyl estradiol	35(7)

TABLE 20-2 Progestin and Estrogen Content of the More Common Combination Contraceptive Pills *(continued)*

Name	Progestin	mg	Estrogen	mcg
Tri-Levlen	Levonorgestrel	0.05(6)	Ethinyl estradiol	30(6)
	Levonorgestrel	0.075(5)	Ethinyl estradiol	40(5)
	Levonorgestrel	0.125(10)	Ethinyl estradiol	30(10)
Tri-Norinyl	Norethindrone	0.5(7)	Ethinyl estradiol	35(7)
	Norethindrone	1.0(9)	Ethinyl estradiol	35(9)
	Norethindrone	0.5(5)	Ethinyl estradiol	35(5)
Triphasil	Levonorgestrel	0.05(6)	Ethinyl estradiol	30(6)
	Levonorgestrel	0.075(5)	Ethinyl estradiol	40(5)
	Levonorgestrel	0.125(10)	Ethinyl estradiol	30(10)
Trivora	Levonorgestrel	0.05(6)	Ethinyl estradiol	30(6)
	Levonorgestrel	0.075(5)	Ethinyl estradiol	40(5)
	Levonorgestrel	0.125(10)	Ethinyl estradiol	30(10)

Source: Adapted from Dickey, R. P. *Managing Contraceptive Pill Patients*, 10th ed. Dallas, TX: Essential Medical Information Systems, 2000, table 4, pp. 88–91. Numbers in parentheses for multiphasic pills are the number of days in each phase. Used with permission.

ent effectiveness rates with perfect use and typical use. As shown in Table 16-2 (page 464), perfect use, especially of the combination pill, provides effectiveness comparable to that of sterilization, long-term hormonal contraception such as implants and injectibles, and two intrauterine contraceptive devices (the Copper T 380A and LNG-IUS; see Chapter 19). The pill's effectiveness with typical use, however, is worse than that of these same other methods. Typical use figures are affected by a woman's skipping pills for whatever reason: side effects, complications, anxiety about possible side effects or complications, illness, forgetfulness, lack of understanding the instructions, or a transient desire to become pregnant. The woman's compliance with pill-taking instructions is critical to efficacy of the method.

Although the pill is the most popular of all the methods of contraception in the United States, it has a high attrition, or discontinuation, rate. Nearly 30 percent of women who start the pill will not still be using it a year later. The most frequently cited reasons for discontinuing the pill are side effects and fear of potential side effects. Unfortunately, many women who discontinue taking oral hormonal contraception do so without initiating another contraceptive method even when they do not want to become pregnant.

The responses of women to the pill have been diverse. At one end of the spectrum are women who are afraid of using the pill because of the adverse publicity the pill has periodically received. At the other end of the spectrum are women who favor the pill for its ease of use, its disassociation with the act of sexual intercourse, and its high effectiveness rate.

Contraindications, Side Effects, and Complications

Contraindications The following are absolute contraindications to initiating combination oral hormonal contraception for a woman by a midwife:

1. Pregnancy (known or suspected)
2. Thrombophlebitis (presence or history of)
3. Thromboembolic disorders (presence or history of)
4. Cerebrovascular accident, cerebrovascular disease, or coronary artery disease (presence or history of)
5. Liver damage, impaired liver function, or acute hepatitis
6. Benign or malignant liver tumor (presence or history of)
7. Cholestatic jaundice of pregnancy or jaundice with prior contraceptive pill use
8. Type II hyperlipidemia (hypercholesterolemia)
9. Estrogen-dependent neoplasia (known or suspected)
10. Carcinoma of the breast (known or suspected)
11. Undiagnosed abnormal genital bleeding
12. Carcinoma of the endometrium (known or suspected)
13. Classic migraine headaches (with aura)/severe migraine with neurologic symptoms
14. Smoking by women over the age of 35
15. Diabetes mellitus
16. Leiden Factor V mutation or family history of multiple family members with multiple unexplained venous thromboembolism events at an early age

The following are relative contraindications to initiating combination oral hormonal contraception

for a woman by a midwife. The midwife should exert extreme caution in the presence of any of these conditions, discuss any particularly questionable situation with the consulting physician, make case-by-case decisions based on the total history, physical findings, and unique situation of that individual woman, or provide a different contraceptive method.

1. Hypertension; blood pressure greater than 140/90
2. Asthma
3. Cardiac disease (presence or history of)
4. Renal disease (presence or history of)
5. Gallbladder disease (presence or history of)
6. Ulcerative colitis
7. Sickle cell or sickle cell–hemoglobin C disease
8. Lupus erythematosus
9. Depression (presence or history of, especially if worse premenstrually or postpartum)
10. Elective surgery requiring lengthy immobilization
11. Varicose veins

The midwife should evaluate each woman who has any degree of mental retardation, substance abuse, or psychiatric disorder for reliability in pill taking and make a decision whether combination oral hormonal contraception is contraindicated on this basis. The midwife also should discuss with the woman her risk for HIV or sexually transmitted diseases and her need for a barrier method of contraception in addition to combination oral hormonal contraception. The pill gives no protection against the transmission of HIV or sexually transmitted diseases.

Side Effects and Risk of Complications The side effects of oral hormonal contraception are legion but have been much reduced since the advent of the lower dosages. Still, approximately 40 percent of women who use the pill have or perceive that they have side effects. These must be taken quite seriously and a woman given careful anticipatory guidance so that she does not simply discontinue taking the pill without being evaluated for the cause of the symptom or obtaining another method of contraception.

Experts have categorized the side effects (assuming nonmedical causes) by hormonal etiology; see Table 20-3. It is helpful to remember that each woman has her own individual hormonal makeup and balance. Therefore the same brand of pill may, for example, cause hormonal excess in one woman and hormonal deficiency in another woman. Both women may have side effects but the side effects may differ, since the underlying hormonal patterns are different.

There is a constant flow of information from reanalysis and meta-analysis of old data and from new findings from more recent studies that bring ongoing changes in thinking about potentially serious complications for women taking combination oral contraceptive pills. The following is a brief synopsis of conclusions, as of this writing, of these potential complications.

Cardiovascular system (myocardial infarction; cerebrovascular accidents; thrombophlebitis and venous thromboembolism [VTE], which includes deep vein thrombophlebitis and pulmonary embolism; and hypertension): Cardiovascular risk is based more on screening the women for risk factors than the hormonal makeup of the pill when the estrogen is less than 50 mcg. It is not necessary to select a pill with different progestins on this basis [2]. In other words, the profile of a woman who is obese, hypertensive, has a relevant family history, and smokes is a candidate for cardiovascular disease without the combination oral contraceptive pill. Current use of low-dose combination oral contraceptive pills is unrelated to an increased risk of myocardial infarction among nonsmokers [3]. The risk of ischemic stroke in women on combination oral contraceptive pills increases with smoking and hypertension and decreases with low dosage of estrogen. Risk is not related to the progestogen [2, 4]. The clearly established increased risk of venous thromboembolism has been reduced with pill formulations of lower than 50 mcg of estrogen [5].

The benefits of the combination oral contraceptive pill (see next section) outweighs the risks for nonsmoking, healthy women of any age. There is no increased risk of cardiovascular diseases from past use of oral hormonal contraception, and there is no relationship between atherogenic disease and the use of oral hormonal contraception [4]. Women who smoke should be helped to stop and, if they are over age 35, to find another contraceptive method.

Migraine headaches: The common migraine headache (without aura) is not a contraindication for oral hormonal contraception (unlike the classic migraine headache, with aura, which is a contraindication). Tension headaches are not contraindications [6]. Headaches should be carefully evaluated prior to and during use of oral hormonal contraception. Persistent headaches are often a precursor of cardiovascular accidents. Women on combination oral contracep-

TABLE 20-3 Relation of Side Effects to Hormone Content

	Reproductive System	Premenstrual Syndrome	General	Cardiovascular System
Estrogen Excess	Breast cystic changes Cervical extrophy Dysmenorrhea Hypermenorrhea, menorrhagia, and clotting Increase in breast size Mucorrhea Uterine enlargement Uterine fibroid growth	Bloating Dizziness, syncope Edema Headache (cyclic) Irritability Leg cramps Nausea, vomiting Visual changes (cyclic) Weight gain (cyclic)	Chloasma Chronic nasal pharyngitis Gastric influenza and varicella Hay fever and allergic rhinitis Urinary tract infection	Capillary fragility Cerebrovascular accident Deep vein thrombosis hemiparesis (unilateral weakness and numbness) Telangiectasias Thromboembolic disease
Estrogen Deficiency	Absence of withdrawal bleeding Bleeding and spotting during pill days 1 to 9 Continuous bleeding and spotting Flow decrease, hypomenorrhea Pelvic relaxation symptoms Vaginitis atrophic		Nervousness Vasomotor symptoms	
Progestin Excess	Cervicitis Flow length decrease Moniliasis		Appetite increase Depression Fatigue Hypoglycemia symptoms Libido decrease Neurodermatitis Weight gain (noncyclic)	Hypertension Leg vein dilation
Progestin Deficiency	Breakthrough bleeding and spotting during pill days 10 to 21 Delayed withdrawal bleeding Dysmenorrhea (also estrogen excess) Heavy flow and clots (also estrogen excess), hypermenorrhea, menorrhagia			
Androgen Excess			Acne Cholestatic jaundice Hirsutism Libido increase Oily skin and scalp Rash and pruritus Edema	

Source: Adapted from Dickey, R. P. *Managing Contraceptive Pill Patients*, 10th ed. Dallas, TX: Essential Medical Information Systems, 2000, table 10, pp. 102–103. Used with permission.

tive pills who first develop migraine headaches while on the pill or who experience increased severity or frequency of preexisting migraine headaches should immediately stop the pill and select another method of contraception [7].

Breast cancer: A reanalysis of worldwide epidemiological evidence from 54 studies conducted in 25 countries provided strong evidence of a small increase in relative risk of having breast cancer diagnosed either while taking combination oral hormonal contraception or within the first ten years after discontinuation. After ten years there was no significant excess risk [8]. Breast self-examination by the woman and annual breast exams by the midwife are imperative. A multigenerational family study suggests that women who used formulations of combination oral hormonal contraception prior to 1975, when the estrogen dosage was considerably higher than in today's pill formulations, and have a first-degree relative (sister, mother) with breast cancer may be at particularly high risk for breast cancer [9]. These women need to be carefully monitored for early detection of breast cancer.

Other: Evidence is conflicting on whether there is an association or no association between taking combination oral hormonal contraception and other complications including cervical cancer, gallbladder disease, and hepatic neoplasms.

The midwife should be aware that laboratory test results may be altered in women on combination oral hormonal contraception, although this was seen more with the older formulations with higher dosages of the estrogen and the progestin.

Certain medications decrease the efficacy of oral hormonal contraception. Conversely, contraceptive pills decrease the efficacy of certain medications. In both cases the issue is the effect of the drug (either the oral contraceptive or the medication) on the liver (e.g., whether the drug stimulates the metabolic capacity of the liver) and the rate of clearance of the drug through the liver. There is a great deal that is speculative, anecdotal, theoretical possibility, and simply not known. Information on the effect of antibiotics on oral contraceptives falls into this category. Some medications, however, are known to affect liver metabolism and reduce the effectiveness of oral contraceptive pills. They include the following:

- rifampin (Rifamycin, Rifadin; antituberculosis drugs)
- phenytoin (Dilantin; antiseizure medication)
- primidone (Mysoline; antiseizure medication)
- carbamazepine (Tegretol; antiseizure medication)
- phenobarbital (Donnatal; antispasmodic/sedative)
- griseofulvin (Fulvicin; antifungal treatment for ringworm)

Women on the above medications should choose a different contraceptive method.

The action of the following drugs is most likely potentiated by oral hormonal contraception:

- diazepam (Valium; antianxiety medication)
- chlordiazepoxide (Librium; antianxiety/sedative)
- theophylline (Aerolate, Bronkotabs, Marax, Respbid, Theolair; bronchodilators for asthma)
- tricyclic antidepressants (Tofranil, Elavil, Norpramin)
- corticosteroids/cortisone (Cortone; anti-inflammatories)

Women on the above medications will require less of the medication to obtain the desired effect.

The action of the following drugs is most likely reduced by oral hormonal contraception:

- guanethidine (Ismelin, Esimil [with diuretic]; antihypertensive)
- metoprolol (Lopressor; antihypertensive)
- methyldopa (Aldoclor, Aldomet, Aldoril; antihypertensive)
- acetaminophen (Tylenol; analgesic)

Women on the above medications will require more of the medication to obtain the desired effect.

St. John's wort, used for depression, activates two enzyme pathways that can interfere with the use of other medications by causing them to be metabolized more quickly. Specifically, it induces cytochrome P450 drug metabolizing enzymes in the liver and affects a transport protein, P-glycoprotein, in the intestines [10]. The Food and Drug Administration recommends that persons using drugs that are metabolized by the cytochrome P450 pathway (such as oral contraceptives) not take St. John's wort. However, no formal studies exist that address the effect of St. John's wort on the efficacy of oral contraceptives. It is now thought that St. John's wort may not be as effective as previously thought [10]. Midwives need to specifically include in their history taking whether a woman is using St. John's wort and, if she is, discuss with her the possible reduction in protection from pregnancy if also using oral contraceptive pills. If studies prove that St. John's wort is actually ineffective in the treatment of depression, then the benefits of oral contraceptive pills for those who want them need to be

considered as taking precedence over the use of St. John's wort.

Benefits of Combination Oral Hormonal Contraception

There are a number of significant benefits that accrue to women who take combination oral hormonal contraceptive pills. These benefits should be weighed by the individual woman and midwife together and balanced against any risks that woman may have. This is particularly true in balancing the *possible* potential risk of breast cancer against the *known* protection of combination oral hormonal contraception against ovarian cancer and endometrial cancer.

Ovarian cancer: 40 percent reduction of risk in women who have ever used oral hormonal contraception. The protection starts within 3 to 6 months and increases with length of use; with more than 10 years of use there is an 80 percent reduction in risk. Protection continues for at least 15 years after discontinuing use of the pills. The protection is the same with different formulations of the pill including low-dose pills of 35 mcg or less of estrogen [11, 12].

Endometrial cancer: Risk is reduced by length of time taking combination oral hormonal contraception: 20 percent with 1 year of use, 40 percent with 2 years of use, and 60 percent with 4 or more years of use. Protection is the same with different formulations of monophasic pills including those with less than 50 mcg of estrogen but, as of this writing, there are no data regarding multiphasic pills. Protection continues for 15 or more years after discontinuation [11].

Benign breast disease: significant reduction of fibrocystic changes and fibroadenoma development. Protection against fibrocystic changes lasts up to 1 year after discontinuation [11].

Other: Evidence of protection against other diseases is conflicting but may possibly include pelvic inflammatory diseases [11] and colorectal cancer [13]. In addition, combination oral contraceptive pills protect against other diseases and conditions simply by virtue of the facts that pregnancy is prevented, ovulation is suppressed, and menstrual blood loss is reduced. These include the following:

1. Iron deficiency anemia
2. Ectopic pregnancy
3. Mittelschmerz
4. Dysmenorrhea
5. Menorrhagia
6. Metrorrhagia
7. Toxic shock syndrome

Combination oral hormonal contraception is sometimes used off-label as therapy for several menstrual and hormone related disorders. These include the following:

1. Dysmenorrhea (often used in conjunction with nonsteroidal anti-inflammatory drugs)
2. Menorrhagia
3. Metrorrhagia
4. Irregular menses
5. Acne
6. Hirsutism
7. Endometriosis

Finally, women can be taught to have some control over their own menstrual cycle by tricycling to reduce the number of menstrual cycles if they have premenstrual syndrome, migraine headaches with their menses, dysmenorrhea, or menorrhagia. Tricycling is achieved when the woman takes 3 consecutive packs of pills skipping the hormone-free weeks and using only the 21 active pills for a total of 63 days. She then takes no pills for 7 days after which she starts the next tricycle.

Women who want to control their menstrual periods for their own convenience (e.g., traveling, special occasions, etc.) can do this by simply extending the number of days they take active pills or by skipping the pill-free week.

Management Plan for Combination Oral Hormonal Contraception

Management of the care of the woman taking combination oral hormonal contraceptive pills consists of the following components:

1. Informing the woman of the effectiveness rates and potential side effects and complications of taking the pill and having her sign an informed consent form
2. Conducting a general history, physical and pelvic examinations, and laboratory tests
3. Screening for any deviations from normal and for any contraindications to initiating the pill
4. Selection and initiation of the pill
5. Giving the woman instructions for taking combination oral contraceptive pills
6. Scheduling and managing the return visits
7. Managing the possible side effects and complications related to the pill

The first component is self-explanatory; the second and third components have been discussed previously. It should be noted, however, that in 1993 the Food and Drug Administration approved a change in practice as reflected in the labeling on packages of oral contraceptives, which states that "physical examination may be deferred until after initiation of oral contraceptives if requested by the woman and judged appropriate by the clinician." This action was taken to address the needs of women in three particular circumstances, who otherwise might not adopt a method of contraception: (1) women whose appointment falls during their menstrual period and who would have to reschedule for a full examination, (2) adolescents who fear a pelvic examination, and (3) women who would have to wait for an available appointment time for an initial examination [14].

Selection and Initiation of the Pill

There was a time, back when the large number of available pills contained a wide range of estrogen and progestin dosages, that selection was based on a match between a woman's hormonal profile and the pill with the most appropriate hormonal potency for her profile. With today's low dosage of both the estrogen and the progestin, the differences among pills are not as profound, and this somewhat cumbersome and complicated method of selection is no longer necessary. This is not to say that you cannot do some matching of a woman's hormonal profile and hormonal components of the pill if you so choose. However, years of experience in health department clinics where the choice of pills was severely limited has taught clinicians that it is quite possible to choose from among a generic choice of two or three pills for initiating oral contraception and then switch the pill, if necessary, in accord with the adjustment/side effects an individual woman has. It is well worth a midwife's time to sit down with various sources of information on selection of a pill [5, 7, 15] and identify one or two pills to use for a generic choice of pill initiation. Tables 20-4 and 20-5 are helpful in making more individualized pill selections and include the progestin-only minipills. Table 20-4 groups the various formulations of the oral hormonal contraceptive pills by their endometrial, progestational, and androgenic activities. Table 20-5 gives pre-pill characteristics of the woman, the type of pill activity thus indicated that she needs, and the number of the pill grouping(s) from Table 20-4 with that type of activity and the names of the pills in that group.

Initiation of the pill depends on where the woman is in relation to her menstrual cycle, postabortion, postdelivery, and lactation. Oral hormonal contraception may be started immediately after a first- or second-trimester abortion. Postabortion women and women who have had a full-term delivery are *not* physiologically analogous as to hormone levels, reinstitution of ovulation, or decidual restoration. Combination oral hormonal contraception can be started in the third week postpartum for women who are not breastfeeding. Delaying until the third week postpartum avoids the increased risk of thrombophlebitis and thromboembolism during the first two postpartal weeks. Ovulation postdelivery is thought to occur rarely prior to the fourth postpartal week. However, after the sixth postpartal week it is quite possible for ovulation to have occurred and for the woman who is not breastfeeding to be pregnant if she has had unprotected sexual intercourse.

During the first 6 months postpartum, a woman is protected from pregnancy by the lactation amenorrhea method (LAM; see Chapter 17) as long as she is fully breastfeeding and has no bleeding after the first 56 days postpartum. However, if she is partially breastfeeding or plans to wean the baby, she may want to start oral hormonal contraception. Combination contraceptive pills affect the production of milk and reduce the milk supply. This is true even if the woman does not start taking the combination pills until 6 weeks postpartum and even if she takes combination pills with a low dose of estrogen [15]. For this reason it is best for the breastfeeding woman not to use combination pills until she plans to wean or after 6 months postpartum, when LAM begins to lose its effectiveness and she starts to ovulate again.

In order to prevent breakthrough bleeding and to be contraceptively effective as soon as possible, a woman should not start oral hormonal contraception any later than the tenth day in her cycle and preferably before the fifth day from the beginning of menstruation. So if a woman has her initial visit to a midwife in midcycle, she needs to wait until her next menstrual period to start the pills (either on the first day or on the Sunday after she starts to menstruate, depending on the packaging of the pill). For the interim, the midwife can give the woman a spermicidal preparation and condoms to use as her primary method until she is able to start on the pills and then as a backup method during the first cycle of pill taking. It is possible to start a woman on the pills at any point in the cycle, but this approach

TABLE 20-4 Oral Hormonal Contraceptives with Similar Endometrial, Progestational, and Androgenic Activities[a]

Group	Oral Contraceptives	Estrogen and Dose	Activity
1	Micronor Nor-QD Ovrette	No estrogen	Endometrial: low Progestational: low Androgenic: low
2	Mircette Desogen Ortho-Cept	22 mcg ethinyl estradiol (average) 30 mcg ethinyl estradiol 30 mcg ethinyl estradiol	Endometrial: intermediate Progestational: intermediate/high Androgenic: low
3	Loestrin 1/20 Estrostep* Loestrin 1.5/30	20 mcg ethinyl estradiol 30 mcg ethinyl estradiol (average) 30 mcg ethinyl estradiol	Endometrial: low Progestational: intermediate/high Androgenic: intermediate/high
4	Levlen Levora Lo/Ovral Low-Ogestrel Nordette	30 mcg ethinyl estradiol	Endometrial: intermediate Progestational: intermediate Androgenic: intermediate
5	Tri-Levlen* Triphasil* Trivora* Ovcon 35 Ortho-Cyclen Ortho Tri-Cyclen*	32 mcg ethinyl estradiol (average) 35 mcg ethinyl estradiol	Endometrial: intermediate Progestational: low Androgenic: low
6	Demulen 1/35 Zovia 1/35	35 mcg ethinyl estradiol	Endometrial: low Progestational: high Androgenic: low
7	Jenest* Necon 10/11* Nelova 10/11* Ortho-Novum 7/7/7* Ortho-Novum 10/11*	35 mcg ethinyl estradiol	Endometrial: intermediate Progestational: intermediate Androgenic: low
8	Alesse Levlite Brevicon Modicon Necon 0.5/35 Nelova 0.5/35 Tri-Norinyl*	20 mcg ethinyl estradiol 35 mcg ethinyl estradiol	Endometrial: low Progestational: low Androgenic: low
9	Necon 1/35 Nelova 1/35 Norethin 1/35E Norinyl 1/35 Ortho-Novum 1/35	35 mcg ethinyl estradiol	Endometrial: intermediate Progestational: intermediate Androgenic: intermediate
10	Necon 1/50M Norethin 1/50M Norinyl 1/50 Nelova 1/50M Ortho-Novum 1/50	50 mcg mestranol	Endometrial: intermediate Progestational: intermediate Androgenic: intermediate
11	Norlestrin 1/50 Ovcon 1/50	50 mcg ethinyl estradiol	Endometrial: intermediate Progestational: intermediate Androgenic: intermediate
12	Demulen 1/50 Zovia 1/50	50 mcg ethinyl estradiol	Endometrial: intermediate Progestational: high Androgenic: low
13	Ogestrel Ovral	50 mcg ethinyl estradiol	Endometrial: high Progestational: high Androgenic: high

[a] Arranged by estrogen type and dose.

* Multiphasic.

Source: Adapted and printed with permission from EMIS, Inc., from Managing Contraceptive Pill Patients®—10th ed., by Richard P. Dickey, MD, PhD.

TABLE 20-5 Choice of an Initial Oral Hormonal Contraceptive[a]

Characteristics	Type of OC Indicated	Suggested OC for the Initial Cycles (See Table 20-4 for OC Groups)
Regular light menses; 2 to 4 days flow; mild or no cramps	Low endometrial activity	Groups 3, 6, 8
Regular moderate menses; 4 to 6 days flow; moderate cramps	Intermediate endometrial activity	Groups 2, 4, 5, 7, 9
Regular heavy menses; 6-plus days flow; severe cramps	High endometrial activity	Group 13
Irregular and infrequent menses; hypermenorrhea when occurs; associated acne, oily skin, hirsutism	Probably polycystic ovarian syndrome; high progestational and low androgenic activity desirable	Groups 2, 6, 12
Irregular menses; hypomenorrhea when occurs; no androgen effects	If galactorrhea present, possible pituitary adenoma; skull x-ray or prolactin needed If no galactorrhea, low estrogen and low progestational activity combination OCs or multiphasic OCs may be used	Groups 1, 5, 8, barrier and spermicide methods
Smokers—ages 35 and over	Combination OCs contraindicated	Group 1, barrier and spermicide methods
Nonsmokers—ages 35 and over	Sub 35 mcg estrogen, intermediate/high progestin, combination OC	Groups 2, 3, 4
Weight less than 110 lbs	Lower estrogen and low progestin dose	Groups 5, 7, 8
Weight more than 160 lbs	High estrogen and progestin activity	Groups 9–13
Progesterone hypersensitivity: history of toxemia, strong family history of hypertension, excessive weight gain, tiredness or varicose veins during pregnancy, depression, excessive premenstrual edema	Low progestin dose and progestational activity; monitor blood pressure	Groups 1, 5, 8
Estrogen hypersensitivity: excessive nausea, edema or hypertension in pregnancy; hypertrophy of the cervix or uterus; uterine fibroids; large or fibrocystic breasts; heavy menses; migraine	Low estrogenic activity	Groups 1, 3
Conditions predisposing to cardiovascular disease, type II hyperlipidemia (hypercholesterolemia), diabetes mellitus, obesity, smoking more than 15 cigarettes per day, hypertension, varicose veins, thrombophlebitis during pregnancy, family history of cardiovascular disease before age 50	Combination pills not recommended	Group 1, barrier and spermicide methods
Surgery planned within 1 to 4 weeks	Combination pills should be stopped	Group 1, barrier and spermicide methods

[a] After the initial cycles, all patients should be switched to Group 2 through 8 OCs if possible (≤35 mcg estrogen, low androgen activity).

Source: Adapted and printed with permission from EMIS, Inc., from Managing Contraceptive Pill Patients®—10th ed., by Richard P. Dickey, MD, PhD.

practically guarantees breakthrough bleeding and offers questionable effectiveness until the pills are "in control." Most women will not tolerate this amount of trouble. It is better to synchronize the initiation of pills with the woman's natural cycle.

Regardless of when a woman starts taking the pill, she should be given a spermicidal preparation and condoms "to cover" during the first month of taking the pills. Although the pill is effective after 7 days of pill taking, "coverage" for a month provides additional protection in case of forgetfulness while the woman is establishing a regular pill-taking routine. This also enables you to teach her a second contraceptive method to use in the event she decides to discontinue the pills, she is placed on any medication that reduces the effectiveness of the contraceptive pill, or she forgets her pills in the future. She should use condoms routinely in addition to the pill if she is at risk for HIV or sexually transmitted diseases.

The Return Visit

The woman is scheduled for her first revisit after two or three complete pill cycles. This means that you need to give her or prescribe three or four packages of pills initially. She should be seen sometime in the middle of her third or fourth package of pills. You can calculate this time from the date on which you start her on the pills. During the first revisit you should evaluate the following:

1. Blood pressure
2. Weight
3. History
   - **a.** woman's or couple's satisfaction with the method
   - **b.** use of spermicidal preparation and condoms
   - **c.** description of how and when she is taking her pills
   - **d.** any medications she is taking: what, what for
   - **e.** any visits to a doctor or emergency room since starting pills: why
   - **f.** menses (compare with pre-pill menses)
     - **(1)** date
     - **(2)** length
     - **(3)** amount of flow
     - **(4)** pain
   - **g.** side effects
4. Any questions or concerns

Some midwives believe that this first revisit should be followed by a 6-month visit and then annual visits with a Pap smear thereafter. Other midwives go directly to an annual visit if all is well at the first revisit. Some clinicians believe that after 5 years of contraceptive pill use, women should have a Pap smear every 6 months.

At the annual revisit you should take the same history you obtained at the first revisit, plus a complete general screening history, physical and pelvic examinations, Pap smear, and other laboratory tests and adjunctive studies as specified in Chapter 2.

Management of Side Effects and Complications

When a woman has a side effect, the midwife should ascertain which of the following three possible courses the side effect will probably take:

1. Spontaneous remission as the woman's body adjusts to the hormonal effect of the pill. Remission is common with side effects occurring during the first three cycles of pill taking. Women are often encouraged to "wait it out" through this period of time. Spontaneous remission should have occurred by the fourth pill-taking cycle.
2. Continuation (more likely when the side effect occurs after several cycles of pill taking, but may occur with early cycles of pill taking). If the side effect appears likely to continue, you should switch the woman to a different pill or discontinue the pill and initiate another contraceptive method according to her choice.
3. Development into a dangerous complication. Some side effects are harbingers of more severe complications. If the side effect is determined to be such a harbinger, the woman should stop taking the pills immediately (see item 5 under "Instructions for Women Taking Combination Oral Contraceptive Pills," page 526).

If switching to a different pill is an option, the midwife needs to determine the following in relation to the side effect: (1) when in the menstrual cycle it occurs, (2) whether it is due to hormone excess or hormone deficiency, and (3) which hormone is involved (the estrogen or the progestin).

Table 20-3 relates symptoms or side effects to generic hormonal excess or deficiency of estrogen or progestin. After checking Table 20-3, you can consult Tables 20-1 and 20-2 to identify the biological potency and dosage of the pill a woman is taking and find a pill with more or less of the estrogen or progestin that is needed to potentially take care of the problem.

Knowing when in the woman's cycle the side effect occurs may help you diagnose the problem. For example, early cycle breakthrough bleeding is usually due to estrogen deficiency; late cycle break-

through bleeding is usually due to progestin deficiency. Thus, the pill you would switch the woman to would be quite different; a pill with higher estrogenic activity for early cycle breakthrough bleeding and a pill with a progestin with higher endometrial or progestational potency for breakthrough bleeding at any other time in the cycle.

If switching to a different pill is the method of management chosen, remember the following:

1. If the switch is to a pill with equal or greater estrogen and progestational potency, the switch can be made any time during the cycle.
2. If the switch is to a pill with less estrogen and progestational potency, the switch must be made only at the beginning of a new pill cycle, as the new pill will take a longer time to achieve hormonal menstrual control.
3. Depending on the severity of the side effect, it might be advisable to switch the pill at the beginning of a pill cycle even if the switch is one that can be made in midcycle, just to minimize confusion.
4. The woman should be counseled that her body will again be undergoing adjustment to a different hormonal balance and some temporary side effects may be experienced.

The contraceptive pill should be discontinued in the presence of the following symptoms or side effects, which should be further evaluated by the midwife and the consulting physician:

1. Headaches that are severe, persistent, of sudden onset, or qualitatively different from those the woman normally experiences
2. Visual disturbances:
   a. blurring of vision
   b. flashing lights
   c. diplopia
   d. scintillating scotomata
   e. periods of temporary blindness
3. Unexplained severe chest pain or shortness of breath
4. Unexplained severe abdominal pain
5. Severe calf or thigh pain
6. Temporary numbness or paralysis of any part of the face or body
7. Slurring of speech
8. Hemoptysis
9. Marked increase in blood pressure

The pill should also be discontinued if the woman develops any disease that contraindicates the use of the pill.

The woman should be provided with another method of family planning when she must stop taking the pill because of side effects, complications, or undesirable drug interactions.

Instructions for Women Taking Combination Oral Contraceptive Pills

General Instructions The following instructions should be given to all women taking the combination pill, regardless of whether it is the 21-day or the 28-day pill:

1. Keep your pills in a place safe from children and animals but also where you will be reminded to take them daily. It helps if you keep them with something you use in your daily routine, such as your toothbrush or toothpaste, coffee pot, or alarm clock.
2. Make your pill taking as much a routine as possible. Taking your pill at approximately the same time every day not only helps make it a routine but also ensures a consistent level of contraceptive hormone in your body.
3. It is necessary to take the pills exactly as instructed if you do not want to become pregnant.
   a. If you miss one pill during the first 3 weeks of your pill-taking cycle, you probably won't become pregnant, but you should use a backup method of contraception (for example, a spermicidal preparation and condoms) for the next 7 days. Take the forgotten pill as soon as you remember it and the next pill at the regular time (this may mean you take them both at the same time).
   b. If you miss two pills during the first 2 weeks of your pill-taking cycle, you may or may not still be protected from pregnancy. Take two pills the day you remember them and two pills the next day. This should catch you up on your pill cycle. Also, use a spermicidal preparation and condom each time you have intercourse for the next 7 days. Do not be surprised or alarmed if you have some midcycle spotting.
   c. If you miss two pills during the third week of your pill-taking cycle or if you miss three pills during any of the first 3 weeks of your pill-taking cycle, chances are good that you will start bleeding or get pregnant. Use a spermicidal preparation and condoms for the next 7 days. Throw away the remainder of your pill package and start a new package. If you have a Sunday-start type pill, continue taking an active pill every day in your old pill package until Sunday, then start a new package.

4. Be sure to keep your revisit appointment so you don't run out of pills and so you can be examined carefully for any possible side effects.
5. Call for an appointment *immediately* if you are having any of the following symptoms. Do not wait to see if they will simply go away because these are danger signs:
   a. severe headaches
   b. visual disturbances
      (1) blurring of vision
      (2) flashing lights
      (3) spots before your eyes
      (4) temporary moments of blindness
   c. severe chest pain or shortness of breath
   d. severe abdominal pain
   e. severe calf or thigh pain
   f. temporary numbness or paralysis of any part of your body
   g. slurring of speech
   h. coughing up bloody sputum
   i. severe depression
   j. if you miss two menstrual periods or think you are pregnant
6. Be sure to tell any doctor or nurse practitioner you see for any medical problems that you are taking birth control pills. Some medications can interfere with the effectiveness of the pill, and the pill can interfere with the effectiveness of some medications.
7. Do not ever take another woman's pills or allow another woman to take your pills. Most likely someone else's pills are not the same strength and hormonal makeup as your own, and such pill taking may leave you without contraceptive protection or give you side effects you otherwise would not have.
8. Remember to use a spermicidal preparation and condoms during your first cycle of pill taking. You should also use this secondary method if you run out of pills, stop taking the pill, miss pills, have diarrhea or vomiting, or need protection from HIV or sexually transmitted diseases.
9. If you want to control the timing of your menstrual periods or reduce the number of menstrual cycles you have, you can do this by continuing to take pills after the initial 21 days without stopping for hormone pill-free days for up to 3 cycles or 63 days. Then stop for 7 days for a menstrual period and start your pills again 7 days later for a minimum of 21 days.
10. It is helpful if you keep a menstrual history, noting the first and last day of each of your menstrual periods and how heavy the flow is for each day. It is not unusual for a woman's period to be short and light when she is taking the pill.
11. If you decide to stop taking the pill because you are not happy with contraceptive pills as a birth control method, be sure to call for an appointment and use a spermicidal preparation and condoms for protection from pregnancy until your appointment.
12. Call your midwife if you have plans for surgery. Depending on the nature of the surgery and the length of time you will be immobilized, you may need to stop taking the pills and use an alternative contraceptive method. Be sure to tell your surgeon that you are on birth control pills.
13. If you decide to stop taking the pills because you wish to get pregnant, stop at the end of a pill cycle and use a spermicidal preparation and condoms or other method of birth control for 3 months after stopping the pills. Waiting through three menstrual cycles prior to attempting to get pregnant allows time for your body to readjust to its own natural hormonal balance and menstrual cycles. It also enables you and your midwife to make a more accurate estimate of the date your baby will be born.

Additional Specific Instructions for Taking the 21-Day Combination Pill The instructions on the package inserts vary with the pill being taken. The following instructions apply to any of the 21-day combination pills.

1. A pill must be taken every day during the days that pills are to be taken. A missed pill equals a chance to become pregnant.
2. No pills are to be taken for 1 week (7 days).
3. Start your next package of pills 1 week (7 days) after the day you took your last pill. For example, if you take the last pill in one package on a Tuesday, you take the first pill in the next package the next Wednesday. This means that you will always be starting a new package of pills on the same day.
4. Continue taking pills in this pattern no matter what is happening with your menstrual periods. For example, continue taking pills even if
   a. spotting or bleeding occurs while you are taking the pills.
   b. your menstrual period ends before the week without the pills ends.
   c. your menstrual period is still going on when your new package of pills is to be started.

Additional Specific Instructions for Taking the 28-Day Combination Pill The only difference between the 28-day pill and the 21-day pill is that the 28-day pill

is taken every day of the month. A woman who does not take pills for a week between packages of 28-day pills is ensuring the likelihood of a pregnancy.

1. A pill must be taken every day. There is never a day on which you do not take a pill.
2. Take the first pill in a new package of pills the very next day after you take the last pill in the previous package. If you take the last pill in one package on a Wednesday, you take the first pill in the next package on the next day, Thursday.
3. Continue taking pills in this pattern no matter what is happening with your menstrual periods. For example, continue taking pills even if
   a. spotting or bleeding occurs while you are taking the pills.
   b. your menstrual period is still going on when your new package of pills is to be started.

Progestin-Only Contraceptive Pills (Minipills)

Description, Effectiveness, and User Response

Progestin-only pills contain only a low dose of a single progestin taken every day at the same time of day. The mechanism of action is primarily that of creating a hostile impenetrable cervical mucus. It may also suppress ovulation and causes a thin, atrophic endometrium that will not support implantation.

The effectiveness of the progestin-only pills is dependent on a woman adhering strictly to a regimen of taking her pill at the same time every day as the serum levels of the progestin in the pill are depleted in 24 hours. Late pills thus become as important as missed pills and accounts for the difference in effectiveness between perfect use and typical use (see Table 16-2, page 464).

Contraindications, Side Effects, and Risk of Complications

Contraindications Because the progestin-only minipills do not have estrogen and contain a low dose of progestin, they can often be used safely by women with medical conditions that contraindicate the use of estrogen-containing combination pills. The contraindications are as follows:

1. Pregnancy (known or suspected)
2. Carcinoma of the breast (known or suspected)
3. Undiagnosed abnormal genital bleeding
4. Benign or malignant liver tumor (presence or history of)
5. Acute liver disease; jaundice; hepatic failure

The one minipill specific contraindication is if a woman will not be able to reliably take her pill *at the same time every day*. The midwife should carefully evaluate the ability of a woman to be consistently reliable in complying to a rigid schedule of pill taking.

The midwife also needs to assess the woman's need for protection against sexually transmitted diseases and HIV. Progestin-only pills do *not* provide this protection.

Side Effects and Risk of Complications Menstrual irregularities with frequent and irregular bleeding are common and the reason most often given for discontinuation.

The midwife should be aware that laboratory tests for thyroxine concentrations may be decreased.

Medications that affect liver metabolism by increasing hepatic clearance of progestins and thus reduce the effectiveness of progestin-only pills include the following:

Antituberculosis drugs: rifampin (Rifamycin; Rifadin)

Anticonvulsants: phenytoin (Dilantin), carbamazepine (Tegretol)

Barbituates: phenobarbital (Donnatal)

Women on these medications should choose a different contraceptive method.

The data on the effect of broad-spectrum antibiotics on the effectiveness of progestin-only pills are sparse and contradictory. The midwife should advise a woman to use a spermicide and condoms if she is ever treated with antibiotics.

Benefits of Progestin-Only Pills

The primary benefit of progestin-only pills is that they do not contain any estrogen and thus can be used by a woman for oral hormonal contraception when she is contraindicated for the combination pill for estrogen-related reasons.

Women on progestin-only pills experience decreased menstrual blood loss and decreased dysmenorrhea.

Women have a rapid return to fertility after discontinuing the progestin-only pill.

Selection and Initiation of the Progestin-Only Pill

The management plan for progestin-only pills is the same as for combination hormonal contraception (see page 520).

There are presently three progestin-only pills on the market as noted in Group 1 in Table 20-4. Micronor and Nor-QD contain 0.35 mg of norethindrone and Ovrette contains 0.075 mg of norgestrel. Selection of a progestin-only pill is based on three critical factors for a woman who wants oral hormonal contraception:

1. Contraindicated for combination pills
2. Absolutely reliable for taking the pill at the same time every day
3. Able to tolerate menstrual bleeding irregularities

It is the pill of choice for postpartum mothers, because the lack of estrogen reduces the risk of thrombophlebitis and thromboembolic disorders, and for breastfeeding mothers, because progestin-only pills do not negatively affect milk production. This is true for the minipill even if started immediately after a full-term delivery.

In order to minimize as much as possible the irregular bleeding associated with the progestin-only pills, the woman should start the pills during her menstrual period, preferably on the first day. However, the progestin-only pill can be started at any time in the cycle as long as the midwife is sure that the woman is not pregnant. The midwife should instruct the woman on using a spermicidal preparation and condoms as a back-up method for one week.

The Return Visit

The return visit is the same as for the combination oral contraceptive pills (see page 524). The visit should emphasize a pill-taking history of consistency in the time of taking the pills every day. In addition, if the woman is breastfeeding, a history of frequency of breastfeeding and adequacy of milk production should be taken. Careful note should be made of any bleeding irregularities and the woman's ability to cope with them.

Management of Side Effects and Complications

The major side effect of irregular bleeding and spotting is managed by ruling out pregnancy and having a discussion with the woman regarding her tolerance of this side effect. If intolerant and *not contraindicated*, switch her to an oral hormonal contraceptive pill with estrogen. If she is contraindicated for the combined pill, then switch her to a nonhormonal contraceptive method.

If the woman has severe abdominal pain, evaluate her for ovarian cyst, ectopic pregnancy, and pelvic inflammatory disease. Treat or refer appropriately. If not pregnant, it is not necessary to discontinue the progestin-only pill. The woman should immediately stop taking the progestin-only contraceptive pill if she develops severe headaches (new onset or worsening of preexisting headaches) and visual disturbances (flashing lights, blurring of vision, loss of vision, scintillating scotomata). The woman should be provided with another method of contraception.

Instructions for Women Taking Progestin-Only Oral Contraceptive Pills

1. Start your pills on the first day of your menstrual period.
2. Take one pill at approximately the same time *every* day. When you finish one package of pills, start a new package of pills the next day. Never stop taking a pill every day.
   a. If you miss one pill or are more than 3 hours late in taking your pill, you are *not* protected against pregnancy. Take your missed or late pill as soon as you remember it, and take your next pill at the usual time. Also, use a spermicidal preparation and condoms for the next 7 days.
   b. If you miss two or more pills, stop taking the pills and use a nonhormonal contraceptive method such as a spermicidal preparation and condoms until you have a menstrual period or pregnancy has been ruled out. If you have had sexual intercourse during this time, consider an emergency contraception method.
3. Call for an appointment immediately if you do not have a menstrual period within 45 days of your last menstrual period. It is not unusual to have irregular or infrequent periods while taking the minipill, but if you go longer than 45 days without a period you need to know whether you are pregnant.

Emergency Postcoital Contraception

Description, Indications, and Access

Nearly half of all pregnancies in the United States are unintended [16]. The probability of getting pregnant from one random act of unprotected intercourse ranges from 2 to 5 percent [17]. The use of emergency contraception pills can reduce the risk of unintended pregnancy by 75 percent [18].

As long as contraceptive methods remain imperfect, "emergency" postcoital contraception will be necessary. Indications for emergency postcoital contraception include the following:

1. Rape/sexual assault
2. Unsuccessful use of the withdrawal method, in which the man fails to withdraw or ejaculates on the woman's external genitalia
3. Unexpected unprotected intercourse or failure to abstain when using natural family planning
4. Missing several contraceptive pills
5. Condom breaks during usage
6. Sperm leaks from the condom when the male withdraws
7. Incorrect use of a barrier method or use of a faulty barrier method
8. Expelled IUD

The urgent nature of emergency postcoital contraception takes it out of the realm of a routine contraceptive method. It should, however, be included in discussions of contraceptive methods so that women become aware of the availability of emergency postcoital contraception.

As of this writing, emergency contraception still requires a prescription. Thus, many clinicians are writing prescriptions for emergency contraception along with whatever is going to be used as the ongoing contraceptive method in case of incorrect use or method failure that ends in unprotected intercourse [5]. A concerted effort is being made through a citizen's petition to the Food and Drug Administration from more than 70 organizations for emergency contraception products to be sold over-the-counter. This effort is grounded in the facts that emergency contraception has "low toxicity, no potential for overdose or addiction, no teratogenicity, no need for medical screening, self-identification of the need, uniform dosage, and no important drug interactions" and thus meets customary criteria for over-the-counter use [19]. The American College of Nurse-Midwives

> supports removing barriers to the immediate availability of emergency contraception through increased education for consumers and professionals, advance prescription of emergency contraceptive pills, direct pharmacy access, FDA approval of over-the-counter distribution, and insurance coverage for all prescriptive methods of contraception. [20]

In the meantime, the Planned Parenthood Federation of America has endorsed prescription of emergency contraception pills by telephone which has been implemented by Planned Parenthood affiliated clinics [19]. Several state Planned Parenthoods have toll-free numbers for getting a prescription to be called to a woman's choice of pharmacy [18]. There is also a nationwide toll-free emergency contraception hotline: 1-888-NOT-2-LATE (1-888-668-2528) and Web site (http://not-2-late.com).

Methods, Side Effects, and Management

There are several ways of providing emergency contraception:

1. The two emergency contraception pill products on the market
2. The Yuzpe regimen of existing combination oral hormonal contraceptive pills
3. The use of an existing progestin-only oral hormonal contraceptive pill
4. The copper intrauterine contraceptive device
5. Off-label use of mifepristone

The two emergency contraception pill products on the market are Preven and Plan B. Preven contains 0.05 mg of ethinyl estradiol and 0.25 mg of levonorgestrel in each of 4 tablets. Two pills are taken within 72 hours (3 days) of unprotected intercourse and the other 2 pills are taken 12 hours later. Plan B contains 0.75 mg of levonorgestrel in each of 2 tablets. One pill is taken within 72 hours of unprotected intercourse and the other pill is taken 12 hours later.

In comparing these two products, levonorgestrel alone (Plan B) is more efficacious in preventing pregnancy (see first note under Table 16-2 on page 464) and has a substantially lower incidence of the side effects of nausea, vomiting, and fatigue [21].

The Yuzpe regimen calls for a total of 200 mcg of ethinyl estradiol and 2 mg of norgestrel or 1 mg of levonorgestrel to be taken in two doses, 12 hours apart, within 72 hours of unprotected intercourse. As shown in Table 20-6, there are 12 combination oral contraceptive pills that contain these hormones and, taken as noted, add up to at least this dosage (see Table 20-2). They are listed alphabetically by progestin.

In addition, Ovrette is a progestin-only contraceptive pill on the market that can be used for emergency contraception. It contains 0.075 mg of Norgestrel per pill and is prescribed as 20 pills for the initial dose as soon as possible within 72 hours after unprotected intercourse and 20 pills for the second dose 12 hours later.

TABLE 20-6 Combination Oral Contraceptive Pills That Can Be Used for Emergency Contraception

Pill[a]	Progestin	Number of Pills to Take Per Dose[b]
Alesse	Levonorgestrel	5
Levlen	Levonorgestrel	4
Levlite	Levonorgestrel	5
Levora	Levonorgestrel	4
Lo/Ovral	Levonorgestrel	4
Nordette	Levonorgestrel	4
Ovral	Levonorgestrel	2
Tri-Levlen (3rd phase yellow pills only)	Levonorgestrel	4
Triphasil (3rd phase yellow pills only)	Levonorgestrel	4
Trivora (3rd phase pink pills only)	Levonorgestrel	4
Low-Ogestrel	Norgestrel	4
Ogestrel	Norgestrel	2

[a] All emergency contraception pills contain ethinyl estradiol.
[b] Two doses: initial dose as soon as possible within 72 hours after unprotected intercourse; second dose 12 hours later.

Emergency contraception pills are most effective if taken within 12 to 24 hours of unprotected intercourse but may be taken within 72 hours (3 days) according to product information. However, if a woman is late in obtaining emergency contraception, she will still potentially benefit and should still be able to access the pills up to 120 hours (5 days) after unprotected intercourse, especially if other alternatives (e.g., copper IUD) are unacceptable [21].

All of the emergency contraception pill regimens have side effects that may last 1 to 2 days. These include abdominal pain, headache, menstrual irregularities with next menses, fatigue, dizziness, and breast tenderness. Approximately 50 percent of women who take a combination of estrogen and a progestin will have nausea and 20 percent will vomit [18]. Advise the woman to take over-the-counter meclizine hydrochloride (Dramamine) 1 hour prior to taking the initial dose. Taking the pills with food may decrease the likelihood of nausea. If the woman vomits within 1 hour of taking the pills, the dosage should be repeated.

A copper intrauterine contraceptive device (IUD) can be inserted within 5 to 7 days after the unprotected intercourse. Therefore, the copper T 380A (ParaGard) can be used when hormonal methods are no longer an option. It is advisable to perform a pregnancy test before inserting an IUD to be sure that the woman is not already pregnant.

An IUD can be used as an emergency postcoital contraceptive method only if the woman has none of the usual contraindications for insertion of an IUD. It is not a good method to use after rape because of the potential for sexually transmitted diseases and infection. While highly effective, the IUD is an extraordinarily expensive method of emergency contraception but is a particularly good choice when the woman wants an IUD for her ongoing contraceptive method.

The off-label use of mifepristone (RU 486) for emergency contraception is highly effective when taken within 120 hours (5 days) of unprotected intercourse. Side effects are significantly lower than with the Yuzpe regimen except that the next menses is more likely to be delayed. A single dose of 600 mg is used although there is now evidence that a lower dosage is equally effective and is less likely to delay the next menses [22].

Management of Care

Although it is highly likely that emergency contraception will become available over-the-counter, as of this writing a prescription is still required in most states. As a physical or pelvic examination is not needed and routine pregnancy testing is not advised and no other laboratory work is necessary, this leaves a history to be taken when a woman calls for help to access emergency contraception. This history can be taken over the telephone and includes the following:

1. The woman's menstrual cycles (this month, last month, and usual)
2. When coitus took place
3. Contraindications to either oral hormonal contraceptives or to the copper IUD
4. Past contraceptive methods

If a woman has a history of thrombophlebitis or thromboembolic disorders, then the emergency contraceptives of choice are a progestin-only regimen or copper IUD. This information also helps you in advising the woman regarding a regular contraceptive method.

Having contact with the woman gives you the opportunity to counsel her regarding the fact that emergency contraception will not work if she is pregnant. It is not an abortifacient. Also there are no negative or teratogenic effects on the fetus [19].

Emergency contraception pills are for short-term use and there are no severe long-term side effects or complications [18].

The midwife should either be available to the woman or provide her with extra pills, along with instructions, to be used in the event she vomits within 1 hour of taking the original pills. The woman should be given an appointment to be seen again in 3 to 4 weeks. At this visit the midwife should evaluate the woman's history since she used the emergency postcoital contraceptive method, noting any side effects and bleeding/menses. By this visit the woman should have had a menstrual period. If not, a pregnancy test should be done; if the test is positive, the midwife should ascertain the woman's attitude toward the pregnancy and provide counseling regarding prenatal care or abortion as indicated. The midwife should also carefully evaluate whether the woman is experiencing an ectopic pregnancy. If the woman is not pregnant, she should be provided with an ongoing contraceptive method of her choice.

Injectable Hormonal Contraception

There are two injectable forms of hormonal contraception. Since the hormonal makeup of each is very different, they will be discussed separately.

Depot Medroxyprogesterone Acetate (Depo-Provera Contraceptive Injection)

Description, Effectiveness, and User Response Depo-Provera is an aqueous suspension of depot medroxyprogesterone acetate (DMPA) microcrystals. DMPA is a derivative progesterone. The dose for contraceptive purposes is 150 mg/mL, which is injected intramuscularly every twelve weeks. It is not necessary to adjust the dosage dependent on the woman's weight. A higher dose of DMPA (400 mg/mL) is available that is used for treating cancer but has lower drug bioavailability and should not be used for contraceptive purposes.

DMPA is a progestin whose primary mechanism of action is to inhibit both the secretion of follicle stimulating hormone (FSH) and luteinizing hormone (LH) and LH surges, thereby inhibiting ovulation. If the injections are initiated within 5 days of the beginning of menstruation, the contraceptive effect is immediate, as ovulation will not occur that first month. If the injections are initiated later than 5 days after the beginning of menstruation, the woman should use a backup method of contraception for several weeks, as ovulation may not be inhibited that first month. Secondary mechanisms of action include thickening of the cervical mucus, which serves as a barrier to sperm, and alteration of the endometrium, which would make it inhospitable to a fertilized ovum (a nonissue since there is no ovulation).

The injection is effective for 14 weeks, which gives a 2-week grace period if the next injection cannot be given precisely 12 weeks (or 3 lunar months) later. As shown in Table 16-2 (page 464), Depo-Provera is one of the most effective contraceptive methods. There is no difference between perfect use and typical use, because as long as the woman shows up to get her injection there are no compliance issues involved.

DMPA is an excellent alternative for women who want highly effective long-term contraception and have medical conditions that contraindicate their use of anything with estrogen in it.

Depo-Provera has two major side effects that are positive to some women and negative to others: menstrual changes and delayed return of fertility. A negative side effect is weight gain. Many women like the method because it is totally separate from sexual activity, there is no visible evidence of use of a contraceptive method, and it is so highly effective. All women on Depo-Provera have menstrual changes, and this is the reason most commonly given for discontinuation of the method.

Contraindications, Selection, Side Effects, and Benefits

Contraindications and Selection The following are absolute contraindications to initiating Depo-Provera for a woman by a midwife:

1. Pregnancy (known or suspected)
2. History of breast cancer
3. Genital bleeding of unknown origin
4. History of cardiovascular accident or thromboembolic disease
5. History of liver dysfunction or disease
6. Known hypersensitivity to Depo-Provera

Relative contraindications the midwife should consider before initiating Depo-Provera for a woman include the following:

1. History of depression
2. History of any kind of breast disease or abnormal mammogram
3. History of migraine headaches
4. The woman's desire to become pregnant within the next year or two

5. The woman's desire to time a pregnancy within a rather narrow time range
6. Family history of osteoporosis

Although it is not a contraindication to the use of DMPA, the midwife should assess the woman's risk of exposure to HIV and sexually transmitted diseases. The woman should be fully informed that Depo-Provera does not provide protection against HIV or sexually transmitted diseases and that if she is at risk she will need to use condoms also.

In addition to its other attractive features for some women, Depo-Provera is a method that is available to women for whom other methods, especially those with estrogen, are contraindicated. The wide range of women for whom Depo-Provera is an appropriate choice includes the following:

1. Adolescents to women in their 40s
2. Nulligravidas to grand multiparas
3. Women who are breastfeeding (after 6 weeks postpartum)
4. Women with liver disease (despite what the package insert says) [23, 24]
5. Women with hemoglobinopathy
6. Women with hypertension
7. Women with a history of thromboembolism (despite what the package insert says) [23, 24]
8. Women with seizure disorders
9. Women over age 35 who smoke

Side Effects As noted earlier, there are two major side effects of DMPA that affect all women receiving the injections: menstrual changes and delayed return of fertility. The menstrual changes experienced by women on Depo-Provera start as episodes of unpredictable irregular bleeding and spotting that may last as long as 7 days or more or may be heavy during the first few months of use. These episodes gradually become less frequent and shorter until the woman has amenorrhea. Fifty percent of women experience amenorrhea after 1 year of use; with further use three-quarters of DMPA users experience amenorrhea. Menstrual changes are the most common reason women discontinue use of DMPA. The initial unpredictability puts some women on edge. Other women fear that the absence of menses is indicative of either pregnancy or disease. On the other hand, some women like having amenorrhea, which gives a certain freedom not otherwise experienced until menopause. Some clinicians treat the irregular bleeding or heavy bleeding with conjugated equine estrogen or combination oral contraceptive pills. Before doing this, however, the midwife needs to screen the woman for any contraindications to the use of estrogen. Treatment also mitigates against some of the reasons a woman may be getting DMPA injections, such as needing a progestin-only hormonal contraceptive method and not wanting any evidence around of using a contraceptive method. If taking estrogen is not a problem, give the woman a pack of combination oral contraceptive pills. Another option that some clinicians use if taking estrogen is contraindicated, is to give the woman another DMPA injection. The most effective method for helping a woman through the first 3 to 6 months of irregularity is anticipatory guidance before receiving the first injection.

Depo-Provera provides reversible contraception, but the return of fertility is delayed after discontinuation of the injections. This delay may be as long as 18 to 24 months, although 50 to 70 percent of women conceive by the end of 1 year after discontinuation. This side effect of Depo-Provera should be thoroughly discussed with the woman before the first injection. There is no relationship between the length of time the woman has been receiving injections and the length of time before fertility returns [25].

Another major side effect for some women is weight gain. The evidence on weight gain during use of DMPA is contradictory. A study with weight gains of more than 5 pounds in the first year and thereafter a progressive increase in weight of up to $16\,^1/_2$ pounds over 6 years has been reported [25] as have studies that report no problems with weight gain [24]. A woman starting use of Depo-Provera should be advised of the unsure possibility of weight gain and counseled regarding healthy lifestyle weight management. Other possible side effects include headaches, breast tenderness, abdominal bloating, mood changes, and depression.

There is a reduction of bone mineral density associated with DMPA use, which has potential for an increased risk of postmenopausal osteoporosis. The evolving evidence, however, indicates that this loss is reversible within a year or two of discontinuation and that there is no long-term effect [24].

Benefits In addition to being a safe, effective contraceptive method for a wide range of women, Depo-Provera has a number of benefits [26]. It not only provides contraceptive protection but also improves certain medical conditions:

1. Iron deficiency anemia: increased hemoglobin because of reduced menses
2. Protects against pelvic inflammatory disease

3. Sickle cell disease: decreased frequency of crises with increased red blood cell survival
4. Menorrhagia and dysmenorrhea
5. Seizure disorders: decreased frequency of seizures

Finally, all women on Depo-Provera benefit from the fact that DMPA is associated with the prevention of endometrial cancer; it contributes to a significant decrease in risk (80 percent after 1 year of use) [24] for at least 8 years after discontinuation of the injections [23].

Management of Care The majority of the education, counseling, and instruction of the woman regarding Depo-Provera comes during the process of selecting this method of contraception. Adequate premethod counseling will go a long way toward ensuring that the woman does not discontinue the method because of menstrual changes. She also needs to fully understand the delay in return of fertility. An informed consent form, detailing these two side effects of DMPA and requiring her signature, may be useful.

Although the risk of breast cancer for women on DMPA is no greater than for women on oral contraceptive pills, it was a concern that kept the FDA from approving Depo-Provera for 20 years. The World Health Organization (WHO) study that finally put this matter to rest found that the overall relative risk in women who had ever used DMPA was 1.2 [27, p. 5]. Although this risk was low enough for the FDA to approve Depo-Provera, the midwife would be prudent to ensure careful monitoring by having the woman do monthly breast self-examinations, by performing a breast examination annually, and, on women with a family history of breast cancer, by obtaining a baseline mammogram.

Initiation of DMPA injections is as follows:

Post menses: within 5 days or at any time in a woman's cycle with use of spermicide and condoms until her next menses

Post abortion: within 5 days

Post delivery (not breastfeeding): immediately or within 3 weeks postpartum unless the woman has a history of postpartum depression. Then give the first injection at 6 weeks postpartum

Post delivery (breastfeeding): immediately or at 6 weeks postpartum

The small amounts of Depo-Provera found in breast milk do not negatively affect either the breast milk or the baby.

The injection is given deep in the gluteus maximus or deltoid muscle with a 21 to 23 gauge needle. The woman is advised *not* to massage the injection site for at least several hours, to expect menstrual irregularities, and to take calcium supplements (1000 mg) daily. The midwife should also discuss with her calcium-rich foods such as milk, cheese, yogurt, sardines, and tofu.

There is one known drug interaction. Aminoglutethimide (Cytadren), an anticancer drug, may significantly reduce the efficacy of Depo-Provera. Very rarely a woman has a severe allergic reaction with anaphylaxis. For this reason the midwife may want to have a woman wait in the area for 20 minutes after the injection if she has not previously used DMPA.

The woman is given an appointment to return in 12 weeks or 3 lunar months. If she misses her appointment but returns before 14 weeks for her injection, she remains contraceptively protected. However, if more than 14 weeks have passed since the last injection, you must make sure she is not pregnant before giving her another injection. To avoid pregnancy, it helps for the woman to use a spermicide and condoms after 13 weeks or for the midwife to have given her a prescription for emergency contraception. In the event of an accidental pregnancy, the contraceptive doses of DMPA do not increase the risk of congenital anomalies.

Weight, blood pressure, dipstick urine for glucose if the woman has a history of gestational diabetes or a family history of diabetes, and a history that focuses on menstrual pattern, any other side effects, and risk for HIV and sexually transmitted diseases are taken at the routine 3-month injection visit. As long as the 3-month visits and the annual health care physical examination (see Chapter 2) reveal no contraindications, the woman may continue with Depo-Provera indefinitely.

Combination Injectable Hormonal Contraception (Lunelle)

Description, Effectiveness, and User Response Lunelle is a monthly 0.5-mL dose of aqueous suspension of 25 mg of medroxyprogesterone acetate and 5 mg of estradiol cypionate (MPA/E_2C). Its primary mechanism of action is suppression of ovulation. It may also inhibit sperm from penetrating through the thickened cervical mucus.

The injection is effective for 28 days with a 10-day window (28 ± 5 days) for repeat injection. As shown in Table 16-2 (page 464), the combination hormone injection is one of the most effective contraceptive methods. MPA/E_2C offers many of the advantages of combination oral contraceptive pills

without the daily responsibility for pill taking. This accounts for the difference in typical use between combination oral contraceptive pills and the combination hormonal injection.

The advantages of the combination injectable hormonal contraceptive to some women include regular cycles and a rapid return to fertility.

Contraindications, Selection, Side Effects, and Benefits

Contraindications and Selection Absolute contraindications are the same for combination oral contraceptive pills (see page 516) plus the following:

1. Severe hypertension
2. Diabetes with vascular involvement
3. Valvular heart disease with complications

The midwife should also assess the woman's risk of exposure to HIV and to sexually transmitted diseases. Lunelle does *not* provide protection against these diseases. The woman should be fully informed of this and instructed to use condoms if she is at risk.

Selection of Lunelle by a woman may be based on her desire for a monthly injectable over a daily pill, regular menses over the irregular bleeding of progestin-only methods, and a rapid return to fertility. Others may find monthly injections a little onerous, especially if a woman has to wait to be seen. This can be resolved with a separate patient flow system for women getting regular contraceptive injections.

Side Effects Side effects are similar to combination oral contraceptive pills. Bleeding irregularities occur primarily during the first 3 months, with most women having regular menstrual cycles after 3 months. Women who get their monthly injections at evenly spaced intervals have more predicable bleeding patterns [28].

Other side effects that occur most frequently are breast tenderness, acne, and weight gain. Weight gain is the leading cause of discontinuation and ranges from an average of 4 to 6 pounds during the first year to progressively increased amounts during the second year.

Drug interactions are the same as for combination oral contraceptive pills and for the DMPA injection. (See pages 519 and 533.)

Benefits Benefits are probably similar to combination oral contraceptive pills although as yet not studied.

Management of Care The woman is fully informed, has chosen Lunelle, and has been screened for contraindications. The initial injection is then given within the first 5 days after the onset of menstruation or completion of a first trimester abortion; or no earlier than 4 weeks postpartum if not breastfeeding and no earlier than 6 weeks postpartum if breastfeeding.

Lunelle is given as an intramuscular injection into the gluteus maximus, deltoid, or anterior thigh. Vigorously shake the vial with the solution in it just before use to ensure a uniform suspension of the drugs.

The woman should be counseled that her first menstrual period under the influence of Lunelle will be in 2 to 3 weeks; that she needs to return in 28 ± 5 days for her next injection, and that she should return for her repeat injections based on the calendar and not on when she is menstruating. If she is going to be late in returning for her next injection, she needs to know that she is vulnerable to pregnancy and that she should use a spermicide and condoms. If unprotected intercourse occurs, she should use the prescription you have given her for emergency contraception. If she is later than 33 days in returning for her next injection, you need to first rule out pregnancy.

Return visits consist of questions regarding her menses and any side effects along with administration of the injection. She should be scheduled for an annual physical and pelvic examination and routine laboratory tests.

Subdermal Implants

The Norplant System of subdermal levonorgestrel implants was approved by the Food and Drug Administration in 1990. In August 2000, the pharmaceutical company advised health care providers that Norplant insertion kits distributed after October 20, 1999, had a lower than expected release rate of hormones from several lots and recommended no longer inserting the Norplant capsules. Although Norplant is still approved by the Food and Drug Administration, which has also approved a two-rod implant originally called Norplant II (now under the trade name Jadelle), the pharmaceutical company is not marketing either one in the United States as of this writing. Norplant is still in the arms of an unknown number of women in the United States and is used, as is

Jadelle, in other countries. For these reasons, information about Norplant is retained in this edition of the book as is the removal procedure (Chapter 51). There is also a single subdermal implant called Implanon expected to be available in the United States by 2003 [29]. Biodegradable implants in the form of capsules and pellets are in development.

The Norplant System consists of six sealed capsules made of dimethylsiloxane/methylvinylsiloxane copolymer (Silastic), each of which contains 36 mg of levonorgestrel (a synthetic progestin) in crystalline form. The levonorgestrel diffuses through the capsules at an initial rate of 85 mcg per day. The diffusion rate decreases to approximately 30 mcg per day in about 9 months and remains at this level. Contraceptive levels of levonorgestrel in the body are reached within 24 to 48 hours of implantation. The implants can be left in the body for 5 years before replacement is necessary. Research in China has shown efficacy of still less than 1 percent of pregnancies up to 7 years [29]. If a woman wants to get pregnant, the implants are removed and the return of fertility is almost immediate.

The usual location for implantation is the inner aspect of the nondominant upper arm, although the implants can be located elsewhere in the body (e.g., buttocks, lower abdomen, upper leg). The inner upper arm is a protected area of the body, readily accessible for insertion and removal, not very visible to others after the initial tissue bruising has healed, but visible and accessible to the woman for postinsertion and postremoval care.

Of all the birth control methods, including sterilization (see Table 16-2, page 464), the Norplant system has the lowest percentage of women experiencing an accidental pregnancy. The capsules used in the United States are of lesser density than some of the original capsules studied in other countries. This means that U.S. women who weigh over 70 kg will benefit from the same high effectiveness of this method as women who weighed less than 50 kg in those studies of the implants. There is no difference between perfect use and typical use, because once the capsules are implanted there is nothing for the woman to do. Norplant also has the second highest continuation rate at 1 year, after sterilization.

The levonorgestrel implants have two primary mechanisms of action: (1) they render the cervical mucus hostile to sperm, and (2) they inhibit ovulation in at least 50 percent of the woman's cycles. The implants most likely also suppress the cyclic proliferation of the endometrium induced by estrogen, so the endometrium remains in a state of atrophy. The cervical mucus thickens and becomes viscous so that it serves as a barrier to sperm. The level of levonorgestrel maintained in the woman's body by The Norplant System partially suppresses the luteinizing hormone surge, limiting ovulation. Follicle stimulating hormone and luteinizing hormone secretion continues at normal levels.

Women express a high level of acceptance of and satisfaction with The Norplant System. The main reasons for discontinuing the method other than the desire to become pregnant are menstrual irregularities and headaches.

Contraindications, Selection, and Side Effects

All of the implant systems are progestin-only and are thus similar in action, contraindications, selection, and side effects to the following discussion of Norplant.

Contraindications and Selection The following are absolute contraindications to the use of Norplant:

1. Pregnancy (known or suspected)
2. Abnormal genital bleeding of unknown origin
3. Active thrombophlebitis or thromboembolism disorders
4. Acute disease of the liver; benign or malignant liver tumors
5. Known or suspected breast cancer

The contraceptive effectiveness of levonorgestrel is compromised when the woman is taking drugs for the treatment of tuberculosis (e.g., Rifampin) or seizure activity (e.g., Dilantin). Such women should use a backup contraceptive method while on these drugs and for 2 weeks after completing drug therapy.

The midwife should assess the woman's risk of exposure to HIV and sexually transmitted diseases. The woman should be fully informed that Norplant does not provide protection against HIV or sexually transmitted diseases and that if she is at risk she will need to use condoms also.

Women for whom Norplant would be an appropriate choice include the following:

1. Women who are breastfeeding (after 6 weeks postpartum)
2. Women who have had unacceptable side effects from oral contraceptive pills containing estrogen
3. Women who have difficulty remembering to take a pill or an aversion to the manipulation needed for the barrier methods

4. Women who want long-term contraception (e.g., women who are finished with childbearing but do not want sterilization)
5. Women who want to be able to time a pregnancy

Side Effects The side effects associated with Norplant are more prevalent in the first several months of use, when the level of levonorgestrel in the body is higher. Generally, a woman who is fully informed of the possible side effects before insertion and supportively monitored after insertion is more apt to continue with the method until the side effects resolve or become more tolerable as time goes on and the level of serum levonorgestrel decreases.

The two major side effects of Norplant are irregular menstrual bleeding and headaches. Irregular menstrual bleeding ranges from amenorrhea (infrequent) through unpredictable, irregular, frequent bleeding or spotting to prolonged bleeding. Most, but not all, women settle into a predictable pattern of menstrual bleeding by the end of the first year of using the implants. Menstrual changes, however, are the most frequent reason for discontinuation of The Norplant System.

Headaches are the second most frequent reason for discontinuation of the method. For many women the headaches subside as the level of levonorgestrel decreases. In the meantime they obtain relief with over-the-counter analgesics. A rare woman may have severe headaches with blurred vision and papilledema. Although these symptoms may be coincidental, discussion with your consulting physician regarding removal of the implants, referral to an ophthalmologist, and other possible diagnostic measures is indicated.

Less frequently occurring side effects include an increase in appetite and weight gain (which averages 5 lb over 5 years and is usually due to other causes), breast tenderness (bilateral; associated with fluid retention), acne (which improves after removal of implants), hair loss, nervousness, ovarian cysts (which usually regress spontaneously; investigate further if a cyst persists or becomes larger and painful), nausea (which improves after removal of implants), dizziness, and depression.

Management of Care

The majority of education, counseling, and instruction of the woman regarding The Norplant System comes during the process of selecting this method of contraception. Adequate pre-method counseling will go a long way toward ensuring that the woman does not discontinue use because of side effects.

Postinsertion instruction includes a reminder that The Norplant System does not protect the woman from HIV or sexually transmitted diseases and that she needs to use condoms if she is at risk. She should be given an appointment for her annual health care examination, and the benefits of this examination should be emphasized, as she will not have contraceptive need as motivation to keep this appointment.

Contraceptive Vaginal Ring (NuvaRing)

Description, Effectiveness, and User Response

To date, there is only one contraceptive vaginal ring on the market in the United States. Approved by the Food and Drug Administration in the fall of 2001, NuvaRing is a homogeneous design of an estrogen and a progestin surrounded by an ethylene vinyl skin, which allows for a daily release of 0.015 mg of ethinyl estradiol and 0.120 mg of etonogestrel over the course of 3 weeks (21 days). Because release of the hormones is directly into the vagina, a lower dose per day is required for cycle control. By contrast, oral contraceptive pills first have to pass through the liver leaving less bioavailability and thus requiring larger dosages. Contraceptive vaginal rings suppress ovulation with lower hormone doses [30, 31].

The ring is flexible, soft, and transparent, and approximately 4 mm ($^1/_8$ in.) thick and 54 mm (2 in.) in diameter, which is a little smaller than the smallest diaphragm. A ring is inserted by the woman for one cycle of 3 consecutive weeks of continuous ring use and then removed by the woman for 1 week without the ring during which time she has a withdrawal bleed menstrual period. She then inserts a new ring and a new cycle begins. Insertion is akin to insertion of a diaphragm except that fitting is not required. Wherever the woman places the ring inside her vagina will be correct.

NuvaRing has an effectiveness rate of 1 to 2 pregnancies in 100 women using this method [32]. User response has been positive from both women and their partners. It is convenient because the woman can easily insert it and forget it for 3 weeks. Removal is also easy. NuvaRing is usually not felt by the woman and only occasionally felt by her partner during sexual intercourse. Return to fertility is rapid and usually occurs with the first cycle after discontinuation.

Contraindications and Side Effects

Contraindications Contraindications are the same as for any combination hormonal contraceptive method (see pages 516 and 534). There is no available data on whether the lower dosages used in the vaginal ring route would mean fewer contraindications and side effects than with the oral route for combination hormonal contraception.

Side Effects Headaches are the primary side effect occurring in nearly 7 percent of users [31, 33]. Other side effects include leukorrhea (5.3 percent), nausea (2.8 percent, usually when first inserted), weight gain (2.2 percent), and device-related events (3.8 percent) such as "foreign body sensation, coital problems, and device expulsion" [31, 33]. There is minimal to no adverse or clinical effect on lipid parameters, carbohydrate metabolism, and blood pressure.

Management Plan for Contraceptive Vaginal Ring

The management plan for NuvaRing is the same as for combination oral hormonal contraception (see page 520). NuvaRing should not be used if the woman is breastfeeding.

The woman is instructed on the insertion and removal of the ring and on the use of NuvaTime, an electronic reminder alarm. The NuvaRing is first inserted during the first 5 days of the woman's menstrual cycle with instructions to also use a spermicide and condoms for seven days.

Expulsion occurs in approximately 2.6 percent of women using NuvaRing. If it is out less than 3 hours, then the ring simply should be rinsed off with cool to lukewarm water and reinserted. If it has been out more than 3 hours, then the woman may not be protected from pregnancy and needs to use a spermicide and condoms for 7 consecutive days in addition to reinserting the ring.

If the woman forgets to remove the ring for up to 4 weeks, she should then remove it for a ring-free week and then insert a new ring and start a new cycle. If the ring has not been removed for more than 4 weeks, the woman may not be protected from pregnancy and she should check to be sure she is not pregnant. If not pregnant, spermicide and condoms need to be used in addition to a new ring for 7 days in a row.

NuvaRing comes in boxes of 1 or 3. Start the woman with a box of 3 and give her an appointment for a follow-up visit in $2\,^1/_2$ months. This visit is the same as the return visit for any combination hormonal contraceptive (see page 524). If all is well at the return visit, then give the woman an appointment for her annual physical examination.

Transdermal Contraceptive Patch (Ortho Evra/Evra)

Description, Effectiveness, and User Response

To date, there is only one transdermal contraceptive patch on the market in the United States. Measuring $1\,^7/_8$ in. by $1\,^7/_8$ in., it is thin and very light, and it consists of three layers. The outer layer is a beige, flexible, protective film of polyester. The adhesive middle layer contains 6 mg norelgestromin and 0.75 mg ethinyl estradiol which, when applied to the skin, releases 150 mcg of norelgestromin and 20 mcg of ethinyl estradiol into the bloodstream daily. Norelgestromin is the primary active metabolite of norgestimate, which is a progestin used in oral contraceptive pills [34]. The third layer of clear polyester is called a release liner and protects the adhesive layer during storage. It is removed prior to use.

The contraceptive patch is applied for 7 days for 3 weeks or 21 consecutive days. This is followed by a patch-free week during which the woman has a withdrawal bleed menstrual period. She then starts the cycle over again. Four anatomical sites that result in therapeutic levels of the hormones are used: buttocks, upper outer arm, lower abdomen, or upper torso, excluding the breasts [34]. Even though the patch is to be changed every seven days, it continues to deliver the hormones for another two days which means that the woman does not have to change her patch at the exact same time every week [35].

The effectiveness of the contraceptive patch is comparable to that of combination oral contraceptive pills and is just under 1 per 100 women using this method with an overall failure of 0.88 and a method failure of 0.7. However, the patch may be less effective in women with a baseline body weight of 198 pounds or greater [36].

Studies show that 4.7 percent of patches were replaced because of partial detachment (1.8 percent) or complete detachment (2.9 percent). Adhesion is not affected by heat, humidity, and exercise. Women can carry out their usual daily activities, exercise, participate in sports, bathe, and swim while wearing the patch [37].

Compliance with the regimen of changing the patch weekly compares very favorably with compli-

ance with oral hormonal contraceptive pills. Perfect use of the patch ranged from 88.1 to 91.0 percent without significant differences between age groups [38]. These results demonstrate ease of use.

Return to fertility may be delayed and conception should be postponed until regular menstruation has resumed [39].

Contraindications and Side Effects

Contraindications Contraindications are the same as for any combination hormonal contraceptive method (see pages 516 and 534).

Side Effects Side effects are similar to those of combination oral contraceptive pills (see pages 517–520) with the addition of the nonhormonal related side effects of application site reactions. More prevalent side effects include headache, dysmenorrhea, and breast discomfort. Breast discomfort was greater than oral contraceptive pills in the first two cycles but then decreased to comparable levels [35, 40]. Reasons for the increased rate of dysmenorrhea with use of the patch (13.3 percent) have not yet been studied.

Management Plan for Contraceptive Patch

The management plan for the contraceptive patch is the same as for combination oral hormonal contraception (see page 520). The contraceptive patch should not be used if the woman is breastfeeding.

In addition to the screening done for contraindications to combination hormonal contraception, the midwife should also screen for any previous skin allergies to bandages or medicated patches and take careful note of the woman's weight. If she weighs around 198 pounds or more, then the woman needs to know the increased risk for pregnancy and be counseled about other contraceptive methods.

The woman is instructed on the removal of the contraceptive patch from its package, the sites where it can be applied, when to start using the patch, how to apply the patch, and how to track use of the patch on a calendar. She will need to also use a spermicide and condoms for the first week of her first cycle. The woman can first apply her contraceptive patch on the first day of her menstrual period or on the first Sunday after her menstrual period begins. Each new patch should be applied on the same day of the week. The woman should apply the patch in a way that her fingers never touch the medicated side of the patch. This is done by removing only half of the release liner and applying the patch to her chosen site and then removing the other half of the release liner and pressing down the rest of the patch. She should first clean and dry the site. She needs to check her patch daily by running her fingers around its edges to make sure they are not detaching.

If the patch becomes partially detached, the woman should try to reapply it, but if it does not stick, or if the patch has become completely detached, then she should use a new patch immediately and continue with this same cycle if this situation has been for less than one day. If the woman does not know how long her patch has been partially or completely detached or if it has been for longer than one day, then she is not protected from pregnancy. She should start a new patch—and a new cycle of 21 consecutive days—immediately. She will also need to use a spermicide and condoms for the first week of this new cycle. A patch should not be used if it is touched or becomes stuck to itself or to something else, and nothing else—such as tape or a wrap—should be used to try to keep the patch in place.

On the other hand, if the woman forgets to change her patch during week 2 or 3 of the cycle, and she remembers within 1 to 2 days, she should apply a new patch as soon as she remembers but continue to change the patch as was originally scheduled. If she does not remember to change her patch for more than two days, she should understand that she is not protected from pregnancy and that she should start a new 4-week cycle by putting on a new patch and use a spermicide and condoms for the first week of this new cycle. If the woman forgets to take off the patch at the beginning of the patch-free week, she should remove it as soon as she remembers within that week and start the new patch, and new 4-week cycle, as originally scheduled.

If the woman forgets to start a new 4-week cycle and apply the first patch after the patch-free week, she needs to understand that she is not protected from pregnancy and that she should start a new 4-week cycle by putting on a new patch and use a spermicide and condoms for the first week of this new cycle.

The woman should be instructed not to use creams, oils, powder, makeup, or sprays on or near her skin where she intends to place or has a patch as these may cause the patch to become loose. If the patch causes skin irritation, she should remove the patch and apply a new patch elsewhere. She should

not try to move the same patch and she should not wear two patches at the same time as this may cause nausea and vomiting.

The midwife should supply the woman with a prescription for emergency contraception and encourage her to have a spermicide and condoms on hand in the event that she did not notice that the patch had become detached or that she made an error in removing or starting a new patch on schedule.

Contraceptive patches come in a carton containing 3 patches for 1 cycle and also in cartons containing 1 patch to use as a replacement if necessary. Initially prescribe 4 cycles and make an appointment for follow-up in 3 months.

The follow-up visit is the same as the return visit for any combination hormonal contraceptive (see pages 524 and 534). If all is well at the return visit, then give the woman an appointment for her annual physical examination.

References

1. Estrogen dose in oral contraceptives: FDA committee examines safety and utility of 50 mcg estrogen OCs. *The Contraception Report* V(1):10–13 (March) 1994.
2. International Federation of Fertility Societies. Consensus conference on combination oral contraceptives and cardiovascular disease. *Fertil. Sterility* 71(6 suppl.):1S–6S (June) 1999.
3. Rosenberg, L., Palmer, J.R., Rao, R.S., and Shapiro, S. Low-dose oral contraceptive use and the risk of myocardial infarction. *Arch. Intern. Med.* 161(8):1065–1070 (April 23) 2001.
4. Rosenberg, L., Palmer, J. R., Sands, M. I., et al. Modern oral contraceptives and cardiovascular disease. *Am. J. Obstet. Gynecol.* 177(3):707–715 (September) 1997.
5. Hatcher, R. A., Nelson, A.L., Zieman, M., et al. *A Pocket Guide to Managing Contraception*. Tiger, GA: Bridging the Gap Foundation, 2001.
6. Headaches/migraines and oral contraceptives: What are the facts? *The Contraception Report* II(4):6 (September) 1991.
7. Dickey, R. P. *Managing Contraceptive Pill Patients*, 10th ed. Dallas, TX: Essential Medical Information Systems, 2000.
8. Collaborative Group on Hormonal Factors in Breast Cancer. Breast cancer and hormonal contraceptives. *Lancet* 347(9017):1713–1727 (June 22) 1996.
9. Grabrick, D. M., Hartmann, L. C., Cerhan, J. R., et al. Risk of breast cancer with oral contraceptive use in women with a family history of breast cancer. *JAMA* 284(14):1791–1798 (October 11) 2000.
10. St. John's wort and oral contraceptives. *The Contraception Report* 13(2):12–14 (June) 2002.
11. Dayal, M., and Barnhart, K. T. Noncontraceptive benefits and therapeutic uses of the oral contraceptive pill. *Semin. Reprod. Med.* 19(4):295–304, 2001.
12. Ness, R. B., Grisso, J. A., Klapper, J., et al. Risk of ovarian cancer in relation to estrogen and progestin dose and use characteristics of oral contraceptives. *Am. J. Epidemiol.* 152(3):233–241, 2000.
13. Fernandez, E., La Vecchia, C., Balducci, A., Chatenoud, L., Franceschi, S., and Negri, E. Oral contraceptives and colorectal cancer risk: a meta-analysis. *Br. J. Cancer* 84(5):722–727 (March 2) 2001.
14. Revised oral contraceptive labeling: FDA approves recommendation allowing delay of pelvic exam. *The Contraception Report* IV(5):4 (November) 1993.
15. Hatcher, R.A., Trussel, J., Stewart, F., et al. *Contraceptive Technology*, 17th ed. New York: Ardent Media, 1998.
16. Henshaw, S. K. Unintended pregnancy in the United States. *Family Planning Perspectives* 30:24–29, 46, 1998.
17. Wilcox, A. J., Dunson, D. B., Weinberg, C. R., Trussell, J., and Baird, D. D. Likelihood of conception with a single act of intercourse: providing benchmark rates for assessment of post-coital contraceptives. *Contraception* 63:211–215, 2001.
18. Ellertson, C., Trussell, J., Stewart, F., Koenig, J., Raymond, E. G., and Shochet, T. Emergency Contraception. *Semin. Reprod. Med.* 19(4):323–330 (December) 2001.
19. Grimes, D. A., Raymond, E. G., and Jones, B. S. Emergency contraception over-the-counter: the medical and legal imperatives. *Obstet. Gynecol.* 98(1):151–155 (July) 2001.
20. American College of Nurse-Midwives Position Statement. *Emergency Contraception: Expanding Education and Access* Washington, DC: ACNM, September 2001.
21. Mendez, M. N. Emergency contraception: a review of current oral options. *West. J. Med.* 176(3):188–192 (May) 2002.
22. Mifepristone: emergency contraception and other uses. *The Contraception Report* 11(4): 13–14, 16 (December) 2000.

23. Kaunitz, A. M. DMPA: A new contraception option. *Contemp. OB/GYN* 19–34 (January) 1993.

24. Kaunitz, A. M. Current options for injectable contraception in the United States. *Semin. Reprod. Med.* 19(4):331–338, 2001.

25. Product information, 1999.

26. Cullins, V. E. Noncontraceptive benefits and therapeutic uses of depot medroxyprogesterone acetate. *J. Reprod. Med.* 41(*5* suppl.):428–433 (May) 1996.

27. Depot-medroxyprogesterone acetate: An overview of DMPA and its FDA approval. *The Contraception Report* III(*5*):4–8 (November) 1992.

28. Kaunitz, A. M., Garceau, R. J., Cromie, M. A., and the Lunelle Study Group. Comparative safety, efficacy, and cycle control of Lunelle monthly contraceptive injection (medroxyprogesterone acetate and estradiol cypionate injectable suspension) and Ortho-Novum 7/7/7 oral contraceptive (norethindrone/ethinyl estradiol triphasic). *Contraception* 60(4):179–187 (October) 1999.

29. Meckstroth, K. R. Implant contraception. *Semin. Reprod. Med.* 19(4):339–354, 2001.

30. Harwood, B., and Mishell, D. R. Jr. Contraceptive vaginal rings. *Semin. Reprod. Med.* 19(4):381–390, 2001.

31. Roumen, F. J. M. E., Apter, D., Mulders, T. M. T., and Dieben, T. O. M. Efficacy, tolerability and acceptability of a novel contraceptive vaginal ring releasing etonogestrel and ethinyl oestradiol. *Hum. Reprod.* 16(3):469–475, 2001.

32. Product information, 2002.

33. Combined contraceptive vaginal ring awaiting US approval. *The Contraception Report* 12:12–14 (June) 2001.

34. Abrams, L. S., Skee, D., Natarajan, J., and Wong, F. A. Pharmacokinetic overview of Ortho Evra/Evra. *Fertil. Sterility* 77(2, suppl. 2):S3–S12 (February) 2002.

35. Smallwood, G. H., Meador, M. L., Lenihan, J. P. Jr., et al. Efficacy and safety of a transdermal contraceptive system. *Obstet. Gynecol.* 98(*5*):799–805 (November) 2001.

36. Zieman, M., Guillebaud, J., Weisberg, E., Shangold, G. A., Fisher, A. C. and Creasy, G. W. Contraceptive efficacy and cycle control with the Ortho Evra/Evra transdermal system: the analysis of pooled data. *Fertil. Sterility* 77(2, suppl. 2):S13–S18 (February) 2002.

37. Zacur, H. A., Hedon, B., Mansour, D., Shangold, G. A., Fisher, A. C., and Creasy, G. W. Integrated summary of Ortho Evra/Evra contraceptive patch adhesion in varied climates and conditions. *Fertil. Sterility* 77(2, suppl. 2):S32–S35 (February) 2002.

38. Archer, D. F., Bigrigg, A., Smallwood, G. H., Shangold, G. A., Creasy, G. W., and Fisher, A. C. Assessment of compliance with a weekly contraceptive patch (Ortho Evra/Evra) among North American women. *Fertil. Sterility* 77(2, suppl. 2):S27–S31 (February) 2002.

39. Product information, November 2001.

40. Sibai, B. K. M., Odlind, V., Meador, M. L., Shangold, G. A., Fisher, A. C., and Creasey, G. W. A comparative and pooled analysis of the safety and tolerability of the contraceptive patch (Ortho Evra/Evra). *Fertil. Sterility* 77(2, suppl. 2):S19–S26 (February) 2002.

• • • Additional References

Audet, M. C., Moreau, M., Koltun, W. D., et al. Evaluation of contraceptive efficacy and cycle control of a transdermal contraceptive patch vs an oral contraceptive: a randomized controlled trial. *JAMA* 285(18):2347–2354 (May 9) 2001.

Creasy, G. W., Abrams, L. S., and Fisher, A. C. Transdermal contraception. *Semin. Reprod. Med.* 19(4):373–380, 2001.

Curtis, K. M., Chrisman, C. E., Peterson, H. B., and WHO Programme for Mapping Best Practices in Reproductive Health. Contraception for women in selected circumstances. *Obstet. Gynecol.* 99(6):1100–1112 (June) 2002.

Klima, C. S. Emergency contraception for midwifery practice. *J. Nurse-Midwifery* 43(3):182–189 (May/June) 1998.

Klima, C. S. Unintended pregnancy: consequences and solutions for a worldwide problem. *J. Nurse-Midwifery* 43(6):483–491 (November/December) 1998.

Meirik, O. Implantable contraceptives for women. *Contraception* 65:1–2, 2002.

Sivin, I., and Moo-Young, A. Recent developments in contraceptive implants at the Population Council. *Contraception* 65:113–119, 2002.

Zieman, M. The introduction of a transdermal hormonal contraceptive (Ortho Evra/Evra). *Fertil. Sterility* 77(2, suppl. 2) (February) 2002.

PART

IV

Antepartal Care

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CHAPTER

21

Normal Pregnancy Database: Adaptations of the Mother, Development and Growth of the Embryo and the Fetus, and the Placenta

The antepartal period covers the time of pregnancy from the first day of the last normal menstrual period (LNMP) to the start of true labor, which marks the beginning of the intrapartal period. In contrast, the prenatal period covers the time of pregnancy from the first day of the last normal menstrual period to the birth of the baby, which marks the beginning of the postnatal period.

The antepartal period is divided into three trimesters, each consisting of approximately 13 weeks or 3 calendar months. This division derives from the convention of considering the duration of pregnancy to be approximately 280 days, 40 weeks, 10 lunar months, or 9 calendar months from the first day of the last menstrual period. In reality, gestation is not that long. Fertilization takes place at the time of ovulation, approximately 14 days after the last menstrual period (assuming a 28-day cycle). This makes actual gestation approximately 266 days or 38 weeks in length. Adding 14 days gives a total of 280 days from the last menstrual period. In practice, the first trimester is generally considered to be weeks 1 to 12 (12 weeks), the second trimester to be weeks 13 to 27 (15 weeks), and the third trimester to be weeks 28 to 40 (13 weeks).

The database for normal pregnancy has the following components:

1. Maternal anatomical and physiological changes
2. Maternal psychological adjustment and processes
3. Fetal growth and development
4. Placental development, circulation, and functioning

Maternal Anatomical and Physiological Changes

Information concerning maternal anatomical and physiological changes is discussed both here and throughout the chapters on antepartal care and the chapters in the skills section that pertain to antepartal care. This method of presentation was chosen in order to provide the information when it is applicable to understanding particular aspects of the antepartal period and related management of care. This approach is in accord with the principle that learning takes place best when the information is used. Anatomical and physiological changes discussed elsewhere are not necessarily repeated in this chapter. Presented here are the maternal anatomical, physiological, and hormonal changes indicative of pregnancy and an overview of the anatomical and physiological changes made throughout pregnancy.

Physiological and Hormonal Changes Indicative of Pregnancy

Knowledge of the physiology of early pregnancy is necessary for understanding the presumptive and probable signs of pregnancy. It is also important, for purposes of screening for abnormality, to know what other conditions may cause a particular sign.

Presumptive signs of pregnancy are maternal physiological changes that the woman experiences and that in most cases indicate to her that she is pregnant. *Probable signs* of pregnancy are maternal physiological and anatomical changes other than presumptive signs that are detected upon examination and documented by the examiner. *Positive signs* are those directly attributable to the fetus, as detected and documented by the examiner.

At the time of ovulation, the ovum is extruded from a mature graafian follicle in the ovary. The ruptured follicle undergoes a number of changes to become the corpus luteum of menstruation, which progressively degenerates and completely regresses during the subsequent menstruation. If the ovum is fertilized, the corpus luteum is maintained by the production of chorionic gonadotropin by the syncytiotrophoblast surrounding the blastocyst and becomes the corpus luteum of pregnancy.

The continued production of progesterone by the corpus luteum of pregnancy maintains the uterine lining for implantation and the earliest stages of pregnancy; shortly after implantation the placenta begins producing enough progesterone to take over this function. Progesterone from the corpus luteum of pregnancy also causes the mother's basal body temperature to continue at its elevated level following ovulation. With the uterine lining maintained, there is no menstruation; this usually is the first indication of pregnancy for women with regular menstrual periods. Amenorrhea, however, may also be caused by certain chronic diseases, pituitary tumors, environmental factors or changes, malnutrition, and emotional upset, such as that caused by the fear of being pregnant.

The placenta produces several hormones. These hormones cause a number of the physiological changes that aid in the diagnosis of pregnancy. The high levels of estrogen and progesterone produced by the placenta are responsible for breast changes, skin pigmentations, and uterine enlargement in the first trimester. Chorionic gonadotropin is the basis for the immunologic pregnancy tests. Chorionic somatomammotropin (human placental lactogen, or HPL) stimulates the growth of the breasts, has lactogenic properties, and effects a number of metabolic changes.

Specifically, estrogen promotes development of the ductal system of the breasts as well as mammary growth, and progesterone stimulates the development of the alveolar system of the breasts and contributes to mammary growth. Together with chorionic somatomammotropin, these hormones are responsible for the presumptive signs of breast enlargement, causing the breasts to feel tense and tingling during the first 2 months of pregnancy, enlargement of the nipples, and the presence of colostrum in the breasts, which usually can be expressed by the twelfth week of pregnancy. Hypertrophy of the mammary alveoli causes the breasts to feel nodular, starting during the first 2 months of pregnancy. Montgomery's tubercles or follicles are actually hypertrophied sebaceous glands in the areolae and are prominently noticeable by the second month of pregnancy. Excessive enlargement of the breasts causes striations. A tracing of delicate veins may be seen just beneath the skin as the breasts enlarge. Many of these breast changes are also seen in women taking oral contraceptive pills, may occur in women who have brain or ovarian tumors or who are taking certain tranquilizers, and sometimes are seen in pseudocyesis (imaginary pregnancy).

Although the cause of skin pigmentation is not certain, it is thought that estrogen and progesterone have a melanocyte-stimulating effect. This would account for the darkening of the nipple and the primary areolae (darkening of the areola around the nipple), both of which occur around the third month of pregnancy. It also would account for the secondary areolae (mottling of the skin around and beyond the primary areolae); the linea nigra (a narrow line of dark skin pigmentation in the midline of the abdomen from the symphysis pubis to the umbilicus); the striae (stretch marks) of the abdomen (striae gravidarum), excessively enlarged breasts, and occasionally the buttocks and upper thighs; and chloasma (the mask of pregnancy—irregular brownish discolorations of the forehead, nose, cheeks, and neck). All of these occur around the fifth or sixth lunar month of pregnancy. The pigmentation of the nipples and breasts varies with the woman's complexion. It is a pronounced pink in blondes, dark brown in brunettes, and black in the black race. Chloasma is most noticeable in brunettes. Although skin pigmentations are fairly common in pregnant women, they may be absent. Chloasma is seen sometimes in women taking oral

contraceptive pills. All skin pigmentations may also be associated with a variety of tumors of different origin. Most of the pigmentation changes of pregnancy regress and disappear after pregnancy has ended, with the exception of the striae, which lose their reddish brown pigmentation but remain as fine silvery white lines of glistening fibrous tissue.

Vascular spiders and palmar erythema during pregnancy possibly are due to the hyperestrogenemic state of the woman while pregnant. These conditions, which occur around the fifth to sixth lunar month of pregnancy, usually disappear after pregnancy has ended and have no clinical significance. However, palmar erythema in the first trimester indicates the possibility of hepatitis, with which it is also associated. Vascular spiders generally appear on the face, neck, upper chest, and arms and are minute reddened elevations of the skin; each has a central body from which radicles branch out. Many women do not experience either of these conditions during pregnancy.

Hormonal changes are only one of many possible explanations for the etiology of nausea and vomiting, which is so common as to be considered a presumptive sign of pregnancy. "Normal" nausea and vomiting in pregnancy rarely extend beyond the first trimester.

It is not really known what accounts for the fatigue often encountered during the first trimester. For a number of years it was thought that the basal metabolic rate (BMR) initially fell early in pregnancy, which would account for first trimester fatigue. More current thought is that the elevated progesterone(s) that initially maintain the pregnancy cause fatigue or have a sleep-inducing effect.

Hormonal Pregnancy Tests

Pregnancy tests are based on the production of human chorionic gonadotropin (hCG), which is a product of the syncytiotrophoblast, the outer layer of the trophoblast. The syncytiotrophoblast is differentiated and secretes hCG as the trophoblast invades the endometrium and implants. It is not possible to detect hCG in the maternal plasma or urine until implantation takes place. As variability in cycle length is largely due to the number of days from the beginning of menses to ovulation [1] and implantation time varies from 6 to 12 days after ovulation [2], it may or may not be possible to detect hCG when a woman misses the first days of her menstrual period. Pregnancy tests are based on the detection of hCG. Some pregnancy tests claim to be accurate down to the first day of a woman's missed menstrual period. However, as many as 10 percent of women do not implant by the first day of their missed menstrual period and therefore would register as false negative pregnancy tests if done at that time [1]. Conversely, a number of pregnancies that are detected very early also spontaneously abort very early [3].

Human chorionic gonadotropin is secreted into the maternal bloodstream where it is present in the plasma. It is then excreted in the mother's urine. The most sensitive tests, such as immunoradiometric assay, can detect hCG in either plasma or urine by the first day after implantation or 8 to 9 days after ovulation or 8 to 11 days after conception. After that point, the hCG level increases exponentially, doubling approximately every 2 days until it peaks at about $8\,^1/_2$ to 10 weeks' gestation as dated by a woman's last menstrual period (LMP) (see Figure 23-1). There is a very wide variation in normal hCG levels, which means that there are no absolute numbers for any given day or week of gestation and that a single number may not be that useful. What is informative are serial tests of hCG levels (at least two; more if indicated) and vaginal sonography. This becomes important in evaluating a threatened abortion, ectopic pregnancy, multiple gestation, hydatidiform mole, and choriocarcinoma. If such tests are conducted for whatever reason, the results may also be useful in dating a pregnancy.

Quantitative assays of hCG are of diagnostic significance in pregnancy. They are abnormally low in ectopic pregnancies and threatened abortions (also causing false-negative pregnancy tests) and abnormally high in women with multiple pregnancy, hydatidiform mole, or choriocarcinoma. Quantitative values in the serum radioimmunoassay tests are also useful in dating a pregnancy.

Human chorionic gonadotropin in the urine has been used for pregnancy tests since the late 1920s, when Aschheim and Zondek originated biological assay of its presence. The biological tests of pregnancy utilize small immature animals (mice, rats, rabbits, frogs, toads) and are based on the response of the animal's ovaries or testes after the animal is injected with either serum or urine of the woman suspected of being pregnant. These tests were supplanted by the immunologic assays of hCG. The immunologic assays utilize specific antisera obtained from animals (rabbits) in which antibody response to hCG has been stimulated. The assay is based on the fact that hCG is a protein and therefore antigenic. The antisera are mixed with

urine from the woman suspected of being pregnant which mediates the response of the antisera when mixed with either latex particles coated with hCG (latex particle agglutination inhibition tests) or with erythrocytes (from sheep) that have been sensitized to hCG (hemagglutination inhibition tests). If the woman is pregnant, her urine contains hCG, which neutralizes the antibodies in the antiserum and inhibits agglutination—a positive pregnancy test. If the woman is not pregnant, her urine does not contain hCG and agglutination will occur—a negative pregnancy test.

The companies that manufacture these pregnancy tests enclose with the necessary materials step-by-step instructions for the performance and interpretation of the test, information pertaining to the period in gestation when the test is most accurate, and data concerning the sensitivity of the test in detecting specific levels of hCG in terms of international units of hCG per liter or milliliter of urine. Because hCG is similar in structure to luteinizing hormone (LH), the antibodies of both these hormones will cross-react with each other. Therefore most tests limit their maximum quantity sensitivity in order to avoid false-positive tests caused by cross-reactivity with luteinizing hormone.

False-negative immunologic pregnancy tests occur in about 2 percent of all tests run and usually result from doing the test too early in the pregnancy (i.e., before 6 weeks since the first day of the last menstrual period) or, occasionally, too late in the pregnancy (after the middle of the pregnancy). False-positive results occur in about 5 percent of all immunologic tests. False-positive results may be caused by the woman's having massive proteinuria or may occur during the onset of menopause in middle-aged women, when the levels of pituitary gonadotropins rise while the endocrine function of the ovaries declines. False-positive pregnancy tests may also result from the cross-reaction of pituitary gonadotropins with hCG.

Overall, the immunologic pregnancy tests are as accurate as the biologic pregnancy tests (95 to 98 percent), although accuracy may vary somewhat depending on the test used and whether care is taken to ensure that the test is being done during the appropriate time of gestation. Since pregnancy tests are not 100 percent accurate, they are considered a probable sign of pregnancy, and the results should be evaluated in relation to the presence or absence of other signs of pregnancy.

Radioreceptorassay and radioimmunoassay tests are extremely sensitive tests able to detect hCG at far lower levels than previous tests could. Both require expensive equipment and trained technicians. Because the radioreceptorassay test cross-reacts with luteinizing hormone, however, it is more limited in its sensitivity than the radioimmunoassay tests.

Human chorionic gonadotropin consists of two dissimilar glycoprotein chains, designated as the alpha subunit and the beta subunit. The radioimmunoassay blood tests are designed specifically to detect the hCG beta subunit because it is distinctly different from other glycoprotein beta subunits, whereas the hCG alpha subunit is quite similar, if not identical, to other glycoprotein alpha subunits. This radioimmunoassay test is commonly called beta-preg. The laboratory will supply information about the expected levels for the particular week of gestation and the sensitivity of the test used. This is a highly accurate test, though not 100 percent perfect.

The most recent pregnancy tests use enzymes to detect the hCG beta subunit and are called enzyme-linked immunosorbent assay (ELISA) (Figure 21-1). They consist of immunosorbent assays of monoclonal antibodies to the hCG beta subunit. They have good sensitivity, are highly specific, take very little time, are not very expensive, and are easy to perform. Enzyme immunoassay is used by professionals for in-office or in-clinic testing along with the agglutination immunologic assay pregnancy tests. In addition, enzyme immunoassay is the basis for home pregnancy tests. Home tests are not as accurate in actual use as they are in the laboratory conditions of the companies that make them. Variables include correct timing of when the test is done, correct timing of when the test is read, early pregnancy loss, whether the test was properly stored prior to use, and if a woman had an hCG in-

FIGURE 21-1 Midwife discussing a woman's pregnancy test.

jection (sometimes used with assisted reproduction). If the test is negative, the instructions advise that the woman test herself again in 1 week if she still has not had her menstrual period. Toll-free telephone numbers, most of which are answered by Registered Nurses who can respond to questions/concerns, are given by the pharmaceutical companies that market the home pregnancy tests.

Anatomical Changes/Uterine Enlargement

Estrogen and perhaps progesterone are thought to be primarily responsible for uterine growth by hyperplasia (an increased number of cells) during the early months of pregnancy. This growth is not influenced by any mechanical effect of the developing embryo. The uterine wall is strengthened rather than weakened by this development, since the increased number of muscle cells are accompanied by a marked increase in elastic tissue and an accumulation of fibrous tissue. Thereafter, uterine enlargement occurs because of a combination of hypertrophy (an increase in the size of the cells) and the mechanical effect of interior pressure on the uterine wall by the growing products of conception. During the early months of gestation, there is also a marked increase in the size of the uterine blood vessels and lymphatics. The resulting vascularity, congestion, and edema most likely account for the overall softening of the uterus and, combined with hypertrophy of the cervical glands, give rise to Chadwick's, Goodell's, and Hegar's signs. Chadwick's sign is the bluish or purplish discoloration of the vulva and vaginal mucosa, including the vaginal portion of the cervix. Goodell's sign is the softening of the cervix, from a nonpregnant state of firmness similar to that of the tip of a nose to the softness of lips in the pregnant state. Hegar's sign is the softening and compressibility of the uterine isthmus. These three signs are evident by about 6 weeks' gestation.

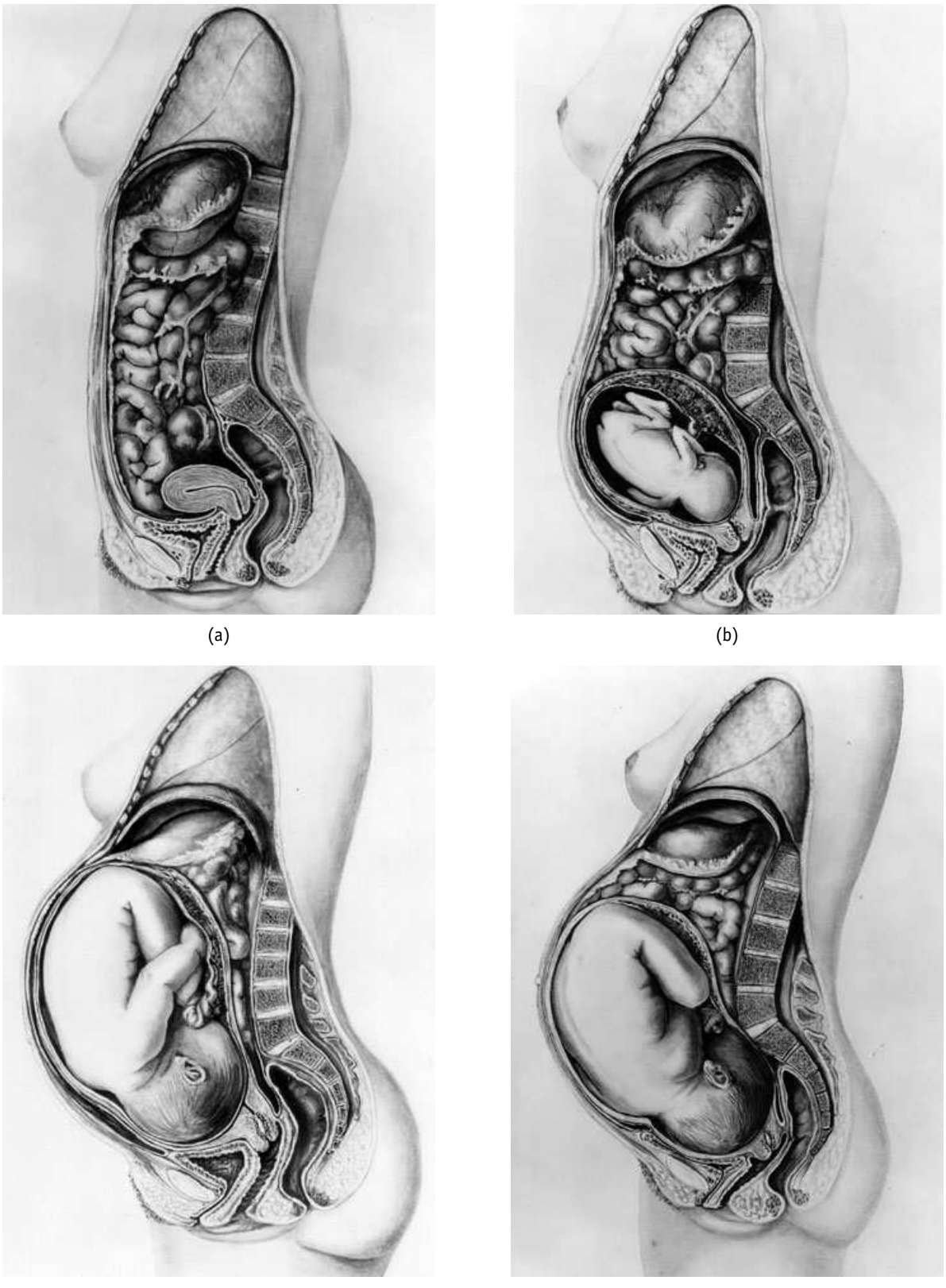
The softness and compressibility of the uterine isthmus (Hegar's sign) have the effect of decreasing support to the enlarging body of the uterus with its increasing heaviness in the fundus. The result is exaggerated uterine anteflexion during the first 3 months of pregnancy, while the uterus is still a pelvic organ. This causes the fundus to press on the bladder, and urinary frequency ensues. Urinary frequency is relieved early in the fourth month of pregnancy as the uterus rises out of the pelvis and, therefore, no longer causes bladder pressure.

As the uterus enlarges, its shape changes from the nonpregnant pear shape to a globular form in the early months of pregnancy and becomes an ever-larger ovoid after the third month of pregnancy. (See part (b) of Figure 21-2.) As it enlarges, the uterus can no longer be contained within the pelvis, and it rises out of the pelvis to become an abdominal organ. The uterus rotates slightly to the right as it rises out of the pelvis. This dextrorotation is thought to be caused by the rectosigmoid's occupying the left side of the pelvic cavity. The uterus may enlarge at slightly different rates (one to two weeks' variation) for the primigravida and the multigravida. This variation may create some differences in early sizing and again when the uterus reaches anatomical landmarks such as the umbilicus.

Early uterine enlargement may not be symmetrical. The ovum normally implants in the upper uterine wall, more frequently on the posterior side. If the implantation is located closer to one cornual area, the cornual area where the ovum implants enlarges first in response to the embryological development taking place at that site. Such implantation may be detected during pelvic examination by the asymmetry of the uterus and a rough, irregular contour in one of the cornual areas. This uterine irregularity occurs around the eighth to tenth week of pregnancy and is called Piskacek's sign.

Uterine enlargement contributes to two other maternal signs of pregnancy. The first is Braxton Hicks contractions, which are hypothesized to result in part from the stretching of the uterine muscle cells. An increase in the concentration of actomyosin in the muscle cells is also thought to contribute to this contractility of the uterus. Braxton Hicks contractions are nonrhythmic, sporadic, painless uterine contractions that start about the sixth week of pregnancy but are not detectable during bimanual pelvic examination until the second trimester and during abdominal examination in the third trimester. They increase in frequency, duration, and intensity as well as attain some degree of rhythm and regularity close to term, at which time they are frequently misinterpreted as labor contractions. They are the major culprit in false labor.

The other sign of pregnancy brought about by uterine enlargement is abdominal enlargement. This begins at the fourth month of pregnancy as the uterus becomes an ever-larger abdominal organ, as can be seen in part (b) of Figure 21-2. The abdomen is more prominent when the woman is standing than when she is supine. Abdominal enlargement can also be more noticeable in multiparas than in primigravidas because of the loss of muscle tone of the abdominal wall, if the woman has not exercised



(a) (b)

(c) (d)

FIGURE 21-2 Schuchardt charts: (a) nonpregnant; (b) fifth lunar month; (c) ninth lunar month; (d) just before labor.
Source: Reproduced with permission from Maternity Center Association, New York.

to get back in shape after each previous pregnancy. A pendulous abdomen results as the uterus sags forward and downward. This can cause problems during labor in extreme cases.

Uterine enlargement with progressive thinning of the uterine wall enables the fetal contributions to the diagnosis of pregnancy to become apparent. The uterus changes from an almost solid organ in the nonpregnant state, with only a narrow opening between the anterior and posterior walls, to an enlarged vessel at term with walls only 5 mm thick, a weight of approximately 2 ounces to more than 2 pounds at term, and a capacity of less than 10 mL increasing by 500 to 1000 times greater to 5000 mL or more. The combination of uterine enlargement, thinning of the uterine wall, and the uterus becoming an abdominal organ enables detection during the second trimester of a number of signs of pregnancy that were previously not able to be noticed. The precise times, however, when the fetal heart tones are heard and quickening is felt vary not only with the thinness or obesity of the individual woman but also with parity. The uterus and abdominal musculature of a multipara have hypertrophied and stretched before. They will do so again more easily, and thus the uterine wall may be thin enough to facilitate eliciting these signs of pregnancy a week or two earlier in a multipara than in a primigravida.

The fetal heart starts beating at the beginning of the fourth week postfertilization (sixth week after the LMP), but it is not until around the twentieth week following the LMP that the heartbeat can be heard with a head fetoscope during abdominal examination of the mother. However, it can be heard abdominally between the twelfth and twentieth weeks after the LMP with hand-held ultrasonic instruments, and movement of the fetal heart can be seen by 7 weeks with a transvaginal ultrasound. Fetal heart tones must be differentiated from the maternal pulse, maternal bowel sounds, fetal movement sounds, and the uterine souffle. The funic souffle (the sound of blood rushing through the umbilical arteries) is synchronous with the fetal pulse.

Similarly, weak fetal movements start in the third month of pregnancy, but it is not until around the twentieth week that they are strong enough and the uterine wall is thin enough that the movements can be felt and properly diagnosed during abdominal examination. The mother may be aware of fetal movements around the eighteenth week following her LMP. These movements increase in intensity over the weeks, from gentle flutterings to unmistakable fetal kicks. The time when the mother first feels fetal movement is called *quickening*, meaning the perception of life. Quickening may be useful as corroborative evidence in dating a pregnancy, but it is not definitively diagnostic because the early flutterings may feel to the mother like the movement of gas through the intestines.

It is not until after the twentieth week that the fetal outline can be palpated during abdominal examination. Again, this is not a definitive diagnostic sign since subserous myomas may feel like fetal parts. Ballottement can be elicited abdominally around the same time. In this sign, a sudden tap on the uterus causes the fetus to sink in the amniotic fluid and rebound to strike gently against the fingers of the examiner. Ballottement is possible at this time because there is a large volume of amniotic fluid in relation to the size of the still small fetus. This proportion grossly changes later in pregnancy, as shown in parts (b), (c), and (d) of Figure 21-2.

Positional changes of the abdominal organs and contents as the abdominal space is increasingly filled with the enlarging uterus, account for a number of the normal discomforts of pregnancy discussed in Chapter 22. Parts (c) and (d) of Figure 21-2 show the different effects on the mother's bladder, room for stomach and lung expansion, center of gravity, and spine before and after lightening, and beginning effacement, as the baby's head descends into the pelvis.

Maternal Physiological Changes

It is important to know the basic maternal physiological changes as they explain many of the discomforts of pregnancy as well as give a database from which to interpret physical and laboratory findings that would be abnormal in the nonpregnant state but are normal during pregnancy. Many of these changes are repeated elsewhere in this book when their applicability becomes important to understanding pregnancy and the management of antepartal care.

Cardiovascular/Hemodynamic Changes

Hemodynamic changes enable the mother's cardiovascular system to meet the demands of the fetus while maintaining her own cardiovascular status. They are caused by increased levels of estrogen, progesterone, and prostaglandins, and they are reversible with the end of pregnancy [4].

The mother's total blood volume increases between 30 and 50 percent in singleton pregnancies and 50 percent or above in twin pregnancies. Total blood volume is a combination of plasma volume, which accounts for 75 percent of the increase, and red blood cell volume, which increases by 33 percent from nonpregnant values. The result is hemodilution, which is reflected in a lower hematocrit, is known as the physiological anemia of pregnancy, and is most pronounced between 24 and 32 weeks' gestation. The increase in total blood volume begins early in the first trimester, becoming rapid until midpregnancy and then more slowly until 32 weeks, after which it remains relatively stable although the erythrocyte mass continues to increase [4, 5, 6].

Posture and body position of the pregnant woman affect fluid distribution and both arterial and venous pressures. A decrease in blood volume occurs after being in the supine position for an hour or more. At the same time, femoral venous pressure is rising steadily. The mechanical pressure of the pregnant uterus on the pelvic veins and on the inferior vena cava impedes the return blood flow from the legs and pelvis, which causes an increase in venous pressure, a sharp rise in hydrostatic pressure in the microcirculation, subsequent leakage of fluid from the vascular bed into the interstitium, and results in edema of the feet and ankles. It also contributes to development of leg and vulvar varicose veins and hemorrhoids and predisposes to deep-vein thrombosis. The distensibility of the veins also contributes to the decreased venous return to the heart. The lateral recumbent position relieves the mechanical pressure from the pregnant uterus, increases blood flow from the lower extremities, and returns the increased femoral venous pressure to normal. The antecubital venous pressure is not affected by the pressure of the uterus on the inferior vena cava and does not change during pregnancy [4, 6].

In late pregnancy, having a woman in the supine position may cause the now large and heavy uterus to rather quickly compress the venous return to the extent that cardiac filling may be reduced and cardiac output decreased. In about 10 percent of women, this may result in arterial hypotension, and the woman may feel faint or lose consciousness. This is readily remedied by having the woman turn on her side or sit up [6]. Arterial blood pressure may also be lowered below the level of the compression if the aorta is also compressed. This means that the pressure in the arteries below the compression is significantly lower and is not accurately reflected in the brachial artery blood pressure. This should be kept in mind when there is systemic hypotension, such as may occur with spinal analgesia, as the decrease will be greater in the uterine arterial pressure than in the arteries above the level of aortic compression [6]. Brachial artery blood pressure usually decreases until midpregnancy at which time it gradually rises again to prepregnant levels by term. The systolic decreases 8 to 10 points while the diastolic has a larger decrease of approximately 12 points [6]. This normal decrease in blood pressure should be kept in mind when evaluating blood pressure increases and screening for hypertensive disorders of pregnancy.

Cardiac output—the product of heart rate and stroke volume—increases significantly beginning in early pregnancy and remaining elevated throughout pregnancy. Factors contributing to this increase include an early increase in stroke volume, an early and progressive increase in heart rate of approximately 15 beats per minute, and decreased systemic vascular resistance. This is evidenced when measured in the lateral recumbent position because when the woman stands, cardiac output falls to nonpregnant levels [6]. As discussed in the preceding paragraph, cardiac output may decrease when the woman is in the supine position in late pregnancy due to the compression of the inferior vena cava by the uterus, which thereby impedes venous return. Obviously, cardiac output is higher when the woman is in the lateral recumbent position than when she is supine.

The heart itself is displaced upward and to the left as the diaphragm becomes progressively elevated from the growing pregnancy. This moves the apex of the heart laterally and increases the size of the cardiac silhouette on x-ray. Changes in heart sounds include the following [4, 6]:

1. Exaggerated splitting of the first heart sound with increased loudness of both components first heard between 12 and 20 weeks' gestation in 88 percent of pregnant women; best heard along the left sternal border between the third and fifth intercostal spaces.
2. A loud, easily heard third sound.
3. A short systolic murmur in 90 to 95 percent of pregnant women, which may be intensified during either inspiration or expiration; reflects the increased cardiovascular load; heard best along the left sternal border in the third intercostal space or along the lower left sternal border at the apex or aortic area.

4. A soft transient diastolic murmur in 20 percent of pregnant women.
5. Continuous murmurs arising from mammary vasculature in 10 to 14 percent of pregnant women.

Increased blood flow to the skin in pregnancy serves to dissipate excess heat generated by increased metabolism. It also enhances absorption of most transdermal and subcutaneous drugs (see Chapter 10, p. 258).

Renal Changes

There are a number of significant changes in the renal system during pregnancy that enable the mother not only to handle her own wastes and the excess brought about from the increases in blood volume and cardiac output as well as metabolic waste products but also to be the primary organ for the excretion of wastes from the fetus. In addition, the kidneys are critical in mediating sodium retention and water balance during pregnancy and maintaining arterial blood pressure through the renin-angiotensin system. All components of the renin-angiotension system produced from both maternal and fetal sources are increased in normal pregnancy, due in part to high levels of estrogen production.

Table 21-1 summarizes the changes in the renal system during pregnancy. Of particular note for midwives is the hydroureter and hydronephrosis that takes place during pregnancy. Hydroureter occurs as the uterus rises out of the pelvis into the abdomen and compresses the ureters as they cross the pelvic brim. This is more prominent on the right than on the left as the uterus dextrorotates as it comes out of the pelvis. With distention comes elongation and lateral displacement of the ureters. Hydronephrosis occurs in 80 to 90 percent of pregnant women. The increased size of the kidney and dilation of the pelves and calyces as well as the ureters all increase the risk of urinary tract infections due to urinary stasis [4, 6].

The usual daytime (diurnal) pattern of the nonpregnant woman reverses with pregnancy. The pregnant woman accumulates fluid (water and sodium) during the day in the form of dependent edema from the pressure of the uterus on the pelvic blood vessels and the inferior vena cava as discussed above and then excretes it as dilute urine at night (nocturia) via the kidneys when the woman is lying down, especially in a left lateral position.

Pulmonary Changes

It is the maternal respiratory system that delivers oxygen to and removes carbon dioxide from the fetus, and provides energy to the cells of the mother herself, the fetus, and the placenta. Factors affecting pulmonary changes include hormonal influences and mechanical changes.

Mechanical changes include the elevation of the resting position of the diaphragm by approximately 4 centimeters, an increase of 2 centimeters in the transverse diameter while the subcostal angle widens, the lower ribs flare, and the thoracic circumference increases approximately 6 centimeters [6]. These changes are all caused by the upward pressure of the enlarging uterus (see Figure 21-2). Hormonal influences include the effect of estrogen on capillary engorgement throughout the respiratory tract and the effects of progesterone on the relaxation of bronchiole smooth muscle and on the relaxation of the muscles and cartilage in the thoracic region [4].

The respiratory rate, vital capacity, and maximum breathing capacity are not affected during pregnancy but tidal volume, minute ventilatory volume, and minute oxygen uptake increase throughout pregnancy, and functional residual capacity and residual volume of air are decreased. The effect of this is physiological dyspnea or dyspnea of pregnancy, which is related to the increased tidal volume and resulting hyperventilation, and lower PCO_2. The lower PCO_2 puts the mother in respiratory alkalosis, which facilitates transfer of CO_2 from the fetus to the mother. A slight increase in blood pH facilitates the release of oxygen from the mother to the fetus [5, 6]. A 70 percent increase in alveolar ventilation related to the decreased residual volume increases particle uptake and diffusion of drugs in aerosols and bronchodilators (see Chapter 10, p. 258).

Gastrointestinal Changes

Changes in the gastrointestinal tract ensure the delivery of nutrients to meet the needs of both the mother and the fetus and are under both mechanical and hormonal influences. Of particular note for midwives is that many of these changes are responsible for a number of the discomforts of pregnancy.

Estrogen causes increased blood flow to the mouth, making the gums friable and thus contributing to gingivitis. This may also bring the mother's attention to the need for dental care, but not because of any loss of calcium to the fetus. The fetus obtains calcium from the mother's body

TABLE 21-1 Summary of Changes in the Renal System During Pregnancy

Parameter	Alteration	Significance
Renal calyces, pelvis, and ureters	Dilatation (more prominent on right) Elongation, decreased motility, and hypertonicity of ureters May last up to 3 months postpartum	Increased risk of urinary tract infection in pregnancy and postpartum Alter accuracy of 24-hour urine collections
Bladder	Decreased tone, increased capacity	Risk of infection Urinary frequency and incontinence Alteration in accuracy of 24-hour urine collections
	Displaced in late pregnancy Mucosa edematous and hyperemic Incompetence of vesicoureteral valve	Urinary frequency Risk of trauma and infection Risk of reflux and infection Alteration in accuracy of 24-hour urine collections
Renal blood flow	Increases 35–60%	Increased glomerular filtration rate Increased solutes delivered to kidney
Glomerular filtration rate	Increases 40–50%	Increased filtration and excretion of water and solutes Increased urine flow and volume Decreased serum blood urea nitrogen, creatinine, uric acid Altered renal excretion of drugs with risk of subtherapeutic blood and tissue levels
Renal tubular function	Increased reabsorption of solutes (may not always match increase in filtered load)	Maintenance of homeostasis Avoid pathological solute or fluid loss
	Increased renal excretion of glucose, protein, amino acids, urea, uric acid, water-soluble vitamins, calcium, hydrogen ions, phosphorous Net retention of sodium and water	Tendency for glycosuria, proteinuria Compensation for respiratory alkalosis Increased nutritional needs (i.e., calcium, water-soluble vitamins) Accumulation of sodium and water to meet maternal and fetal needs
Renin-angiotensin-aldosterone system	Increase in all components Resistance to pressor effects of angiotensin II	Maintain homeostasis with expanded extracellular volume Retention of water and sodium Balance forces favoring sodium excretion Maintain normal blood pressure
Arginine vasopressin and regulation of osmolarity	Retention of water	Expansion of plasma volume and other extracellular volume
	Osmostat reset	Maintenance of volume homeostasis in spite of reduction in plasma osmolarity

Source: Reprinted from Blackburn, S. T.: Maternal, Fetal, and Neonatal Physiology: A Clinical Perspective, 2nd ed., Changes in the Renal System During Pregnancy, © 2003 Elsevier, Inc., with permission from Elsevier.

stores, not from her teeth. Saliva becomes more acidic but does not increase in volume [4].

The tone of the lower esophageal sphincter decreases under the influence of progesterone, causing smooth muscle relaxation. Displacement of the diaphragm and pressure from the enlarging uterus combine with loss of sphincter tone to cause reflux and heartburn. The action of progesterone on smooth muscles also causes hypotonicity of the stomach with decreased motility and prolonged emptying time. These same changes due to progesterone are true for the entire intestinal tract. The effects of progesterone become more pronounced as pregnancy advances and the progesterone levels increase. The effect of progesterone on the small intestine is to have more time for the absorption of nutrients, minerals, and drugs (see Chapter 10, p. 257). This absorption is also enhanced by hypertrophy of the duodenal villi, which increases their absorptive capacity [4]. The effect of progesterone on the large intestine contributes to constipation as the slow transit time allows for more water to be absorbed and to increased flatulence as the bowel is also displaced by the growing uterus. The appendix and liver are also displaced by the enlarging uterus. The appendix moves upward and laterally out of the lower-right quadrant and may reach as high as the right costal margin above the flank. Under the influence of estrogen on the gallbladder, there may be stasis of the bile salts (cholestasis of pregnancy), resulting in pruritus and icterus [6].

Maternal Psychological Adjustment and Processes

Pregnancy is a time of transition—spanning what life was like before having this child and what life will be like with this child. This radical change of status is considered a crisis with a defined period of time to work through the preparatory psychological processes that are normally present during pregnancy and culminate with the birth of the baby.

In general, the emotions of a pregnant woman are quite labile. She may have extreme reactions and rapidly changing mood shifts. Her emotional reactions and perceptions of the world may change. She is extremely sensitive and tends to overreact. A pregnant woman is far more open both to her internal self and to sharing her experience with others. She ruminates on her sleeping dreams, daydreams, fantasies, and the meanings of words, objects, events, and abstract concepts such as death, life, fertility, fulfillment, and happiness. She may identify with physical forms that signify childbearing or being filled with life or food.

The pregnant woman is extremely vulnerable. She fears death for both herself and her baby. She is frightened of the unknown because her body seems out of her control and her life is in the process of being changed irreversibly. This makes many women more dependent and some women more demanding. It is a time of heightened susceptibility to suggestion, as the woman searches for new support and direction in trying to imagine new role requirements, life changes that presently are vague and unknown, and what all this will mean to her.

Throughout pregnancy, there is a definable sequence of specific psychological processes that often seem to be interrelated with the biological changes taking place. These psychological events and processes are identifiable by trimester of gestation, and this division is used in the following discussion. Both the general psychological response to pregnancy just discussed and the following more specific psychological processes and events recur with each pregnancy for each woman.

First Trimester

The first trimester is often referred to as the period of adjustment. The adjustment the woman is making is to the fact that she is pregnant. The acceptance of this reality and all it means is the most important psychological task of the first trimester.

Most women are upset and ambivalent about being pregnant. Approximately 80 percent go through a period of disappointment, rejection, anxiety, depression, and unhappiness. It is doubtful that there is a single woman—even among those who have planned for and want the pregnancy or have struggled to become pregnant—who has not said to herself at least once that she wished she were not pregnant. This universality needs to be discussed with the woman, because she will tend to hide her ambivalent or negative feelings since they are in conflict with what she thinks she should be feeling. If she is not helped to understand and accept these ambivalent and negative feelings as normal for this period of pregnancy, she most likely will have overwhelming guilt feelings if the baby should subsequently either die or be deformed or abnormal. She will remember the thoughts she had during the first trimester and unless she accepts them may feel that she is the cause of any tragedy.

The woman's focus is on herself. From this self-concern arises much of her ambivalence about the pregnancy as she deals with any previous bad experience with pregnancy, the effect the pregnancy will have on her life (especially if she has a career), new or additional responsibilities she will have to assume, anxieties regarding her capability to be a mother, financial and housing concerns, and acceptance of the pregnancy by significant others. Ambivalence normally ends spontaneously as she accepts the pregnancy. This acceptance usually occurs by the end of the first trimester and is facilitated by her feeling safe enough to express the feelings that are creating conflict within her. In the meantime, some of the discomforts of the first trimester—nausea, fatigue, appetite changes, emotional irritability—may reflect her conflict and depression and at the same time serve as a reminder of her pregnancy.

Some women, especially those who planned their pregnancy or have struggled to become pregnant, are overjoyed, with an element of disbelief, and seek every shred of bodily evidence of indeed being pregnant. The first trimester is often an anxious time of waiting for the pregnancy to be "well established." This is particularly true for women who have had previous miscarriages and for female health care professionals who worry about miscarriages and teratogens. These women impatiently await the end of the first trimester as a milestone after which they can relax and believe in their pregnancy. Some couples choose to not tell others about their pregnancy until after the first trimester, thus avoiding the pain of having to tell others if a miscarriage occurs. Other couples choose to share their joy and excitement as soon as they know and consider they already have a support system in place if there is a miscarriage.

Weight has particular significance to the pregnant woman during the first trimester. It may become a part of the reality testing the woman is doing, as she looks to her body for tangible evidence of being pregnant. For many women, early weight gain may be seen as proof that the baby is growing, even though the baby is not yet physically evident. The woman sees gaining weight as being within her control and contributing to the growth of her abdomen, which means being pregnant to her. Conversely, women who are pregnant and trying to hide it (e.g., some unwed adolescents) may starve themselves to prevent "showing" while trying to cope with and make decisions to resolve some of their problems.

Validation of the pregnancy is done over and over as the woman scrutinizes any bodily change for evidence of the pregnancy. The most evident is the cessation of menses. Breast changes are repeatedly studied. This makes your sharing of pelvic findings, especially those indicative of pregnancy, very important. The woman may repeatedly examine a picture from an early ultrasound. During the first trimester, her pregnancy is her own secret to share with whomever she chooses. Her thoughts relate largely to what is happening to her, her body, her life. At this point the baby is not yet perceived as a separate being.

Women vary widely in their sexual desire during the first trimester. Although some women experience an increase in desire, generally speaking the first trimester is a time of decreased libido, and this creates the need for open and honest communication with partners. Many women feel a need for much love and loving without sex. Libido is heavily influenced by fatigue, nausea, depression, sore and enlarged breasts, worries, anxieties, and concerns—all of which may be a normal part of the first trimester.

Second Trimester

The second trimester is often referred to as the period of radiant health, a time during which the woman generally feels good and is largely free from the normal discomforts of pregnancy. However, it is also the most regressed and inward phase of pregnancy. The second trimester actually subdivides into two phases: prequickening and postquickening. Quickening heralds the fact of a separate life, thereby adding impetus to the woman's primary psychological task of the second trimester—developing her own mothering identity, distinct from that of her own mother.

Toward the end of the first trimester and during the prequickening portion of the second trimester, the woman undergoes a complete reliving and reevaluation of all aspects of her relationship with her own mother. The woman scrutinizes the total range of these feelings and relives the basis for them. All the interpersonal problems the woman and her mother may have had or may still have are analyzed. The potential that interpersonal problems can exist in the mother-child relationship is examined. With this examination comes understanding and acceptance of the qualities in her own mother that she values and respects. The other qualities of her mother, those that are negative or unwanted or do not engender respect, are rejected. This may

cause guilt and inner conflict unless the woman comes to understand the normality of this process and that rejection of specific qualities of her mother in developing her own mothering identity is not equivalent to rejection of her mother as a person.

Included in this process is the evolution of the woman from being a care receiver (from her mother) to being a caregiver (preparatory to being a mother). She may experience conflict over competing with her mother to be seen as a "good" mother. The actual resolution of all this does not occur until long after the baby is born, but the pregnant woman's preoccupation with her own mother and related processes diminishes as the transfer to her own identity as a caregiver is made. At the same time she is being a receiver, demanding attention and love which, in effect, she is storing for her baby in her role as caregiver.

With quickening comes a number of changes, as the pregnancy is unquestionably verified in the woman's mind. Her social contacts increasingly become other pregnant women or brand new mothers, and her interests and activities focus on pregnancy, childbearing, and preparation for a new role. This social shift creates the need for a certain amount of grief work, which in turn serves as a catalyst for assumption of her new role. The grief involves letting go of former relationships, attachments, and significant aspects and events of her former role that will be affected by the forthcoming baby and new role. This does not mean discarding all these relationships and ties but does involve a change in them. Sometimes a pregnant woman is in a work setting where no one understands being pregnant or her social contacts either are not pregnant or have older children and they have moved on to different concerns. In such circumstances, she may have difficulty finding other pregnant women to talk with and compare physical changes. Taking advantage of opportunities such as joining a pregnancy exercise class may give her the social contact with other pregnant women that she seeks. For a multipara, this includes a certain disengagement from established ties with her other children as she prepares her home and family for the changes a new baby will create. Much of the woman's new or changed role is tried out, developed, and refined in fantasy, imagination, and daydreaming.

Quickening enables the woman to conceptualize her baby as an individual separate from herself. This new awareness starts a change in her focus from herself to the baby. Frequently this change is manifested by dreams that someone else, usually a stranger, is being injured. These dreams generally are interpreted as expressing the mother's concern about harm to her baby. At this point, the sex of the baby is unimportant. The concern is for the baby's well-being and welcome into the family group.

Most women feel more erotic during the second trimester; approximately 80 percent of pregnant women experience a significant improvement in their sexual relationships as compared with both their first trimester and before pregnancy. The second trimester is relatively free of physical discomforts; the size of the woman's abdomen is not yet an insurmountable problem; vaginal lubrication is greater; the related anxieties, worries, and concerns causing the woman's previous ambivalence and depression have subsided; and she has shifted from seeking caretaking from her mother to seeking caretaking from her partner—all these factors contribute to an increase in libido and sexual satisfaction.

Third Trimester

The third trimester is often referred to as the period of watchful waiting. Now that the woman is aware of the baby's presence as a separate being, she becomes impatient for the baby's arrival. There is an uneasy sense that the baby could arrive at any time, a fact that places the woman on edge as she watches and waits for the signs and symptoms of labor.

The third trimester is a time of active, visible preparation for childbirth and parenthood as the woman's attention focuses on the forthcoming baby. Both fetal movement and the size of the enlarging uterus are constant reminders of the baby. People around her are now making plans for the baby and may give a baby shower. She becomes protective of the baby, avoiding crowds or anyone or anything she perceives as dangerous. She fantasizes that danger lurks in the outside world. The choosing of names for the baby is a preparatory activity for the baby's arrival. She may attend classes in preparation for childbirth and parenthood. Layettes are made or bought. Rooms are rearranged. Much thought is given to care of the baby. There is much speculation as to the baby's looks and sex.

A number of fears surface during the third trimester. The woman may fear for her own and the baby's lives; that she will have an abnormal baby; labor and delivery (pain, loss of control, the unknown); that she will not know when she is in labor; that the baby will not be able to emerge since

her abdomen is already unbelievably large; or that her own vital organs will be injured by the baby's kicking. Her dreams reflect her interests and her fears. She dreams mostly about babies, children, delivery, losing a baby, or being trapped in a small place and unable to squeeze out. She keeps busy so that she will not think of what frightens her and of all the unknowns.

She also undergoes another grief process as she anticipates the loss of attention and special prerogatives of being pregnant, the inevitable separation of her baby from her body, and the feeling of loss as her full uterus becomes a collapsed and empty vessel. Slight depression is not uncommon, and there may be further increased dependency and introversion, with a feeling of vulnerability.

Once again the woman experiences physical discomfort, which increases as the end of pregnancy nears. She may feel awkward, ugly, and sloppy, and need large and frequent doses of reassurance from her partner. By the middle of the third trimester, the heightened sexuality of the second trimester diminishes as her abdomen becomes an obstacle. Alternative positions for sexual intercourse and alternative methods of achieving sexual satisfaction may help—or may create guilt if she is not comfortable with them. The honest sharing of feelings between the couple and in their consultation with you is essential.

Fetal Growth and Development

The processes that make possible the beginning and early development of a human being involve entire fields of study. Included are the subjects of genetics, gamete maturation (spermatogenesis and oogenesis), ovum and sperm transport, sperm capacitation and acrosome reaction, fertilization, cellular division (specifically meiotic and mitotic), zygote changes and transport during the first week of life, implantation, embryology (which covers roughly the period of life from the second through the seventh week of life postfertilization), fetology (which covers from the eighth week of life after fertilization to birth), and congenital malformations and abnormalities. It is beyond the scope of this book to discuss these topics in any detail. Students interested in these subjects are encouraged to explore textbooks and courses relevant to their interests. This book zeros in on the minimal knowledge needed by the practicing midwife in the area of fetal growth and development. Basically, this includes an appreciation of the intricate and vulnerable stages of cellular differentiation, reorganization, division, and proliferation and structural beginnings occurring during the embryonic period; an ability to describe for the mother-to-be what her baby looks like during each month of the fetal period; and an understanding of the causes of congenital malformations.

First Trimester

The entire zygotic and embryonic period and the first 2 weeks of the fetal period (a total of 10 weeks of life after fertilization) are within the first 12 weeks of pregnancy (counting from the last normal menstrual period), which constitute the first trimester.

Figure 21-3 is a summary by days and weeks of the events in fetal growth and development that occur during the first trimester. The summary ends with the tenth week of age, which is equivalent with the twelfth week of gestation as calculated from the LMP. It is important to make this correlation and to check when reading other sources of literature whether they are dating fetal development from the LMP or from the assumed time of fertilization 2 weeks later. Otherwise you may be 2 weeks off in your understanding of what is happening.

Growth and development begin with the moment of fertilization and the fusing of the female and male pronuclei from the ovum and sperm, respectively. This fusion produces a single cell called a zygote. At this moment a new individual is created, with his or her own unique makeup as determined by this totally new combination of chromosomes and genes. This unique combination results because the pronucleus of each gamete, or sex cell (i.e., ovum and sperm), contains only half (23, or the haploid number) of the total number (46, or the diploid number) of chromosomes in a human being. This halving of the chromosome number is a result of gametogenesis, the process by which mature ova and sperm are developed. At the moment of fertilization, the fusion of the pronuclei of the two gametes restores the diploid number of chromosomes, which is subsequently reflected through mitotic cellular division in every cell in an individual's body except those that later undergo gametogenesis. Also determined at the moment of fertilization, as a result of this fusion and restoration of the diploid number, is the sex of this new individual. Sex is determined by the male gamete, which carries either an X or a Y chromosome. The female gamete

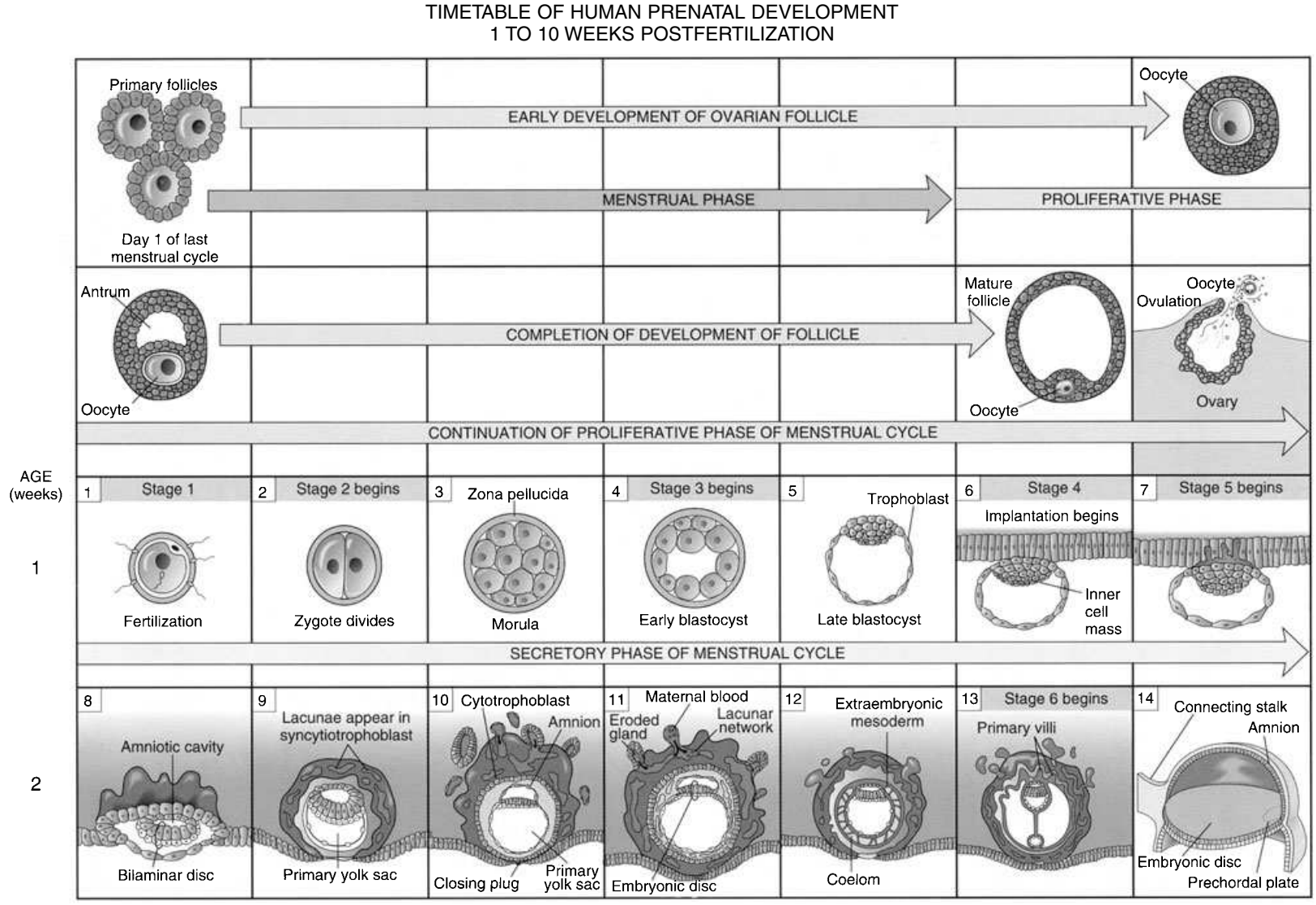
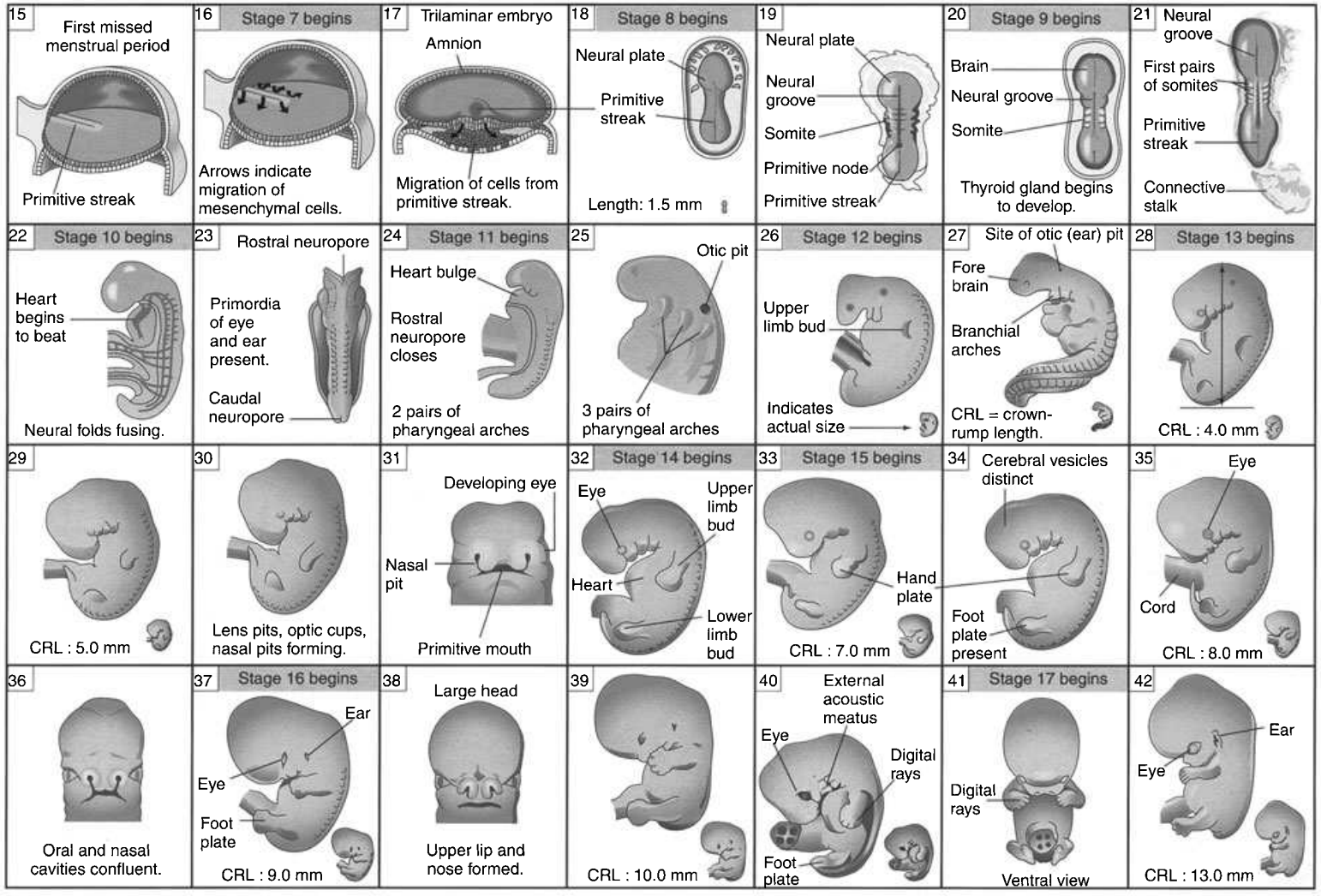
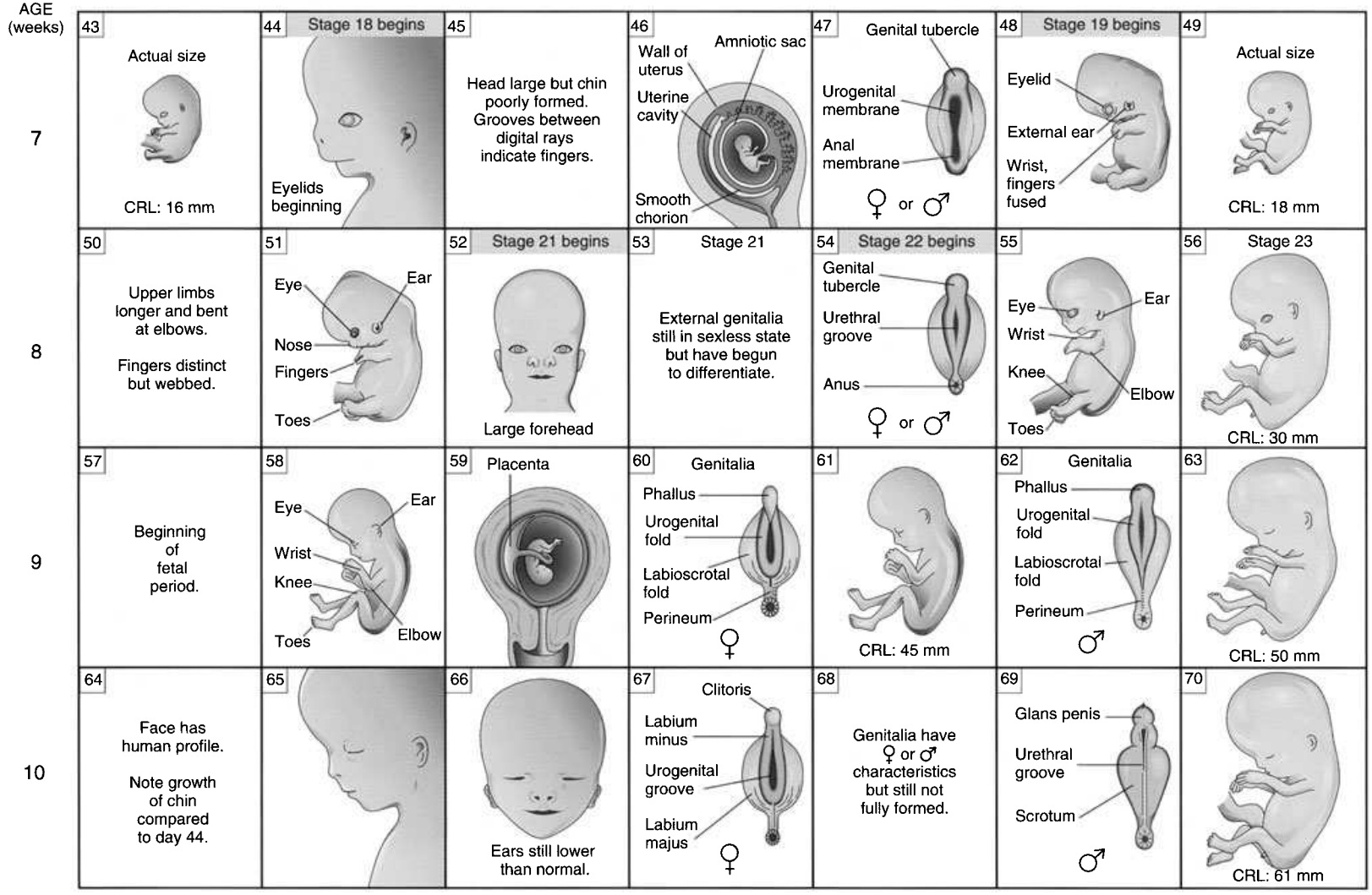


FIGURE 21-3 Early stages of development. Development of an ovarian follicle containing an oocyte, ovulation, and the phases of the menstrual cycle are illustrated. Human development begins at fertilization, about 14 days after the onset of the last menstruation. Cleavage of the zygote in the uterine tube, implantation of the blastocyst, and early development of the embryo are also shown. Beginning students should make no attempt to memorize these tables or the stages (e.g., that Stage 3 begins on day 4 and Stage 5 on day 7).

(Figure 21-3 continues on pps. 558 and 559.)


15
First missed menstrual period
Primitive streak
16
Stage 7 begins
Arrows indicate migration of mesenchymal cells.
17
Trilaminar embryo
Amnion
Migration of cells from primitive streak.
18
Stage 8 begins
Neural plate
Primitive streak
Length: 1.5 mm
19
Neural plate
Neural groove
Somite
Primitive node
Primitive streak
20
Stage 9 begins
Brain
Neural groove
Somite
Thyroid gland begins to develop.
21
Neural groove
First pairs of somites
Primitive streak
Connective stalk
22
Stage 10 begins
Heart begins to beat
Neural folds fusing.
23
Rostral neuropore
Primordia of eye and ear present.
Caudal neuropore
24
Stage 11 begins
Heart bulge
Rostral neuropore closes
2 pairs of pharyngeal arches
25
Otic pit
3 pairs of pharyngeal arches
26
Stage 12 begins
Upper limb bud
Indicates actual size
27
Site of otic (ear) pit
Fore brain
Branchial arches
CRL = crown-rump length.
28
Stage 13 begins
CRL : 4.0 mm
29
CRL : 5.0 mm
30
Lens pits, optic cups, nasal pits forming.
31
Developing eye
Nasal pit
Primitive mouth
32
Stage 14 begins
Eye
Upper limb bud
Heart
Lower limb bud
33
Stage 15 begins
Hand plate
CRL : 7.0 mm
34
Cerebral vesicles distinct
Foot plate present
35
Eye
Cord
CRL : 8.0 mm
36
Oral and nasal cavities confluent.
37
Stage 16 begins
Ear
Eye
Foot plate
CRL : 9.0 mm
38
Large head
Upper lip and nose formed.
39
CRL : 10.0 mm
40
External acoustic meatus
Eye
Digital rays
Foot plate
41
Stage 17 begins
Digital rays
Ventral view
42
Ear
Eye
CRL : 13.0 mm



Source: Reproduced by permission from Moore, K. L., and Persaud, T. V. N. *The Developing Human: Clinically Oriented Embryology*, 6th ed. Philadelphia, PA: W. B. Saunders, 1998.

Note that the dating by weeks is based on fertilization so that the figure is 12 weeks based on the last menstrual period (LMP). The figure assumes fertilization occurs on day 14 of the menstrual cycle. Calendar months would be as follows on this figure: days 16/17 (30/31 by LMP) ends the first calendar month; days 46/47 (60/61 by LMP) ends the second calendar month; and day 77 (91/92 by LMP) would be just beginning the second trimester and ending the third calendar month. The figure actually ends at 12 weeks by LMP (10 weeks postfertilization) or three lunar (28 day) months.

carries only an X chromosome. With fusion, an XX combination normally develops into a female and an XY combination normally develops into a male.

Immediately following fertilization, the resulting zygote begins to undergo mitotic cellular division, called cleavage. Through sequential stages, the dividing cellular mass is called a morula; with cellular reorganization and the entry of fluid, the morula becomes a blastocyst. It is the blastocyst that implants in the uterine lining. By the time the process of implantation is completed on the tenth or eleventh day after fertilization, the embryonic period has begun.

At the time of implantation, the embryo is known as a bilaminar embryo because the embryonic disc arising from the inner cell mass consists of two layers of cells: (1) the epiblast, a thick layer of high columnar cells that form the floor of the amniotic cavity and eventually become the embryonic ectoderm, mesoderm, and endoderm, and (2) the hypoblast, a thin layer of small cuboidal cells that comprise the primary endoderm of the yolk sac (see Figure 21-3, postfertilization week 2, day 8) [7].

The beginning of the third postfertilization week marks the start of morphogenesis—the development of body form. This is accomplished through gastrulation, a process by which the bilaminar embryonic disc is converted into a trilaminar embryonic disc. The primitive streak forms on the surface of the epiblast and is the growth center for the embryo for approximately 2 weeks, after which it becomes insignificant and eventually disintegrates. The trilaminar embryonic disc gives rise to the three germ layers: (1) endoderm, (2) mesoderm, and (3) ectoderm [7].

Figure 21-4 specifies what each germ layer is responsible for in the makeup of the body. Toward the end of the third week, somite development begins, which will ultimately result in 42 to 44 pairs of somites. Arising from the mesoderm, the somites are responsible for most of the skeleton of the head and trunk, its related musculature, and much of the adjacent dermis of the skin [7]. The somites are useful in dating early embryos that are recovered up to approximately 30 days after fertilization. During the third week, the neural tube (rudiment of the brain and spinal cord), notochord (rudiment of the vertebrae), coelomic spaces (rudiments of the body cavities), primitive blood cells, and a primordial cardiovascular system develop.

The heart starts to beat at the beginning of the fourth postfertilization week (sixth week by LMP). It is during the fourth week that rapid growth causes both longitudinal and transverse folding of the embryonic disc. Longitudinal folding, involving a head fold and a tail fold, converts the embryo from a straight form to a curved form. Transverse folding, involving right and left transverse folds folding toward the midline, converts the embryo from a flat form to a cylindrical form. By the end of the fourth week, the embryo has assumed what is often called the salamander look and has the rudiments of ears (otic pit), arms (arm buds), legs (leg buds), and facial and neck structures (the first four branchial arches).

During the fifth postfertilization week, rapid development of the brain results in extensive growth of the head and makes it much larger in relation to the rest of the body. Development is cephalic to caudal, with the legs developing almost a week later than the arms. The eyes begin development with lens placodes (visible in the fourth week), optic cups, and retinal pigment.

The nose, mouth, and palate begin to take form during the sixth week postfertilization (eighth week by LMP) and the eye becomes visible. Arms and legs undergo extensive development and digital rays (primordial fingers) begin to develop in the hand plates. The head is much larger than the trunk.

The seventh postfertilization week marks further development of the limbs with digital rays (primordial toes) developing in the foot plates. The eyelids are formed and visible, and the auricles of the external ears are formed and visible although not yet fully developed or elevated to their proper position. The intestines are herniated into the proximal portion of the umbilical cord where there is room for them.

By the end of the eighth postfertilization week (tenth week by LMP), the embryo has human features even though the head is still disproportionately large and almost half of the total size. The limbs, especially the upper limbs, have well-differentiated regions (e.g., wrist, elbow, knee) and increased length. Ossification of bones has begun, and the neck region is established. Urogenital development has begun but differentiation is too early to ascertain the sex.

The end of the eighth postfertilization week also marks the end of the embryonic period. All essential internal and external structures are present and are undergoing further elaboration and growth, including the replacement of cartilage with bone cells. The embryonic period obviously is a critical time during which any teratogen (e.g., drugs, x-rays, viruses) may either be lethal or cause major congenital malformations (see Figure 21-5).

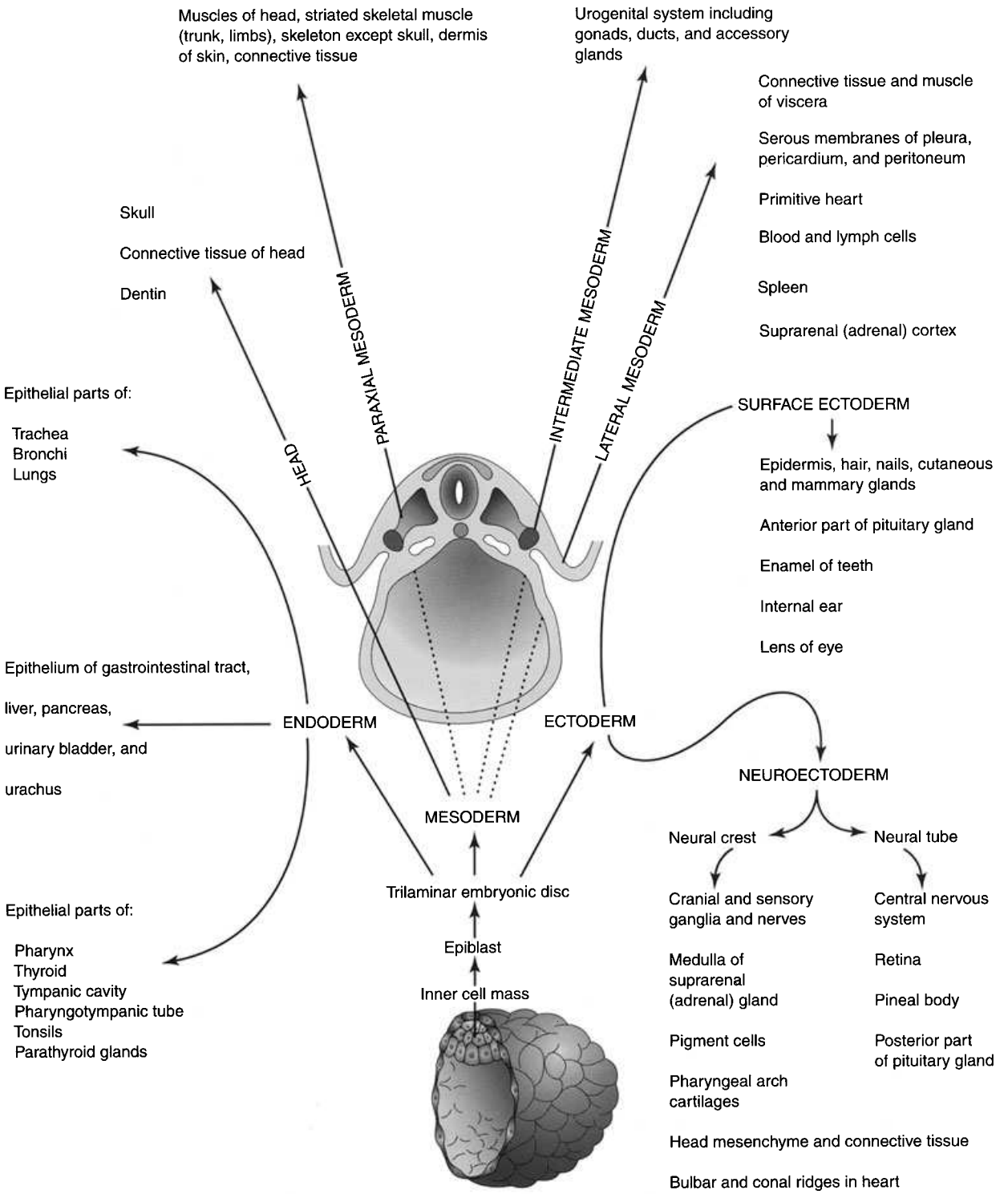


FIGURE 21-4 Schematic drawing illustrating the derivatives of the three germ layers: ectoderm, endoderm, and mesoderm. Cells from these layers make contributions to the formation of different tissues and organs; for example, the endoderm forms the epithelial lining of the gastrointestinal tract and the mesoderm gives rise to connective tissues and muscles.

Source: Reproduced by permission from Moore, K. L., and Persaud, T. V. N. *The Developing Human: Clinically Oriented Embryology*, 6th ed. Philadelphia, PA: W. B. Saunders, 1998.

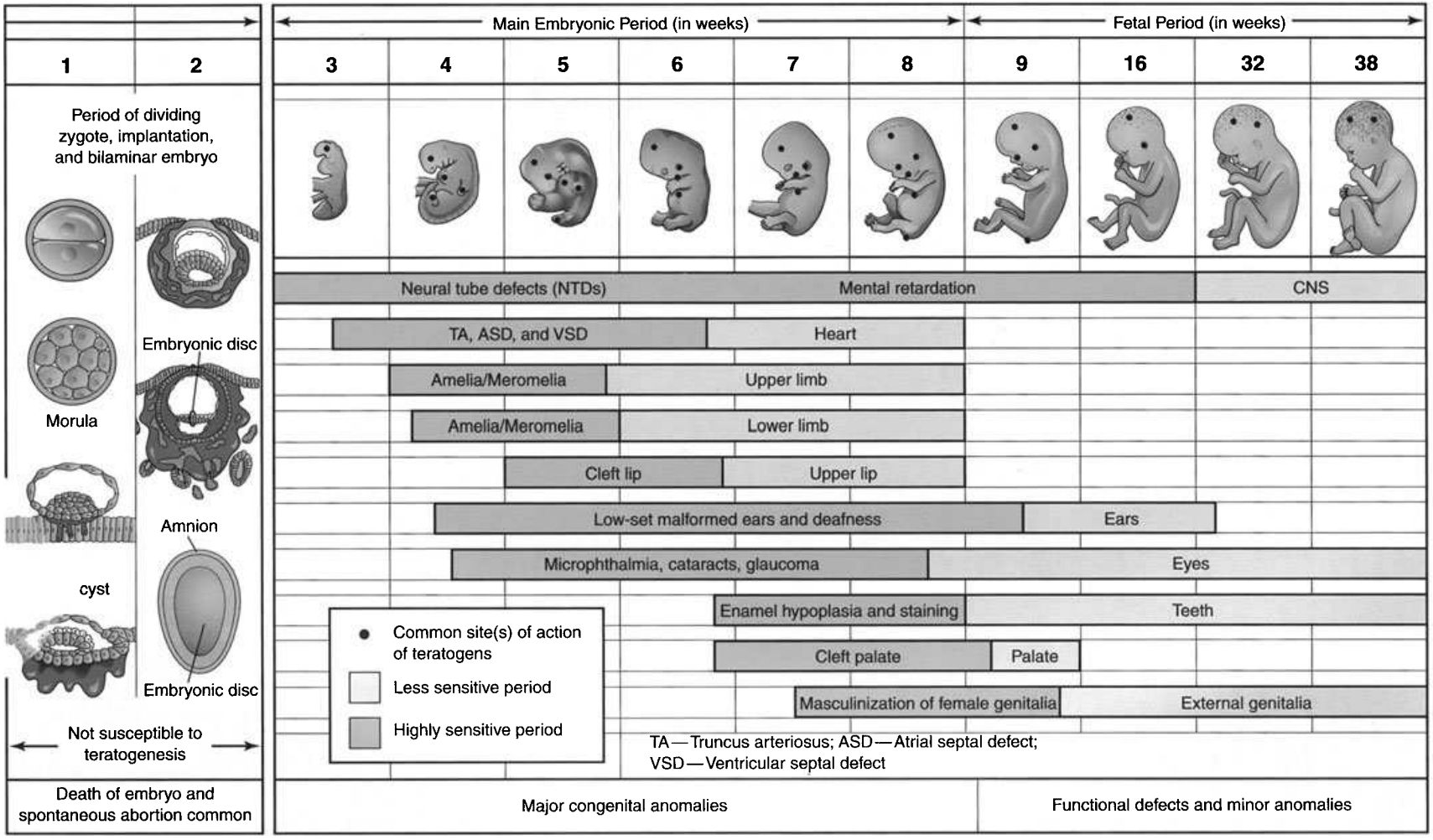


FIGURE 21-5 Schematic illustration of critical periods in human prenatal development. During the first 2 weeks of development, the embryo is usually not susceptible to teratogens; a teratogen either damages all or most of the cells, resulting in death of the embryo, or damages only a few cells, allowing the conceptus to recover and the embryo to develop without birth defects. Darker areas denote highly sensitive periods when major defects may be produced (e.g., amelia, absence of limbs). Lighter areas indicate stages that are less sensitive to teratogens when minor defects may be induced (e.g., hypoplastic thumbs).

Source: Reproduced by permission from Moore, K. L., and Persaud, T. V. N. *The Developing Human: Clinically Oriented Embryology*, 6th ed. Philadelphia, PA: W. B. Saunders, 1998.

The first trimester of pregnancy also includes the first 2 weeks of the fetal period. By the end of the tenth postfertilization week, or the twelfth gestational week calculated from the LMP, the intestines are fully into the abdomen and out of the umbilical cord, the external genitalia have male or female characteristics (though they are not yet fully formed), the anus has formed, and the facial characteristics of the fetus now look undeniably human. The fetus, now weighing approximately 0.5 to 1 ounce, can swallow, make respiratory movements, urinate, move the specific parts of the limbs, squint and frown. The mouth opens and shuts. The head is about a third of the crown-rump length, which is approximately 56 to 61 millimeters (2.2–2.4 inches).

Second and Third Trimesters

The second trimester, 15 weeks long, includes weeks 13 through 27 by gestational age based on the LMP. This is equivalent to weeks 11 through 25 by postfertilization age. The third trimester, of 13 weeks, includes weeks 28 through 40 by gestational age based on the LMP. This is equivalent to weeks 26 through 38 by postfertilization age. *Ages referred to in the following discussion are gestational ages based on the LMP*. The crown-rump lengths are given solely for the purpose of providing you with a general idea of the size of the fetus, information that may be helpful when talking with pregnant women. These measurements should not be confused with the more specific crown-rump ultrasound measurements done for dating up to the twelfth week by LMP.

Weeks 13 to 16 (Fourth Lunar Month) The eyelids are fused and head growth slows, while the ears move to a higher elevation on the sides of the head and the chin becomes evident with development of the mandible. Body growth accelerates, with the legs again growing more slowly than the arms, as the cephalic to caudal direction of growth continues. The arms but not the legs have reached their full length. Fingernails have started to develop but the toenails have not. Reflex response and muscular activity begin, although the mother cannot feel the movement because her uterus is too thick and the activity is too slight. Sex is clearly distinguishable during the fourteenth week (twelfth week after fertilization). By the sixteenth week there has been rapid progress in bone development. Centers of ossification of the skeleton are sufficiently established that they could be seen with roentgenography. The average crown-rump length is 4.5 inches and the fetus weighs between 3.5 and 4 ounces by the end of the sixteenth week.

Weeks 17 to 20 (Fifth Lunar Month) Rapid body growth continues. The legs reach their total length and toenails develop. The eyelids remain fused. The fetus moves freely in the uterus, without the confinement that later growth imposes. Stronger fetal movement and a thinner uterine wall result in the mother's experiencing quickening around the eighteenth week. When the fetus hiccups, the mother may feel this as a rhythmic series of slight jerks or jolts. By the end of the month, vernix caseosa covers the entire body. Vernix caseosa, a mixture of sebum (secretion from the sebaceous glands) and surface epithelial cells, is a thick, cheesy substance that protects the delicate skin of the fetus. The fetal heart may be heard with a fetoscope by the end of the month. By the end of the twentieth week, the average crown-rump length of the fetus is about 6.5 inches and the average weight is almost 1 pound or 500 grams.

Weeks 21 to 24 (Sixth Lunar Month) Hair growth is prominent during the sixth lunar month. The fetus is completely covered with lanugo, a fine downy hair. Eyebrows, eyelashes, and head hair are present. The head remains large compared to the rest of the body. The skin is wrinkled, translucent, and red, giving an aged appearance to the fetus, which is also thin and lean because of a lack of subcutaneous fat. Both capillary blood and the red myohemoglobin of the muscles show through the skin. Buds for the permanent teeth are present. The fetus still has room in the uterus to somersault and can make the motions of crying and sucking. The hands make fists and also grip. Brown fat, which is a source of energy, heat production, and heat regulation in the newborn, forms. By the end of the month, the average crown-rump length of the fetus is just over 8 inches and the weight is approximately 1.25 pounds.

Weeks 25 to 28 (Seventh Lunar Month) Although a little fat storage begins and the contours start to round out, the fetus still is lean and continues to look old and wrinkled during this month. A substantial weight gain makes the body better proportioned by the end of the month. Surfactant begins to

be produced in the lungs by 26 weeks. The hair on the head is longer, the sucking motions are stronger, the eyes begin to open and shut, and fingernails are present. The average crown-rump length of the fetus is approximately 9 inches and the weight is about 2.25 pounds (1000 grams) by the end of the twenty-eighth week.

Weeks 29 to 32 (Eighth Lunar Month) Subcutaneous fat deposits begin to smooth out some of the wrinkles, but the fetus has not totally lost its wrinkled, old appearance. The body is filling out and is not quite so lean. Thick vernix caseosa covers the entire fetus. The hair on the head continues to grow, and the lanugo is plentiful except on the face, from which it has now disappeared. Fingernails reach the ends of the fingers; toenails are present but do not reach the ends of the toes. The fetus has control of rhythmic breathing motions and body temperature. The eyes are open and the pupillary light reflex is present by the end of the month. The average crown-rump length is about 11 inches and weight is approximately 3.75 pounds.

Weeks 33 to 36 (Ninth Lunar Month) By the end of this month, the skin is smooth, without wrinkles, as the subcutaneous fat becomes thicker from additional deposits. The body is rounder, with the arms and legs taking on a somewhat chubby appearance. The hair is longer, the toenails have reached the ends of the toes, and the left testicle has usually descended into the scrotum. The average crown-rump length is a little over 12.5 inches and the weight is approximately 5.5 pounds (2500 grams) during the thirty-sixth week.

Weeks 37 to 40 (Tenth Lunar Month) The tenth lunar month provides the necessary finishing touches. Full growth and development are attained. The fetus is now well rounded with a prominent chest and protuberant mammary glands in both sexes. Both testes are in the scrotum by the end of the month. The lanugo has disappeared from most of the body. The nails project beyond the ends of both the fingers and the toes. The skin varies in color from white to pink to bluish-pink, regardless of race, because the melanin that colors the skin is produced only after exposure to light. The crown-rump length now averages 14 inches. The weight depends on a number of variables but averages 7.5 pounds.

Placental Development, Circulation, and Functions

Development and Circulation

The placenta is partly fetal and partly maternal in origin. The fetal contribution derives from the chorion; the maternal contribution derives from the decidua (endometrium) at the site of implantation.

The outer layer of cells forming the wall of the blastocyst is called the trophoblast. As the trophoblast begins to invade the epithelium of the endometrium, it differentiates into two layers: (1) cytotrophoblast, which is the inner layer, and (2) syncytiotrophoblast, which is the outer layer. This differentiation occurs as the trophoblast comes into contact with the endometrium.

The syncytiotrophoblast is a multinucleated protoplasmic mass without intercellular boundaries. From this mass emerge fingerlike projections, which penetrate through the endometrial epithelium into the endometrial stroma (see Figure 21-6). The endometrial stroma contains both glands and capillaries. Lacunae, or hollow spaces, form around the eighth day in the syncytiotrophoblast as it invades the stroma. As a result, the endometrial glands are eroded, and the capillaries rupture to fill

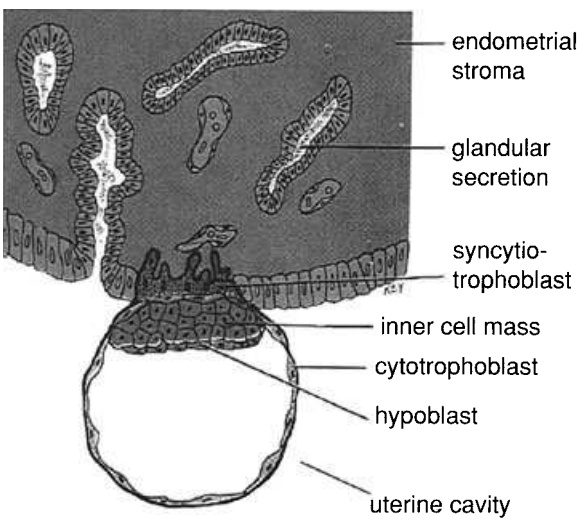


FIGURE 21-6 Early stage of implantation. The syncytiotrophoblast has penetrated the endometrial epithelium and has started to invade the endometrial stroma.

Source: Reproduced by permission from Moore, K. L., and Persaud, T. V. N. *The Developing Human: Clinically Oriented Embryology*, 5th ed. Philadelphia, PA: W. B. Saunders, 1993.

the lacunae with embryotroph. Embryotroph is a mixture of glandular secretions and maternal blood, which is nutritive to the embryo and reaches it by diffusion from the syncytiotrophoblast. It is also through the lacunae that hCG produced by the syncytiotrophoblast enters the maternal bloodstream where it can be detected by pregnancy tests.

After the embryo is completely imbedded in the endometrium, around the twelfth day after fertilization, the lacunae in the syncytiotrophoblast join together to form intercommunicating lacunar networks. These give the syncytiotrophoblast a spongelike structure. At the same time, the endometrium undergoes what is called the decidual reaction, in which the stromal cells enlarge with an accumulation of glycogen and lipid and become known as the decidual cells, and the capillaries become dilated and congested to form sinusoids. Erosion of these sinusoids by the trophoblast fills the lacunar networks with maternal blood and establishes a primitive circulatory system.

Decidua is the name for the uterine endometrium during pregnancy. It differs from the nonpregnant endometrium because of the decidual reaction, whereby, with the exception of the zona basalis, the decidua is shed after birth. The name comes from the Latin word *deciduus*, meaning "a falling off." As Moore points out, the shedding of the decidua is akin to the falling of leaves from deciduous trees in the autumn [7]. There are three areas of decidua:

1. *Decidua basalis:* the decidua beneath the site of implantation of the embryo, which becomes the maternal contribution to the placenta.
2. *Decidua capsularis:* the decidua surrounding the remainder of the embryo, which serves as a covering between the embryo and the uterine cavity. With fetal growth, the decidua capsularis bulges into the uterine cavity and fuses with the decidua parietalis. The uterine cavity is thus obliterated. This occurs by the end of the fourth lunar month of gestation.
3. *Decidua parietalis* (also called the *decidua vera*): the decidua lining the rest of the uterus.

The decidua basalis and decidua parietalis consist of three layers:

1. *Zona compacta:* the surface layer, which is compact in structure.
2. *Zona spongiosa:* the middle layer, which is spongy in structure because of the decidual cells and capillaries.
3. *Zona basalis:* the bottom or base layer, which remains to regenerate a new endometrium when the rest of the decidua is shed postpartally.

Around the fourteenth day after fertilization, chorionic villi begin to form when cytotrophoblastic cells reorganize into columns of cells extending into the core of the syncytiotrophoblast. These are known as the primary villi and form around the outer surface of the embryonic sac. Shortly thereafter, these villi branch and develop central cores of mesenchyme; at this point they are called secondary villi. The mesenchymal cells develop into blood vessels within the villi that connect with the blood vessels of the chorionic sac, also arising from the mesenchyme, and thus with the embryo via the forerunner of the umbilical cord, the connecting stalk. The villi are now called true villi or tertiary villi. Cytotrophoblastic cells at the end of the villi proliferate and extend still further into and through the syncytiotrophoblast into the endometrial stroma to firmly attach and anchor the embryonic or chorionic sac to the decidua.

Until approximately the eighth week after fertilization, the villi cover the surface of the entire chorionic sac. After that, as the sac grows, the blood supply in the area of the decidua capsularis diminishes, causing the villi in the area of the decidua capsularis to degenerate. The result is a denuded chorionic sac called the chorionic laeve or smooth chorion. At the same time, the villi in the area of the decidua basalis proliferate, branch, and enlarge in the rich blood supply there. This results in a multiple treelike or tufted structure called the chorionic frondosum or villous chorion. The chorionic frondosum is the fetal contribution to the placenta.

As the chorionic villi invade and attach to the decidua basalis, remnants of the decidua covered with trophoblast form the placental septa (see Figure 21-7). The placental septa separate, incompletely, the irregular-shaped placental cotyledons. Each placental cotyledon consists of the main stem of a chorionic villus and all its numerous branches and infinite further subbranches. There are between 15 and 30 cotyledons. The septa restrict the exchange of blood between the cotyledons in the intervillous space. This means that infarcting or pathology in one cotyledon remains a localized problem (see again Figure 21-7).

The intervillous space is an elaboration of the earlier lacunar networks. The spaces of the lacunar

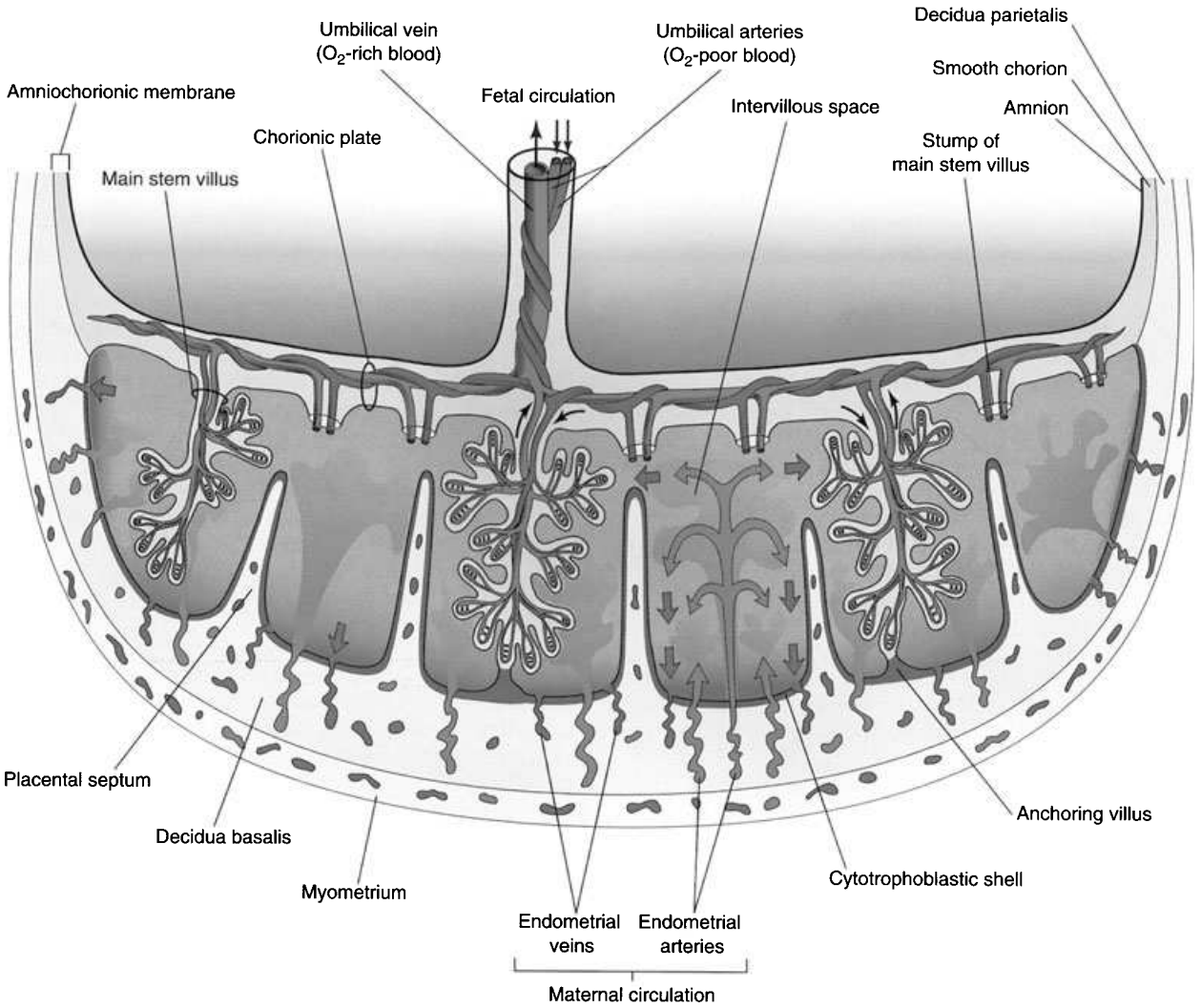


FIGURE 21-7 Schematic drawing of a transverse section through a full-term placenta, showing: (1) the relation of the villous chorion (fetal part of placenta) to the decidua basalis (maternal part of placenta), (2) the fetal placental circulation, and (3) the maternal placental circulation. Maternal blood flows into the intervillous spaces in funnel-shaped spurts from the spiral arteries, and exchanges occur with the fetal blood as the maternal blood flows around the branch villi. It is through the branch villi that the main exchange of material between the mother and embryo/fetus occurs. The inflowing arterial blood pushes venous blood out of the intervillous space into the endometrial veins, which are scattered over the entire surface of the decidua basalis. Note that the umbilical arteries carry poorly oxygenated fetal blood to the placenta and that the umbilical vein carries oxygenated blood to the fetus. Note that the cotyledons are separated from each other by placental septa, projections of the decidua basalis. Each cotyledon consists of two or more main stem villi and their many branches. In this drawing, only one stem villus is shown in each cotyledon, but the stumps of those that have been removed are indicated.

Source: Reproduced by permission from Moore, K. L., and Persaud, T. V. N. *The Developing Human: Clinically Oriented Embryology*, 6th ed. Philadelphia, PA: W. B. Saunders, 1998.

networks enlarge with further invasion of the decidua by the trophoblast to form one large blood sinus called the intervillous space. Located between the chorionic plate on one side and the decidua basalis on the other, the intervillous space is incompletely partitioned by the placental septa that extend from the decidua but do not reach the chorionic plate. The chorionic plate consists of trophoblast externally (next to the intervillous space) and mesoderm internally. The internal mesoderm of the chorion fuses with the amnion at about the end of the first trimester. Together the amnion and chorion constitute the fetal membranes, which enclose and contain the fetus and the amniotic fluid.

Branches of the umbilical arteries and the umbilical vein run between the internal and external layers of the chorionic plate before they enter the chorionic villi that extend into the intervillous space.

Placental circulation, thus, consists of two separate circulations—fetal and maternal—with a large area for exchange of materials between the two circulations as determined by the placental membrane. The placental membrane is composed of the layers of extrafetal tissue between the circulating fetal and maternal blood. These layers are trophoblast (primarily syncytiotrophoblast), connective tissue in the chorionic villi, and the endothelium of the fetal capillaries. The placental membrane has been misnomered as the placental barrier, although most substances, including drugs, can be detected as having passed through the placental membrane. Regardless of how thin this membrane becomes as the placenta matures, neither the functions of the placental membrane nor the effectiveness of these functions changes.

Fetal circulation to the placenta comes from the two umbilical arteries, through which deoxygenated blood leaves the fetus. These arteries subdivide and branch in the chorionic plate and enter the chorionic villi, where further subdivision occurs within the branching villi to form an extensive capillary-venous network at the terminal divisions. At this point placental transfer occurs; that is, the transfer of materials between the fetal and maternal circulations takes place across the placental membrane. The return circulation to the fetus is by way of the branching of the umbilical vein, which corresponds with the branching of the umbilical arteries, to the chorionic plate and then, with further converging, into the umbilical vein through which the oxygenated blood is carried to the fetus (see Figure 21-7).

Maternal circulation in the placenta is actually outside of the maternal circulatory system. Oxygenated blood enters the intervillous space by way of spiral arteries of the endometrium; deoxygenated blood exits from the intervillous space by way of venous openings into the endometrial veins. The arterial entrances and venous exits supplying each cotyledon are randomly scattered throughout the placenta. Although different authors have cited various numbers, there may be as many as 120 spiral artery entrances into the intervillous space of the mature placenta. The blood enters the intervillous space from the spiral artery under tremendous pressure, as dictated by the maternal blood pressure. This results in a rhythmic spurting of a fountain of blood into and across the intervillous space to the chorionic plate. The blood is then dispersed laterally by this boundary and flows over the surfaces of the multitudinous branches of the chorionic villi. This flow is slow enough to allow for the exchange of materials between the fetal and maternal circulations across the placental membrane. Eventually, the now deoxygenated maternal blood exits through the venous portals (see Figure 21-7).

Functions of the Placenta

The placenta truly is an organ of life, with a number of functions designed to provide for and protect the fetus. The placenta provides the fetus with oxygen-carbon dioxide exchange, passage of essential nutrients, excretion of metabolic waste products, and needed metabolic processes. It also protects the fetus by transferring maternal antibodies to the fetus and by its synthesis of hormones essential to the maintenance and well-being of the pregnancy. The placenta thus has three functions. It acts as (1) an organ of metabolism, (2) an organ of transfer, and (3) an endocrine organ in the synthesis, production, and secretion of both protein hormones and steroid hormones.

During early pregnancy, the placenta synthesizes glycogen. This function declines as the fetal liver develops. The placenta also synthesizes cholesterol and fatty acids and has other metabolic processes that most likely provide the needed energy and allow for the other functions of transfer and endocrine biosynthesis.

There are a number of mechanisms by which the placenta transfers materials between the fetal and maternal circulations in the intervillous space across the placental membrane. These include the following:

1. *Simple diffusion:* transfer of substances across a membrane from an area of higher concentration to an area of lower concentration. Low molecular weight substances diffuse readily across the placental membrane. This probably is the mechanism involved in the transfer of oxygen, carbon dioxide, many electrolytes, water, drugs, and analgesic and anesthetic agents.
2. *Facilitated diffusion:* transfer of materials from an area of higher concentration to an area of lower concentration, facilitated across the placental membrane to allow for more rapid or more specific transfer. The placenta facilitates diffusion of substances that are essential for

rapid fetal growth but in low concentration in the maternal blood (e.g., glucose).

3. *Active transport:* transfer against usual physiological principles. This is a metabolic process requiring energy. Active transport includes the transfer from the mother to the fetus of substances that are in low concentration in the maternal blood and in high concentration in the fetal blood. Examples are the transport of iron and ascorbic acid from the mother to the fetus.
4. *Pinocytosis:* movement of a substance across the cells of the fetal membrane to the fetal bloodstream by being engulfed by the invaginations of the chorionic villi. This may be the mechanism involved in the transfer of large protein molecules with a high molecular weight such as immune gamma globulin G.
5. *Breaks between cells:* A break in the chorionic villi allows for the direct transfer of cells. The prime example of breaks is the sensitization of an Rh-negative woman from receipt of erythrocytes from her Rh-positive fetus. These breaks, or leaks, are occasional and do not negate the general truth of the statement that the circulations of the fetus and the mother are separate without gross intermingling of the blood.
6. *Placental infection:* When the placenta is infected, the lesions in the placenta caused by the infectious organisms serve as a means of access into the fetal bloodstream. Protozoal and bacterial infections are transferred this way. Viral infections may pass through the placental membrane and infect the fetus without infecting the placenta.

Substances that have been identified as being transferred across the placental membrane include the following:

1. Oxygen, from mother to fetus
2. Carbon dioxide, from fetus to mother
3. Water
4. Vitamins
5. Glucose
6. Electrolytes
7. Amino acids
8. Whole proteins
9. Lipids
10. Minerals
11. Waste products—e.g., urea, uric acid, bilirubin
12. Hormones
13. Maternal antibodies to selected diseases
14. Most drugs and pharmacologic agents
15. Selected viral, protozoal, and bacterial infections

The hormones that the placenta synthesizes, produces, and secretes include the following:

1. *Human chorionic gonadotropin (hCG):* a protein hormone produced early in the pregnancy by both the cytotrophoblast and the syncytiotrophoblast, primarily in order to maintain the corpus luteum and thus the endometrium and the pregnancy.
2. *Human placental lactogen (hPL):* a protein hormone most likely produced early in the pregnancy by both the cytotrophoblast and the syncytiotrophoblast. It is involved in lactogenic and metabolic processes. It has also been called chorionic growth hormone and chorionic somatomammotropin.
3. *Estrogens:* steroid hormones elaborated by the placenta to the extent of causing a hyperestrogenic state. The precursor for the production of these estrogens is the adrenal cortex of both the mother and the fetus, with greater emphasis on the latter.
4. *Progesterone:* a steroid hormone elaborated by the placenta, utilizing blood cholesterol as a precursor.

The effect of these hormones on the woman and their role in the diagnosis of pregnancy were discussed earlier in this chapter.

The placenta may also synthesize a thyroid-stimulating hormone (chorionic thyrotropin) and adrenocorticosteroids (human chorionic ACTH), although there is as yet no direct evidence of the latter.

References

1. Wilcox, A. J., Baird, D. D., Dunson, D., McChesney, R., and Weinberg, C. R. Natural limits of pregnancy testing in relation to the expected menstrual period. *JAMA* 286(14):1759–1761 (October 10) 2001.
2. Wilcox, A. J., Baird, D. D., and Weinberg, C. R. Time of implantation of the conceptus and loss of pregnancy. *N. Eng. J. Med.* 340(23):1796–1799 (June 10) 1999.
3. Wilcox, A. J., Weinberg, C. R., O'Connor, J. F., et al. Incidence of early loss of pregnancy. *N. Eng. J. Med.* 319(4):189–194 (July 28) 1988.
4. Blackburn, S. T., and Loper, D. L. *Maternal, Fetal, and Neonatal Physiology: A Clinical Perspective*. Philadelphia, PA: W. B. Saunders, 1992.
5. Crapo, R. O. Normal cardiopulmonary physiology during pregnancy. *Clin. Obstet. Gynecol.* 39(1):3–16 (March) 1996.

6. Cunningham, F. G., et al. *Williams Obstetrics*, 21st ed. New York: McGraw-Hill, 2001.
7. Moore, K. L., and Persaud, T. V. N. *The Developing Human: Clinically Oriented Embryology*, 6th ed. Philadelphia, PA: W. B. Saunders, 1998.

• • • Additional References

Baltzer, F. R., et al. Landmarks during the first forty-two days of gestation demonstrated by the B-subunit of human chorionic gonadotropin and ultrasound. *Am. J. Obstet. Gynecol.* 146(8):973–979, 1983.

Caplan, G. Psychological aspects of maternity care. *Am. J. Public Health* 47:25, 1957.

Colman, A. D., and Colman, L. L. *Pregnancy: The Psychological Experience*. New York: Seabury, 1973.

Friederich, M. A. Psychological changes during pregnancy. *Contemp. OB/GYN* 27 (September) 1977.

Gillman, R. D. The dreams of pregnant women and maternal adaptation. *Am. J. Orthopsych.* 38:688, 1968.

Goldstein, S. R. New insights into early pregnancy. *Contemp. OB/GYN* 42-58 (December) 1994.

Lederman, R. P. *Psychosocial Adaptation in Pregnancy*, 2nd ed. New York: Springer, 1996.

Rubin, R. *Maternal Identity and the Maternal Experience*. New York: Springer, 1985.

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CHAPTER

22

Management Plan for Normal Pregnancy

Philosophy and Scope

Care of the pregnant woman and inclusion in her care of persons significant to her are both exciting and challenging. To share in and facilitate a woman's or couple's growth as they open themselves to and explore new feelings is to be allowed to participate in one of life's great experiences. Each woman or couple and each childbearing experience is unique. Providing care for a pregnancy and the corresponding focus on how the woman and her partner are experiencing this pregnancy, therefore, must be in accord with the uniqueness of their experience.

Management of the care of the pregnant woman, like all other aspects of the childbearing cycle, incorporates basic philosophical beliefs of midwifery, as discussed in the first chapter of this book. These include facilitation of natural processes, family-centered care, continuity of care, and the woman's right to participate knowledgeably in her own childbearing experience. Thus midwives most likely subscribe to the listing of rights contained in "The Pregnant Patient's Bill of Rights," prepared by Doris Haire in 1974 and distributed by the Committee on Patients' Rights in New York City.* These are as follows:

> The Pregnant Patient has the right to participate in decisions involving her well-being and that of her unborn child, unless there is a clearcut medical emergency that prevents her participation. In addition to the rights set forth in the American Hospital Association's "Patient's Bill of Rights", (which has also been adopted by the New York City Department of Health), the Pregnant Patient, because she represents TWO patients rather than one, should be recognized as having the additional rights listed below.
>
> 1. *The Pregnant Patient has the right*, prior to the administration of any drug or procedure, to be informed by the health professional caring for her of any potential direct or indirect effects, risks, or hazards to herself or her unborn or newborn infant which may result from the use of a drug or procedure prescribed for or administered to her during pregnancy, labor, birth, or lactation.
> 2. *The Pregnant Patient has the right*, prior to the proposed therapy, to be informed, not only of the benefits, risks and hazards of the proposed therapy but also of known alternative therapy, such as available childbirth education classes which could help to prepare the Pregnant Patient physically and mentally to cope with the discomfort or stress of pregnancy and the experience of childbirth, thereby reducing or eliminating her need for drugs and obstetric intervention. She should be offered such information early in her pregnancy in order that she may make a reasoned decision.
> 3. *The Pregnant Patient has the right*, prior to the administration of any drug, to be informed by the health professional who is prescribing or

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administering the drug to her that any drug which she receives during pregnancy, labor, and birth, no matter how or when the drug is taken or administered, may adversely affect her unborn baby, directly or indirectly, and that there is no drug or chemical which has been proven safe for the unborn child.

4. *The Pregnant Patient has the right*, if cesarean section is anticipated, to be informed prior to the administration of any drug, and preferably prior to her hospitalization, that minimizing her and, in turn, her baby's intake of nonessential pre-operative medicine will benefit her baby.
5. *The Pregnant Patient has the right*, prior to the administration of a drug or procedure, to be informed of the areas of uncertainty if there is NO properly controlled follow-up research which has established the safety of the drug or procedure with regard to its direct and/or indirect effects on the physiological, mental, and neurological development of the child exposed, via the mother, to the drug or procedure during pregnancy, labor, birth, or lactation—(this would apply to virtually all drugs and the vast majority of obstetric procedures).
6. *The Pregnant Patient has the right*, prior to the administration of any drug, to be informed of the brand name and generic name of the drug in order that she may advise the health professional of any past adverse reaction to the drug.
7. *The Pregnant Patient has the right* to determine for herself, without pressure from her attendant, whether she will accept the risks inherent in the proposed therapy or refuse a drug or procedure.
8. *The Pregnant Patient has the right* to know the name and qualifications of the individual administering a medication or procedure to her during labor or birth.
9. *The Pregnant Patient has the right* to be informed, prior to the administration of any procedure, whether that procedure is being administered to her for her or her baby's benefit (medically indicated) or as an elective procedure (for convenience, teaching purposes, or research).
10. *The Pregnant Patient has the right* to be accompanied during the stress of labor and birth by someone she cares for, and to whom she looks for emotional comfort and encouragement.
11. *The Pregnant Patient has the right* after appropriate medical consultation to choose a position for labor and for birth which is least stressful to her baby and to herself.
12. *The Obstetric Patient has the right* to have her baby cared for at her bedside if her baby is normal, and to feed her baby according to her baby's needs rather than according to the hospital regimen.
13. *The Obstetric Patient has the right* to be informed in writing of the name of the person who actually delivered her baby and the professional qualifications of that person. This information should also be on the birth certificate.
14. *The Obstetric Patient has the right* to be informed if there is any known or indicated aspect of her or her baby's care or condition which may cause her or her baby later difficulty or problems.
15. *The Obstetric Patient has the right* to have her and her baby's hospital medical records complete, accurate, and legible and to have their records, including Nurses' Notes, retained by the hospital until the child reaches at least the age of majority, or, alternatively, to have the records offered to her before they are destroyed.
16. *The Obstetric Patient has the right*, both during and after her hospital stay, to have access to her complete hospital medical records, including Nurses' Notes, and to receive a copy upon payment of a reasonable fee and without incurring the expense of retaining an attorney.

It is the obstetric patient and her baby, not the health professional, who must sustain any trauma or injury resulting from the use of a drug or obstetric procedure. The observation of the rights listed above will not only permit the obstetric patient to participate in the decisions involving her and her baby's health care, but will help to protect the health professional and the hospital against litigation arising from resentment or misunderstanding on the part of the mother.

Management of the care of the woman throughout the antepartal period includes the following components:

1. Diagnosis and early management of pregnancy
2. Assessment and evaluation of the well-being of the woman

3. Assessment and evaluation of the well-being of the fetus (see Chapter 23)
4. Relief measures for the common discomforts of pregnancy
5. Nutritional intervention in pregnancy
6. Anticipatory guidance and instruction
7. Screening for maternal and fetal complications (see Chapters 24 and 25)

Diagnosis and Early Management of Care During Pregnancy

Diagnosis of Pregnancy

The diagnosis of pregnancy in the first trimester and early second trimester is based on a combination of presumptive and probable signs of pregnancy. Pregnancy is self-evident later in gestation, when the positive signs of pregnancy are readily observed.

The history, physical, pelvic, and laboratory findings that constitute the database used in making a diagnosis of pregnancy are specifically related to the presumptive, probable, and positive signs of pregnancy. These signs do not make up the midwife's total database for a particular woman, only the part needed to make a diagnosis of pregnancy.

Following is a list of all the presumptive, probable, and positive signs of pregnancy that might be observed during the history, physical examination, pelvic examination, laboratory tests, and adjunctive studies conducted and ordered by the examiner:

History

1. Abrupt cessation of menstruation (presumptive)
2. Nausea and vomiting (presumptive)
3. Tingling, tenseness, nodularity, and enlargement of the breasts and enlargement of the nipples (presumptive)
4. Increased frequency of urination (presumptive)
5. Fatigue (presumptive)
6. Color changes of the breasts—i.e., darkening of the nipples and primary and secondary areolar changes (presumptive)
7. Appearance of Montgomery's tubercles or follicles (presumptive)
8. Continued elevation of the basal body temperature in the absence of an infection (presumptive)
9. Expression of colostrum from nipples (presumptive)
10. Excessive salivation (presumptive)
11. Chadwick's sign (presumptive)
12. Quickening (presumptive)
13. Skin pigmentation and conditions—for example, chloasma, breast and abdominal striae, linea nigra, vascular spiders, palmar erythema (presumptive)

Physical examination

1. Expression of colostrum from nipples (presumptive)
2. Color changes of the breasts (presumptive)
3. Nodularity, tenseness, and enlargement of the breasts and enlargement of the nipples (presumptive)
4. Appearance of Montgomery's tubercles or follicles (presumptive)
5. Enlargement of the abdomen (probable)
6. Palpation of the fetal outline (probable)
7. Ballottement (probable)
8. Fetal movement (positive or probable; authorities vary)
9. Fetal heart tones (positive)

Pelvic examination

1. Enlargement of the uterus (probable)
2. Change in the shape of the uterus (probable)
3. Piskacek's sign (probable)
4. Hegar's sign (probable)
5. Goodell's sign (probable)
6. Palpation of Braxton Hicks contractions (probable)
7. Chadwick's sign (presumptive)

Laboratory tests and adjunctive studies

1. Positive pregnancy test (probable); see Chapter 21
2. Sonographic evidence of pregnancy (positive)

One other positive sign of pregnancy is visualization of the fetal skeleton by roentgenography (x-ray films). The fetal skeleton can first be visualized by the twelfth week of pregnancy, because centers of ossification have formed in most of the bones. The skeleton can be clearly visualized by the sixteenth week. However, because of its danger to the fetus, roentgenography is not used for diagnosis of a viable pregnancy.

It is not always appropriate to seek findings regarding all of the signs of pregnancy outlined here when examining a woman who thinks she is pregnant. This is because not all of the signs are manifested at the same time. For example, if a woman is

approximately 2 months pregnant there is no value in attempting to elicit the following signs, as they either are not yet clinically evident or have not yet occurred:

1. Expression of colostrum
2. Secondary areolae
3. Skin pigmentations
4. Enlarged abdomen
5. Palpation of a fetal outline
6. Ballottement
7. Quickening
8. Fetal movement
9. Fetal heart tones by auscultation

Note that this list includes all of the clinically elicited positive signs of pregnancy.

All of the presumptive and probable signs of pregnancy are evidences of physiological changes taking place in the woman who is pregnant. However, since the majority of these signs can be caused by other conditions, a diagnosis of pregnancy can be made only in the presence of several of these signs.

All women, regardless of the outcome of assessment for pregnancy (pregnant or not pregnant) and regardless of the choice they subsequently make, need evaluation and information, as applicable, about the use of substances (cigarettes, alcohol, over-the-counter medications, prescriptions, illicit drugs), sexually transmitted diseases, nutrition, exercise, genetic screening, HIV screening/counseling, and domestic violence. If the woman is not pregnant, she additionally needs evaluation and information regarding a family planning method and continuing health care, including preconception care (see Chapter 5).

Early Management of Care During Pregnancy

Early management of care during pregnancy includes the decision by the woman or couple about whether to continue the pregnancy. There are three alternatives: (1) continue the pregnancy and keep the baby, (2) continue the pregnancy and give the baby up for adoption, and (3) terminate the pregnancy with an abortion within the allowable time limits. The decision varies with each individual, each pregnancy, and the perception the woman or couple have of the pregnancy. For some, pregnancy brings great joy (albeit with some ambivalence, as described in Chapter 21) and is the fruition of careful planning. For others, pregnancy is a surprise that can be accepted. For still others, pregnancy is perceived as an unmitigated disaster.

The midwife cannot make assumptions about a woman's reaction to the news of her pregnancy and needs to ask her what she thinks about being pregnant. The answer to this question leads the midwife to ascertain whether the woman intends to continue the pregnancy and needs information about prenatal care or wishes to terminate the pregnancy and needs information about abortion.

Abortion The 1973 Supreme Court ruling on abortion in effect legalized abortion, although it gave each state the right to regulate abortion in the second and third trimesters. This ruling voided restrictive laws in 31 states and required revisions to laws in 15 other states [1, 2].

The issues are complex, with the central issues being the following:

1. When does life begin? At conception? Or at the point when the fetus can survive independently of the uterus? This point is much affected today by the life-sustaining technology in neonatal intensive care units.
2. Does the woman have a right to self-determination, including the right to decide whether or not to be pregnant?
3. Does the fetus, regardless of gestational age, have any rights?
4. Are there any circumstances agreed on by a public majority that might constitute grounds for abortion (e.g., rape; diagnosed genetic defects from heredity, disease, or drugs; contraceptive method failure)?

The antiabortion, or prolife, movement stresses the rights of the fetus to life. The prochoice movement, which is neither proabortion nor antiabortion or against life, stresses the right of each individual woman to make her own decision about the choices (alternatives) she has (discussed below), one of which is abortion. Like all controversial issues, especially those dealing with life, death, and the human body, the subject of abortion is heavily laden with emotion. Irrationality by the extremists on all sides of the issue can result.

All women have an emotional response to learning or having confirmed that they are pregnant, as discussed above. Being pregnant requires a number of adjustments. The first trimester is known as the trimester of adjustment, and it is likely that even the happiest woman in the happiest of circumstances has thought at least once to herself that she wished she were not pregnant. This woman, however, is quite different from the woman who seriously contemplates an abortion or imple-

ments a decision to have an abortion. How the woman feels about being pregnant can have far-reaching effects, not only in terms of abortion but also in terms of parent-child relationships if the pregnancy is fulfilled. Therefore, it is vitally important to ask *throughout* the pregnancy how the woman feels about her pregnancy in order to facilitate her coping with the demands of pregnancy and to identify indications of lack of adjustment or precursors to later child abuse.

The legalization of abortion means that every woman, upon being diagnosed as pregnant, has a choice as to whether to carry the pregnancy to its natural conclusion. The woman's decision to have an abortion is not lightly made. In many cases she will turn to the midwife for counsel, advice, and information. Every woman has the right to know her alternatives and, in the case of a first trimester infection (e.g., rubella), her chances of having an affected baby.

If you are a person who in conscience cannot provide abortion counseling, it is only fair that you tell the woman who wants abortion information that this is the situation and she should seek the desired information from someone else. Most professionals in this category will call in a colleague who will provide the information. Clinicians who are not restricted by conscience in the provision of information should be intimately familiar with the local resources for abortion counseling, the procedures for obtaining an abortion, and how to make appropriate referrals.

A recommendation from a 1990 national symposium convened by the National Abortion Federation and the American College of Obstetricians and Gynecologists proposed that midlevel practitioners perform abortions [3]. In 1992 the American College of Nurse-Midwives (ACNM) rescinded a 20-year-old clinical practice statement (1971) that prohibited nurse-midwives from doing abortions [4, 5]. The membership also voted against having prohibitive practice statements, favoring instead the individual use of the ACNM Guidelines for the Incorporation of New Procedures into Nurse-Midwifery Practice. In 1991 the American College of Nurse-Midwives published the following document on reproductive choices (updated in 1997 to include Certified Midwives) [6]:

> Certified Nurse-Midwives (CNMs) and Certified Midwives (CMs) believe that every individual has the right to safe, satisfying health care with respect for human dignity and cultural variations. We support each person's right to self-determination, to complete information, and to active participation in all aspects of care. We acknowledge that the cultural, religious, and ethnic diversity of CNMs and their clients allows for a variety of personal and professional choices. Therefore, the ACNM holds the following positions:
>
> That every woman has the right to make reproductive choices;
>
> That every woman has the right of access to factual, unbiased information about reproductive choices, in order to make an informed decision; and
>
> That women with limited means should have access to financial resources for their reproductive choices.

There are two types of first trimester abortions: (1) surgical, done by dilatation and curettage (D&C) or by dilatation and vacuum aspiration (suction curettage), and (2) medical, done with medications. The discussion here is limited to first trimester medical abortion.

Three medications are currrently in use for medical abortion: (1) mifepristone (Mifeprex), (2) methotrexate, and (3) misoprostol (Cytotec). Prior to the availability of mifepristone, medical abortion was done with off-label use of a combination of methotrexate and misoprostol or misoprostol alone. The major drawback to the combination regimen of methotrexate and misoprostol is the length of time it takes for the abortion to occur—usually approximately 14 days, but up to 15 to 20 percent of women take 4 weeks to abort after administration of the misoprostol and 3 to 7 days after the injection of methotrexate [7, 8, 9]. The effectiveness of misoprostol alone varies widely, depending on whether it is moistened before insertion into the vagina, inserted dry, or taken orally. It also has significantly higher rates of nausea, vomiting, fever and chills, and diarrhea when used alone. For these reasons the discussion here is limited to the combined use of mifepristone and misoprostol.

Mifepristone (Mifeprex) was known as RU 486 prior to its approval as a first trimester abortifacient by the U.S. Food and Drug Administration (FDA) on September 28, 2000. Mifepristone is an antiprogesterone/antiprogestin derivative of norethindrone that inhibits progesterone, the hormone that maintains normal pregnancy. The lack of progesterone alters the decidua, causes the trophoblast to separate from its implantation site, decreases se-

cretion of human chorionic gonadotrophin (hCG), and results in bleeding from the uterus. Used alone, mifepristone is approximately 80 to 85 percent effective. However, when combined with a prostaglandin analogue, effectiveness increases to approximately 96 percent [10].

Misoprostol (Cytotec) is a prostaglandin E analogue that causes contractions of the uterus, which expels the separated embryo. Both misoprostol and mifepristone also soften the cervix, which facilitates expulsion.

The FDA approved the following regimen up to 49 days' gestation by LMP (7 completed weeks):

mifepristone 600 mg po once
    followed approximately 48 hours (2 days) later with
misoprostol 400 mg po once
    with a follow-up visit in 11 days

The earlier in pregnancy the regimen is implemented, the higher the efficacy. An additional dose of misoprostol does not increase efficacy [7].

Since the FDA approval of mifepristone and the recommended regimen, there have been a number of studies researching different dosages of both mifepristone and misoprostol, different lengths of interval time between the two drugs, length of gestational age for which the regimen is effective, at-home administration of the misoprostol, and so forth. Although the regimen of mifepristone and oral misoprostol has been shown to be 80 percent effective up to 63 days (9 completed weeks' gestation based on LMP) and as high as 96 to 97 percent effective up to 63 days if the misoprostol is administered vaginally [11, 12], the American College of Obstetricians and Gynecologists *Practice Bulletin* states that surgical abortion is the preferred treatment for women who desire first trimester abortion after 49 days' gestation by LMP [7].

Five prerequisites should be in place prior to implementing the FDA regimen:

1. The woman must be pregnant and her gestational age determined. This is done by clinical evaluation of the uterus during pelvic examination combined with history and observation of presumptive and probable signs of pregnancy and a pregnancy test, or, if in doubt, vaginal sonography.
2. The woman is not contraindicated to the use of either drug. (See Table 22-1.)
3. The woman agrees to a surgical abortion if the medical abortion fails. This is imperative because misoprostol is teratogenic [7, 13].

TABLE 22-1 Contraindications to Use of Combined Mifepristone and Misoprostol Regimen

- Confirmed or suspected ectopic pregnancy
- Undiagnosed adnexal mass
- Unremoved intrauterine contraceptive device (IUD)
- Severe anemia
- Known coagulopathy or anticoagulant therapy
- Chronic adrenal failure
- Current long-term systemic corticosteroid therapy
- Severe liver, kidney, pulmonary, or cardiovascular disease
- Uncontrolled seizure disorder
- Allergy or intolerance to either drug
- Unwillingness to have surgical abortion if medical abortion is not successful
- Inability to return to office or clinic for follow-up visits

4. The woman is provided with anticipatory guidance on what to expect and when to call. Such guidance includes the following instructions and information:
    a. Expect bleeding, but call if there is too much:
        (1) more than four sanitary pads saturated in two consecutive hours
        (2) heavy bleeding for more than 24 hours
    b. If there is excessive bleeding, a surgical procedure will be required to complete the abortion, most likely suction curettage. This occurs in about 1 to 2 percent of women.
    c. Expect cramps and pain, which may be severe but will resolve after expulsion of the products of conception. Relief measures include a heating pad and medications such as acetaminophen (e.g., Tylenol, Excedrin) or ibuprofen (e.g., Motrin, Advil). Acetaminophen with codeine may be prescribed.
    d. Other possible side effects include:
        (1) nausea
        (2) vomiting
        (3) diarrhea
        (4) fever and chills
        (5) headache
        (6) dizziness

        Call if any of these lasts more than a day.
    e. Identify available support systems for information, counseling, emotional release, anxiety reduction, and any grief work.
    f. Rh-negative women with negative antibody titers should receive Rh immune globulin (e.g., RhoGAM) within 72 hours of the abortion.
5. The woman signs an informed consent.

With these five prerequisites in place, the woman is given the dose of mifepristone. Approximately 11 percent of women abort before returning to take the misoprostol. Women who have not aborted return to the office or clinic in two days and are given the misoprostol. A woman then remains in the clinic or office for approximately 4 hours during which time another approximately 50 percent of women will expel the products of conception. If she has not yet aborted, she is examined by vaginal ultrasound to determine if indeed she did unknowingly abort. She is then sent home with instructions regarding bleeding and she is asked to return in 10 to 15 days. If she has not aborted by then as determined by history, pelvic examination, and vaginal ultrasound, then surgical abortion, usually suction curettage, is done.

The follow-up visit after the abortion has several important features to it. First is to determine by history and pelvic examination that there are no complications. Second is to discuss and implement a plan for contraception. Abortion should not be considered a contraceptive method. Third is to ascertain the woman's mental health about the abortion. Fourth is all the evaluation and counseling that is part of an annual visit or preconception counseling, such as Pap smear, breast self-examination, sexually transmitted diseases, substance abuse, HIV, any form of violence, nutrition, and exercise. See Chapter 5.

Midwives who provide medical abortion but are not trained in surgical abortion need to have a collaborating physician who is trained in surgical abortion. Surgical abortion is indicated in those instances when medical abortion fails and the pregnancy continues, or when the products of conception are not completely expelled, or when there is excessive bleeding.

Assessment and Evaluation of the Well-Being of the Woman

The Initial Examination

The initial antepartal examination occurs at any point in pregnancy when the woman makes an appointment for her continuing health care. It consists of a complete history, physical and pelvic examinations, and a number of laboratory and adjunctive studies. This chapter describes the details of this examination. It is assumed that the woman's pregnancy has already been diagnosed either by prior examination and a pregnancy test (early in her pregnancy) or because it has become self-evident. The details of this initial antepartal examination are basically the same, regardless of what time in pregnancy it takes place. There are obvious differences depending on where the woman is in the pregnancy (e.g., the size of the uterus).

History In addition to collecting the woman's identifying information, past medical and primary care history, family history, menstrual history, obstetric history, gynecologic history, sexual history, contraceptive history, and douching history (outlined in Chapter 2), the midwife needs to gather a present pregnancy history. In planning the sequence in which information is to be obtained during a visit, it is often best to start with the present pregnancy history. This is what most women are interested in and expect to talk about. Your interest in the woman's first concern facilitates obtaining all the other information afterward. Emphasis also needs to be placed on obtaining the date of her last normal menstrual period, calculation of her estimated date of birth, determination of the present number of weeks' gestation, and calculation of her gravida and para status.

Gravida/Para. Gravida refers to the number of times a woman has been pregnant. It does not matter at what point during pregnancy the pregnancy was terminated. Nor does it matter how many babies were born from the pregnancy. It is the pregnancy that counts, not the number of babies. A woman who has had one pregnancy from which issued triplets would still be a Gravida 1 until pregnant again, at which time she would be a Gravida 2. A woman who is pregnant for the first time is called a primigravida. A woman pregnant for the second time is called a secundigravida. Thereafter, if pregnant again, she is called a multigravida. A woman who has never been pregnant is called a nulligravida.

Para refers to the number of pregnancies that terminated in the birth of a fetus or fetuses that reached the point of viability. This point is considered to be 20 weeks' gestation (or 500 grams), which is the cutoff for the definition of abortion. An increase in a woman's parity designation is achieved only if the pregnancy produces a fetus that has reached the point of viability. For example, a woman who has been pregnant twice and had two first trimester abortions is a Gravida 2, Para 0. Note that it is not the number of fetuses reaching

the point of viability but the number of pregnancies carried to the point of the fetus's or fetuses' reaching the point of viability that determines parity. So the woman who has had one pregnancy that resulted in 4-pound triplets is a Gravida 1, Para 1. Para is not affected by whether the fetus or fetuses are born alive or are stillbirths. The woman who has been pregnant twice with one of those pregnancies ending in a full-term stillbirth and the other in a full-term live birth would be a Gravida 2, Para 2.

A primipara is a woman who has had one pregnancy in which the fetus or fetuses reached the point of viability. Unfortunately, primipara is often used interchangeably with primigravida, but it is not possible for a primigravida to be a primipara until after the birth of a baby that reached the point of viability. A multipara is a woman who has had two or more pregnancies in which the fetus or fetuses reached the point of viability. It is possible for a multigravida not to be a multipara since, in this system, the para number can be less, but never more, than the gravida number. A woman who has not carried a pregnancy to the point of viability is called a nullipara.

Para does not provide much information about the pregnancies a woman has had. For this reason, the two-digit system of Gravida/Para is rarely used. *Instead a four- or five-digit system is used in place of para although, in practice, the digits are misnamed as para. This is confusing because this system counts each baby born rather than counting the number of pregnancies carried to viability, which is the basis for determining para.* The digits follow a precise sequence:

First digit: the number of term babies the woman has delivered. *Term* in this system refers to any baby of 36 weeks or 2500 grams or more.

Second digit: the number of premature babies the woman has delivered. *Premature* in this system refers to any baby born between 20 and 36 weeks or weighing between 500 and 2499 grams.

Third digit: the number of pregnancies ending in abortion (either spontaneous or induced). *Abortion* refers to any baby born before 20 weeks' gestation or weighing less than 500 grams.

Fourth digit: the number of children currently alive.

Fifth digit: the number of pregnancies that resulted in multiple births. The fifth digit is not commonly used but is useful when there is a history of multiple births.

The following examples illustrate the use of the four- or five-digit system:

Example 1: A Gravida 2 delivered a full-term baby with each pregnancy, both of whom are currently alive. She is a Para 2002.

Example 2: A Gravida 2 delivered a full-term baby who died at 6 months of age and aborted during her second pregnancy. She is a Para 1010.

Example 3: A Gravida 1 delivered premature twins, one of whom died. She is a Para 0201.

Example 4: A Gravida 6 delivered one full-term live birth, one full-term stillbirth, one premature live birth, and premature triplets, of whom two lived and one died, and she has had two abortions. She is a Para 2424. In this instance, it would be useful to use the fifth digit for the number of pregnancies that resulted in multiple births in order to clarify the first four numbers. With the five-digit system, she is a Para 24241.

In any of the above examples, if the woman were pregnant at the time of this summarizing of her obstetric history, her gravida number would increase by one to account for her present pregnancy. When doing the obstetric history during the initial antepartal examination, if the woman is pregnant for the first time, simply write primigravida across the space provided for this history on the chart.

Last Menstrual Period. Because the date of the first day of the last normal menstrual period (LNMP) is used as the baseline for determining gestational age and the estimated date of birth (EDB), it is important to obtain as accurate a date as possible for this event. Unfortunately, many women do not keep a record of their menstrual periods. They do, however, have a pretty good general idea of the regularity of their periods and when during the month they occur. A little detective work is often indicated. The success of your detective work will most likely depend on the questions you ask.

The first thing to determine about the date a woman gives for her LMP is whether this was a normal period for her. To do this, correlate her description of her last menstrual period with her description of her regular menstrual periods, obtained while taking her menstrual history. For example, if she says her last period was scanty and lasted 1 or 2 days and that her usual periods are moderately heavy for the first 2 days and taper off to scanty around the fourth or fifth day, then you know that her last menstrual period was not normal for her.

Therefore, ask about the period before the one she has given as her last one. If this preceding period was normal for her, then this is the one you count as her LMP. It is not uncommon for a woman to experience some spotting at the time of implantation of the blastocyst as a result of the invasive activity of the chorionic villi in the uterine lining. Since implantation in a woman with a 28-day cycle occurs close to the time she would be expecting a menstrual period (ovulation at day 14 prior to the next menstrual period; 3 to 4 days for the fertilized ovum to move down the fallopian tube to the uterus [day 17 or 18]; 3 days in the uterine cavity before implantation [day 20 or 21]; and then several days for implantation), a woman often misinterprets this spotting from implantation as a menstrual period even though it is distinctly different from her usual period. If you do not explore the normality of her last menstrual period, you may make the error of misdating the pregnancy by one month. This can cause undue concern when clinical findings and gestational age do not correlate throughout the pregnancy. Remember, LMP refers to the first day of her last *normal* menstrual period.

Occasionally you will encounter a woman who professes to have no idea of the date of her last menstrual period. To get some idea of when this might have occurred it is useful to use national holidays or other dates that might be significant to her. Such women often will remember if they had a menstrual period around a particular religious holiday, New Year's Day, Fourth of July, Halloween, Thanksgiving, their birthday, the beginning or end of school, and so forth.

At times, a woman is simply a poor historian, and accuracy in pinpointing the LMP is impossible. This should be so noted on her chart. If the last menstrual period is unknown, an estimated date of delivery is based on many parameters (see "Size-Date Discrepancy" in Chapter 25), including an ultrasound for dating.

Estimated Date of Birth. For many years, the expected date of the end of pregnancy by delivery of a full-term baby was called the estimated date of confinement (EDC). This term has been changed by a number of health care professionals to estimated date of delivery (EDD). The change was introduced because of a feeling that the word confinement connotes illness, limitation, and a passive role rather than a normal event, a healthy process, and active participation. Midwives subsequently changed estimated date of delivery to estimated date of birth (EDB), because this sounds more normal and natural and puts the focus on the mother who gives birth rather than on the practitioner who may or may not be present to "deliver" the baby. Estimated date of birth (EDB) will be used throughout this book.

The EDB is calculated by Naegele's rule, in which 7 days are added to the date of the first day of the LMP and then 3 months are subtracted from that date. Naegele's rule is easiest to calculate by substituting numbers for months and days so that the first number stands for the month and the second number stands for the day. One must be careful to use the actual number of days in the month of the LMP when crossing over to another month. This is illustrated in the following example of calculating the EDB by Naegele's rule:

```
  5/28 (LMP of May 28)
+    7 days
   6/4 (June 4–May has 31 days)
-    3 months
= 3/4 (March 4 of the next year, as 9 months have
       been added)
```

The EDB is at best a "guesstimate" because several variables may alter the actual date of delivery. First, calculation of the EDB is dependent on the woman's accurately identifying the date of the first day of her last normal menstrual period. Second, the actual period of gestation is from the time of fertilization. Since ovulation is generally considered to occur approximately 14 days before the next menstrual period, the length of a woman's menstrual cycle will affect the accuracy of the EDB. A woman with a longer menstrual cycle (more than 28 days) will actually begin her pregnancy later in relation to the LMP and will deliver at a correspondingly later date as variability in the length of the cycle is largely due to the number of days from the beginning of menses to ovulation [14]. The reverse is true for the woman with a shorter menstrual cycle. Third, not all women with 28-day menstrual cycles ovulate 14 days before the next menstrual period; this individual variation in ovulation time will affect the accuracy of the EDB. Therefore, the woman should be told she probably will not have her baby on the exact date of the EDB. The majority of women deliver within 10 to 14 days, either earlier or later, of their EDB, and this range is considered physiologically normal.

The addition of 7 days in Naegele's rule attempts to counterbalance some of the difference between the LMP and the time of fertilization. The

remaining 7 days (to total 14 in a 28-day cycle) are picked up over the 9-calendar-month period of gestation because 7 calendar months have 31 days. However, no single pregnancy would cover the period of time that would include all these 7 months.

It is useless to calculate the EDB by Naegele's rule in the presence of any of the following situations:

1. The woman had irregular menstrual periods including 1 or more months of amenorrhea.
2. Conception occurs while the mother is breastfeeding and ovulating but amenorrheic.
3. Conception occurs before regular menstruation is established after termination of a pregnancy or discontinuation of oral contraceptive pills.

In such instances, an estimated date of birth is based on clinical findings and subsequent projections and an ultrasound scan as early in pregnancy as possible, when fetal biometry is most accurate (see Table 25-2).

The same clinical measurements are used during any pregnancy to double-check the accuracy of the EDB and to detect possible intrauterine growth retardation and other complications. These measurements are discussed in detail in Chapter 25.

Determination of the weeks of gestation according to dates is done most easily and quickly by using one of the gestational calendars or calculators available from the pharmaceutical companies. However, since there is sometimes a slight inaccuracy in using these calculators to determine the EDB, most clinicians calculate the EDB from the LMP by Naegele's rule and use the resulting EDB in setting the calculator to determine the week of gestation.

Present Pregnancy History. The present pregnancy history is designed to detect complications, some of the discomforts, and any complaints about the pregnancy the woman has experienced since her LMP. You may see the woman for her initial antepartal examination at any time during the pregnancy; therefore, the present pregnancy history given here covers symptoms of possible problems in all three trimesters. The woman should be questioned about all of the following during the present pregnancy history:

1. Headaches
2. Dizziness
3. Visual disturbances
4. Syncope
5. Fever
6. Fatigue
7. Nausea
8. Vomiting
9. Heartburn
10. Breast changes
11. Leakage of colostrum
12. Shortness of breath
13. Abdominal pain
14. Back pain
15. Dyspareunia
16. Vaginal discharge
17. Vaginal bleeding
18. Dysuria
19. Urinary frequency
20. Constipation
21. Hemorrhoids
22. Leg cramps
23. Varicosities
24. Edema (ankle, pretibial, face, hands)
25. Infections (e.g., measles, flu, other viruses)
26. Drugs and medications
27. Street drugs, alcohol, and smoking
28. Roentgenography (exposure to x-rays)
29. Accidents
30. Relationship status: support from significant other for pregnancy; presence or history of domestic violence and emotional, physical, or sexual abuse
31. Sexual satisfaction: sexual changes and the feelings of both partners toward any changes
32. Feelings about her pregnancy: effect on her life and her body image, feelings about the baby
33. Quickening (date of)
34. Any complaints, discomforts, or concerns other than those already discussed

A positive response to any of items 1 through 30 requires further exploratory history taking to ascertain the following:

1. When during the pregnancy this occurred; duration; recurrences
2. Specific location (if applicable)
3. Severity (if applicable)
4. Associated symptoms
5. Factors influencing the problem, either aggravating or relieving
6. Medical help (whom); diagnosis and treatment (if applicable)
7. Treatment or relief measures (self or medically initiated) and their effectiveness

The use of drugs and medications during pregnancy is particularly complex, and the midwife needs to review each drug and balance the reason for its use against the risk it carries when used during pregnancy. (See Chapter 10.) In 1980 the Food and Drug Administration published pregnancy risk categories for drugs in the *Federal Register* (see Table 10-5). All drugs are now identified as being in one of the pregnancy risk categories.

Of particular concern is to identify women who are being subjected to violence through physical, sexual, and psychological abuse. This abuse often starts or increases during pregnancy, more in the third trimester, and violent death may be the end result.

All pregnant women should be screened by history, physical, and pelvic examination. Observation of bruises, teeth marks, burns, mutilation; fear of partner; or partner possessiveness and controlling behaviors should not go unexplored. Even without obvious signs, privacy for just the midwife and the woman to talk, without children or partner present, must be created at some point in time during the visit. The midwife can begin with a preamble such as the following: "I always want some time alone with each of the women I see because I have learned that often a woman has concerns she does not want to talk about in front of others. We know that violence in the home often starts or increases during pregnancy and I want to make sure that every woman I see is able to talk about any abuse that is happening to her and develop plans for her safety." You can then ask if she is being abused (hurt) physically (hit, punched, slapped, cut, kicked), sexually (forced to have unwanted sex), or psychologically (called derogatory names, threatened with a weapon, belittled). A positive response requires further history taking to determine frequency, how long she has been a victim of violence, prior injuries (a body map for her to indicate where she has been hurt is useful), and if she is afraid; validation of the abuse to her; a plan for safety including her thinking through the details of an escape route; and providing her with information about possible resources.

Physical Examination A complete screening physical examination is done during the initial antepartal examination in order to ascertain whether the woman has any medical abnormalities or disease. This physical examination was outlined in Chapter 2. Breast examination is detailed in Chapter 52, and variations in findings during breast examination of the pregnant woman were discussed in Chapters 21 and 52. The obstetric abdominal examination is detailed in Chapter 53.

In addition to the physical examination outlined in Chapter 2, the midwife should perform an abdominal examination of the pregnant woman. The following is included in such an examination:

1. Observation of any scars or bruises and inquiry to obtain explanation of them
2. Observation of linea nigra
3. Observation of abdominal striae
4. Determination of the lie, presentation, position, and variety of the fetus
5. Measurement of fundal height
6. Gross evaluation of amniotic fluid volume
7. Auscultation of fetal heart tones
8. Estimation of fetal weight
9. Observation or palpation of fetal movement

Each of these items provides informative data that are useful either in diagnosis of pregnancy, in evaluation of fetal well-being and growth, or as indicators of possible problems.

Any scars or bruises on the abdomen must be noted and their reason for being there explored. The scar of a previous cesarean section is of particular importance. It is useful to know if the woman has had an appendectomy so that appendicitis can be ruled out in the event of right-sided abdominal pain during the pregnancy. The midwife should note any bruises in the woman's chart and discuss their origin with the woman, paying particular attention to the possibility of domestic violence and abuse.

Observations of linea nigra and abdominal striae are presumptive signs of pregnancy. Observation or palpation of fetal movement and hearing the fetal heart tones (FHT) are positive signs of pregnancy. The normal range of fetal heart tones is 120 to 160 per minute. Whether the FHT are in the lower or upper end of this range is *not* an indication of whether the baby will be a boy or a girl.

The importance of determining the lie, presentation, position, and variety of the fetus varies with the length of pregnancy. Prior to the twentieth week it is nearly impossible to ascertain this information because of a combination of the small size of the fetus, the thickness of the uterus, and the still high ratio of amniotic fluid to baby in the amniotic sac. The baby will continue to turn and somersault in the amniotic sac until the bulk of the baby's body is far

greater than the amount of amniotic fluid and there is no longer room for the fetus to turn easily. Consequently, information about fetal placement in the uterus has little meaning for labor and delivery management until around the thirty-sixth week of gestation. By this time most babies have settled into what will be their lie and presentation for the intrapartal period. This is not absolute, however, as some babies will turn again. Malpresentation prior to thirty-six weeks' gestation is not cause for concern because the baby is still turning. Malpresentation after this time, however, may be cause for concern and possible intervention. In planning the management of the intrapartal period, the midwife should determine carefully at the beginning of labor if the problem still exists. Data on lie, presentation, position, and variety are obtained from doing Leopold's maneuvers of abdominal examination by palpation. The procedure for doing Leopold's maneuvers is presented in Chapter 53.

Fundal height is of greatest value when it is measured the same way by the same examiner throughout pregnancy. It provides information regarding the progressive growth of the fetus and serves as a gross screening tool for detection of problems related to a fundal height that is too large or too small for the presumed gestational age by dates (see Chapter 25). A fundal height that is not increasing but remains the same over a period of time is ominous. Signs and symptoms of possible intrauterine fetal growth restriction or fetal death must be looked for and these possibilities ruled out.

There are four major ways of measuring fundal height. These are described in Chapter 53 and the norms for different points in pregnancy are given.

Determining estimated fetal weight (EFW) requires concentrated practice on the part of the examiner in order to develop enough accuracy for the EFW to have any meaning. EFW is important in the intrapartal period, when this figure is compared with the clinical evaluation of the pelvis to ascertain the adequacy of a given mother's pelvis for the size baby she will be delivering. During the antepartal period, EFW is used as one clinical measurement in evaluating gestational age and progressive fetal growth.

Learning to evaluate EFW accurately is difficult, because there is no precise measuring tool for checking the accuracy of your estimate during the antepartal period. Neither experienced hands nor sonogram is necessarily more accurate than the other but both can be used to develop your own accuracy. Combining the ultrasound measurements of abdominal circumference, head circumference, and femur length enables calculation of an EFW that becomes increasingly inaccurate the larger the baby grows. However, it will give the learner some idea of EFW, and it is worthwhile if the student palpates the woman's abdomen prior to a scheduled ultrasound and compares the resulting EFW with that subsequently determined by ultrasound. You also can ask an experienced clinician to give you an EFW on your patient, but the accuracy of even seasoned clinicians is highly variable. The literature describes the inaccuracy of EFW by clinicians, especially for the smaller and larger babies but reports greater accuracy for the middle range of average-sized babies. It is important to feel as much of the fetus as possible, to ascertain accurately what proportion of the fetus you have felt, and to envision the remainder mentally. The following suggestions will help you learn how to translate what you feel into an estimated weight:

1. Palpate as many women in the labor and delivery unit as possible. Compare your EFW with the actual weight of the baby at birth.
2. Undress, put into the fetal position, and palpate as many babies in the normal newborn nursery as possible. (Get the mothers' permission first.) Compare your estimated weight of the baby to the actual weight of the baby. Remember to redress and, if necessary, calm any crying babies you palpate—for the sake of the baby and the mother and to be fair to and maintain good relationships with the nursery staff.
3. Visualize and study the size of premature newborns in relation to their weights.
4. Visualize and study the size and corresponding weights of fetal specimens at different gestational ages.

The only additional information to be obtained from the physical examination other than that outlined in Chapter 2 for the initial antepartal examination, is the woman's prepregnant weight and height at the time of her last menstrual period as well as a measurement of her weight at the time of this examination.

Pelvic Examination A complete pelvic examination is done during the initial antepartal examination. This includes not only the speculum, bimanual, and rectovaginal examination (see Chapter 56) but also evaluation of the bony pelvis by clinical pelvimetry (see Chapter 61).

You may occasionally see a woman who refuses to have a pelvic examination. Such women are usu-

ally either young adolescents who are primigravidas with minimal sexual experience, women who have had traumatic experiences during pelvic examinations in the past, women who have been raped or who have a history of sexual abuse, or women who are victims of current, on-going sexual abuse. These women are quite frightened and will be hurt both mentally and physically if an examination is forced on them. This problem is rarely encountered in women who have had at least one vaginal delivery. Understanding and patience are required on the part of the examiner. Venting of frustration and anger on the woman should be scrupulously avoided. Exploration of the meaning of the woman's behavior to her is mandatory so that you can identify the problem in order to begin working through it. Why is she objecting to this procedure? If she is fearful, precisely what is she afraid of? It may be necessary to arrange for this woman to be examined by someone who is skilled in working with such women and known to be especially gentle in doing pelvic examinations. It may take several antepartal visits before the woman is willing to be examined.

Time is on your side, inasmuch as the pelvic ligaments relax as pregnancy progresses. (The cause of this pelvic relaxation is unknown, although it has been attributed in the past to the hormone relaxin. However, since a pure substance has not been isolated for definitive study, it cannot be said that relaxin is the causative factor.) The relaxation of the pelvic ligaments makes it easier to do a pelvic examination around the thirty-sixth week of gestation than during the first or second trimester. The value of earlier examinations must be weighed against trauma to the woman and a potential breakdown of trust and cooperation, which could affect all other aspects of her pregnancy. In the absence of clinical symptoms requiring a diagnostic pelvic examination, the pelvic can be delayed until later in pregnancy when you need to do clinical pelvimetry.

Laboratory Tests and Adjunctive Studies The laboratory tests and adjunctive studies ordered during the initial antepartal examination vary, depending on policies established in a particular clinical setting. Some tests and studies also vary with the gestational age of the fetus at the time of the examination and with the woman's history. Exactly which tests are used to obtain the same information also varies from setting to setting. The following list encompasses the most common variations; these tests, unless otherwise noted, are routine for all pregnant women. Additional laboratory tests would be done in the event of pathological findings; these tests, which would be specific to the woman and not routine for all, are covered in the discussion of complications in Chapter 24 and are not included in this list.

1. Pap smear (done during speculum examination; see Chapter 57)
2. Gonococcal (GC) and chlamydia testing specimens collected during speculum examination; see Chapter 58
3. Blood type (ABO)
4. Rh factor
5. Antibody screen/antibody titer
6. Sickle cell prep or hemoglobin electrophoresis; done routinely in an increasing number of clinical settings
7. Tuberculin test (PPD) for women in high-risk groups except for those with a known previous positive test (see Chapter 24); done in all public health department settings
8. Venereal Disease Research Laboratory (VDRL), rapid plasma reagin (RPR), or other serology test for syphilis
9. Hepatitis B surface antigen
10. Rubella titer
11. Varicella antibody screen if woman has not had disease or vaccine
12. Hemoglobin and hematocrit; some settings order a broader spectrum of blood counts and tests such as those included in an SMA-4, SMA-12, or CBC (e.g., WBC, RBC, differential); the hemoglobin and hematocrit, however, are minimal in all settings
13. Urinalysis for protein, glucose, and routine microscopic examination; some clinical settings also routinely order a urine culture
14. Diabetes screening at 28 weeks' gestation
15. Screening for vaginal and rectal group B streptococcus (GBS) colonization at 35 to 37 weeks' gestation

In addition, all women should be offered the following:

1. HIV testing
2. Maternal serum alpha-fetoprotein (MSAFP) or triple screen testing (to be done between 15 and 18 weeks' gestation)

In some settings, it may be the midwife's responsibility to draw or otherwise obtain the blood needed for tests. These procedures are described in Chapters 46 and 47.

The procedure for collecting specimens for culture of GBS is to swab the lower vagina at the in-

troitus without a speculum and then, either using the same swab or a second swab, swab the rectum by inserting the swab through the anal sphincter. One or both swabs are placed into the same container of transport medium. Clearly labeled specimens should also identify if the woman is allergic to penicillin and specify susceptibility testing for clindamycin and erythromycin if GBS is isolated [15].

A case study of antepartal management based on the database obtained during an initial antepartal examination is given after the next section on the antepartal revisit. The case study follows the woman through an antepartal revisit.

The Revisit

The antepartal revisits are the return visits the woman makes, after her initial antepartal examination, for prenatal care throughout the remainder of her pregnancy until her entry into true labor. Each revisit consists of a chart review, a history and physical examination geared toward evaluation of the well-being of the mother and the fetus, speculum and/or pelvic examination when indicated, laboratory and adjunctive studies when indicated, and explanations and teaching appropriate to the woman's needs and her baby's gestational age.

Chart Review Immediately before seeing the woman, the midwife should review her chart for the following information:

1. Name
2. Age
3. Parity
4. Weeks of gestation by dates
5. Any significant finding from
   a. obstetrical history
   b. past medical and primary care history
   c. family history
   d. present pregnancy history
   e. initial physical examination
   f. initial pelvic examination
6. Any previously identified problems, treatment, and evaluation of the effectiveness of the treatment
7. Any particular concerns and desires, plans made, and instruction provided
8. Specific medications, treatments, and dietary requirements for which the woman is presently responsible
9. Laboratory reports:
   a. normality of results
   b. need to repeat any lab tests
   c. need for further investigation and lab tests

This comprehensive chart review serves the purposes of (1) reacquainting the midwife with the findings, problems, concerns, and unique aspects related to this individual woman, (2) evaluating the thoroughness of the database, and (3) evaluating the thoroughness and effectiveness of the preceding management.

History The basic revisit history is designed to detect any symptoms or subjective indications of complications or discomforts that the woman may have experienced since her last visit. The woman is thus questioned about the following:

1. Any concerns, complaints, questions, or problems she has
2. Headaches
3. Visual disturbances
4. Dizziness
5. Fever/chills
6. Nausea/vomiting
7. Fetal movement
8. Abdominal pain/contractions
9. Back pain
10. Dysuria
11. Vaginal discharge/leaking fluid
12. Vaginal bleeding
13. Constipation/hemorrhoids
14. Varicosities/leg ache
15. Leg cramps
16. Edema (ankle, pretibial, face, hands)
17. Exposure to any infectious diseases
18. Use of any medicines other than those prescribed (e.g., aspirin)
19. Any relationship changes, such as an increase in or initiation of abuse
20. Any medical care since last visit (e.g., doctor, emergency room); reason, diagnosis, treatment, continuing care

In addition, the woman is questioned about possible discomforts, concerns, and desire for information regarding the weeks' gestation at the time of the revisit (e.g., discomforts and concerns common during this trimester, development of the baby during this month), as well as any plans she may have to attend classes on preparation for childbirth and parenthood (including breastfeeding). The midwife should also inquire about any significant findings identified during the chart review.

Physical Examination At each antepartal revisit the following physical examination is done to detect any signs of complications and to evaluate fetal well-being:

1. Blood pressure (compare with baseline blood pressure obtained at the time of the initial visit; note blood pressure readings throughout pregnancy to date)
2. Weight (compare with prepregnant weight; note the number of pounds for the number of weeks since the last visit; note weight gain pattern)
3. Abdominal examination for
   a. lie, presentation, position, and variety
   b. engagement
   c. measurement of fundal height (compare with measurement at the preceding visit; note pattern of uterine growth)
   d. gross evaluation of amniotic fluid volume
   e. observation or palpation of fetal movement
   f. estimated fetal weight (compare with estimated weight at preceding visit)
   g. fetal heart tones (note rate and location) (see Chapter 53)
4. CVA tenderness (see Chapter 54)
5. Examination of the upper extremities for finger edema (note if any rings are tight and ask if they are tighter than usual; also ask if woman is not wearing any rings that she used to wear because they became too tight, or if she has changed the fingers on which she is wearing her rings)
6. Examination of the lower extremities for
   a. ankle and pretibial edema
   b. quadriceps (knee-jerk) deep tendon reflexes (see Chapter 55)
   c. varicosities and Homans' sign, when indicated

After the initial physical examination, a breast examination for adequate support and for any crusting of leakage should be conducted approximately once a month. If the woman plans to breastfeed, her nipples need to be reevaluated at the thirty-sixth week of gestation to ascertain the need for measures to help bring out flat or inverted nipples.

Pelvic Examination After the initial examination, the midwife performs some or all of the following components of a pelvic examination, as indicated:

1. A speculum examination if the woman complains of vaginal discharge.
   a. Look for visual signs of vaginal infection, and obtain material for a diagnostic wet smear slide; obtain specimen for GC and chlamydia diagnostic testing.
   b. Evaluate treatment for vaginal infection (test of cure) if symptomatic; not necessary if the woman is now asymptomatic (see Table 15-3).
   c. Repeat Pap smear, if needed.
   d. Repeat GC and chlamydia diagnostic testing in the third trimester.
   e. Rule out or confirm premature rupture of membranes (see Chapter 29).
2. Clinical pelvimetry late in the third trimester if the pelvis needs to be reevaluated or if it was not possible to obtain this information during the initial examination because the woman refused to be examined (see the discussion earlier in this chapter).
3. A vaginal examination if the woman has any signs/symptoms of preterm labor to assess
   a. cervical consistency
   b. effacement
   c. dilatation
   d. status of membranes
   e. engagement/station
   f. presenting part

   Some midwives also do a vaginal exam routinely at the fortieth week of gestation by dates and thereafter to determine cervical "ripeness" (readiness) for labor.

Many, although not all, midwives believe in performing a 36-week pelvic evaluation, including a repeat of clinical pelvimetry; obtaining specimens for diagnostic testing of GC, chlamydia, and GBS; and evaluation of cervical status. They view this as part of a total reevaluation of the woman at this time. This total reevaluation also includes evaluation of any laboratory tests.

Laboratory Tests and Adjunctive Studies A voided urine specimen is obtained at each revisit; a dipstick test for the presence of protein and glucose. Laboratory tests and adjunctive studies ordered during the initial antepartal examination are reviewed for results. All women should be screened for diabetes at 28 weeks and for group B streptococcus at 35 to 37 weeks. Practice and institutional policies vary about routinely repeating laboratory tests obtained at the initial visit or repeating them only if indicated by history, physical, and pelvic findings. This includes hemoglobin and hematocrit, VDRL, gonorrhea, chlamydia, and antibody titers

for Rh-negative women prior to receiving prophylactic RhoGAM at 28 weeks (see Chapter 24). Other laboratory tests and adjunctive studies are done if the findings of the history, physical and pelvic examinations, and laboratory studies suggest a need for further diagnostic workup.

Management

Collection of the database through history, physical and pelvic examinations, and laboratory and adjunctive studies is the first step in the management process (see Chapter 2). The remaining steps of the management process depend on the database and its interpretation. Interpretation of the database (step 2 in the management process) includes the following:

1. Determining normality
2. Differentiating between common discomforts of pregnancy and a possible complication
3. Identifying signs and symptoms of possible deviations from normal or complications
4. Identifying areas of possible learning needs

Anticipation of related potential problems (step 3) is important in the development of a comprehensive plan of care. Evaluation of the need for immediate midwife or physician intervention and/or for consultation or collaborative management with other health care team members (step 4) becomes necessary only when there is deviation from normal, with or without an emergency situation.

Development of a comprehensive plan of care includes the following components:

1. Determination of need for laboratory tests or adjunctive studies to rule out, confirm, or differentiate between possible complications
2. Determination of need for consultation with the physician
3. Determination of need for dietary reevaluation and intervention
4. Determination of instructional measures for meeting learning needs
5. Determination of need for any discomfort relief or treatment measures
6. Determination of need for medication or other measures for treatment of minor complications (e.g., vaginitis, asymptomatic bacteriuria, initial urinary tract infection, borderline anemia)
7. Determination of need for consultations with or referrals to other health professionals (e.g., nutritionist, social worker, public health nurse)
8. Determination of need for more active inclusion of significant others
9. Determination of need for specific counseling or anticipatory guidance
10. Determination of need for HIV counseling (if you are not doing it yourself)
11. Scheduling of the next revisit. Revisits for a woman who is progressing normally through her pregnancy are usually scheduled as follows:
    a. up to 28 weeks' gestation, every 4 weeks
    b. between 28 and 36 weeks' gestation, every 2 weeks
    c. between 36 weeks' gestation and delivery, every week

    For a woman who has her first antepartal visit at 8 weeks' gestation, following this schedule will total 14 visits.

    However, the U.S. Public Health Service Expert Panel on the Content of Prenatal Care in their 1989 Report [16] recommended a reduction in the number of visits for women with normal pregnancies and no medical problems. They proposed a total of eight visits for nulliparas and six visits for multiparas for 40 weeks of gestation. Another visit at 41 weeks was added for pregnancies going beyond 40 weeks.

    Reaction was varied and included the following: (1) concern that outcomes would be negatively affected—especially the number of preterm deliveries and the number of women with preeclampsia and their respective sequella; (2) concerns that there would not be enough time and sufficient contact to adequately address the psychosocial issues of women; and (3) questions about cost effectiveness if women instead used the emergency room for pregnancy discomforts (a situation that would be circumvented with more frequent antepartal visits and related instruction). The Expert Panel recommendation was based in part on the practice in England of a lower number of scheduled visits. There was some concern expressed about superimposing a system of antepartal visits predicated on a system of health care that has provided previous health care, such as England has, onto the system in the United States where for many women prenatal care is their first exposure to the health care system.

    Although most clinicians continue with the traditional schedule of visits, some have experimented with different schedules with a reduced number of visits, ranging from six to ten for nulliparas [17, 18, 19, 20]. The findings indicate that clinical outcomes (obstetric and neonatal) are no different for this selected population. Women with a history of obstetric complications or who later develop them, as well as women who have medical problems, have more frequent visits as dictated by their condition.

The revisit appointment data are indicated on the woman's chart with the notation "RTC _____ weeks." (*RTC*, for *return to clinic*, is an abbreviation universally used to mean the return appointment time, even though the visits may not be to a clinic per se.)

12. Determination of approach to providing antepartal care. An alternative option is Centering Pregnancy [21], a group approach to the provision of antepartal care after the initial visit that breaks with both the traditional individual examination room visit with separate childbirth education classes and the traditional schedule of visits. Groups of 8 to 12 women/couples at approximately the same gestational age are formed between 12 to 16 weeks. They meet monthly for 4 months or sessions, and then biweekly, and once for an early postpartum session for a total of ten 90-minute sessions. A session includes individual risk assessment with self-care components, discussion and education periods, and support activities. Additional individual examination room visits are scheduled if necessary. Further information can be obtained at www.centeringpregnancy.com.

Case Study

The following case study is designed to illustrate how management is based on interpretation of the database starting with the findings obtained during an initial examination and continuing during the subsequent revisit. Because the case study is being presented for a specific purpose, parts of the database that would normally be detailed will instead be either omitted as insignificant for this woman or summarized as "within normal limits (WNL)" so that the parts of the database that will be used will be obvious. The first part of Chapter 2, which discusses the first five steps of the management process, should be reviewed, because those steps are utilized in this presentation. After reading the database, you are encouraged to write down your interpretation of the database, anticipation of related potential problems, and management plan before reading this part of the case study.

Initial Antepartal Examination (February 22)

Step 1. Database Ms. Oceana is a 21-year-old African American, Gravida 1 Para 0 at 24 weeks' gestation by dates, with an LMP of September 5 and an EDB of June 12.

Present Pregnancy History. Experienced quickening in mid-January. This is a planned pregnancy both she and her husband are happy about. They desire natural childbirth. Body changes are seen as evidence of the pregnancy and welcomed. Have continued sexual intercourse without problems. Has been having occasional right-sided pain for the past month, complains of a recurrent malodorous vaginal discharge, and has also felt tired throughout her pregnancy although this has not affected her activities. Otherwise her pregnancy has been uneventful. She is not taking any drugs or medications.

Past Medical History. UCHD. Had both rubeola and rubella as a child. Appendectomy at age 17; no blood transfusion. Otherwise insignificant.

Family History. Paternal grandmother is a diabetic controlled by diet and oral medication. Maternal aunt and uncle are twins. Otherwise insignificant.

Obstetric History. Primigravida.

Menstrual History. Menarche at age 11, every 28 days × 5 days with a heavy flow for the first 3 days. No dysmenorrhea.

Sexual, Contraceptive, and Douching History. Successful and satisfied with use of a diaphragm for past two years without any side effects; douches in connection with removal of the diaphragm, has also douched two to three times a week during her pregnancy because of recurrent malodorous vaginal discharge; sexual frequency is twice a week with no problems.

Social History. High school graduate; working as a secretary in an insurance office. Husband in final year of college; living in married student housing with high population of children and pets (dogs and cats) although they have no pets of their own. Does not drink or smoke. Out of town past 3 months caring for parents in noncontagious health care crisis; both are OK now, but was reason for delay in starting prenatal care. Woman states relationship is stable; denies abuse; husband supportive of pregnancy.

Physical Examination

Temperature: 98.6°F, pulse: 84, respirations: 16
Blood pressure: 120/80
Height: 5'6"
Weight: prepregnant, 150 lb; present, 164 lb
General: woman appears her age, well nourished, and in good physical and emotional health

Hair and skin: WNL
HEENT: WNL
Neck: WNL
Breasts: WNL; nipples erect; plans to breastfeed
Heart and lungs: WNL
Abdomen: WNL; scar in right lower abdomen from appendectomy
Area of right-sided pain identified as being in the right lower quadrant of the abdomen and into the right inguinal region
Fundal height: 26 cm
? breech presentation
FHT: 132 RLQ
EFW: 700 grams
No CVAT
Extremities: WNL

Pelvic Examination. Thick, white, malodorous discharge with plaques on the vaginal walls and cervix; wet smear slide shows branching hyphae and budding spores; otherwise WNL

Clinical pelvimetry:
Inlet:
diagonal conjugate—more than 11.5 cm
forepelvis—slightly narrowed
Midplane:
ischial spines—prominent
sciatic notch—quite wide, 3–4 fb
sidewalls—parallel
sacrum—flat, posterior inclination, and long
Outlet:
intertuberous diameter—more than 8 cm
pubic arch—tight 2 fb
coccyx—movable

Laboratory. Urine negative for protein, 2+ glucose by dipstick (no immediate possible explanation). All other labs negative.

Step 2. Interpretation of the Database The basis (information from the database) for each interpretation will be given.

1. Monilial vaginal infection. *Basis:*
   - **a.** complaint of a malodorous vaginal discharge
   - **b.** history of douching during pregnancy because of a malodorous vaginal discharge
   - **c.** speculum examination revealing thick, white, malodorous discharge and plaques on the vaginal walls and cervix
   - **d.** visualization of branching hyphae and budding spores on a wet smear slide
2. Need for diabetic screening to rule out diabetes. *Basis:*
   - **a.** family history shows paternal grandmother is a diabetic controlled by diet and oral medication
   - **b.** history of recurrent malodorous vaginal discharge during this pregnancy; known diagnosis of monilia at this time, and most likely the previous episodes were also monilial
   - **c.** glycosuria: 2+ glucose by dipstick not related to dietary intake (would have to have occurred twice to be the only basis for screening)
3. Right-sided round ligament pain. *Basis:*
   - **a.** complaint of occasional right-sided pain for the past month
   - **b.** area of pain identified as the right lower quadrant of the abdomen and into the right inguinal region; no s/s of preterm labor
   - **c.** had appendectomy at age 17
4. Borderline pelvis with anthropoid tendency. *Basis:*
   - **a.** clinical pelvimetry findings
     - **(1)** slightly narrow forepelvis
     - **(2)** prominent ischial spines
     - **(3)** wide sciatic notch
     - **(4)** sacrum long and flat with posterior inclination
     - **(5)** pubic arch a tight 2 fb
5. ? breech presentation. *Basis:* abdominal examination of a ? breech presentation; this has no significance at this time
6. Teaching needs:
   - **a.** Re douching, to discontinue this practice. *Basis:* patient history of douching two to three times a week during her pregnancy because of a malodorous vaginal discharge
   - **b.** Re breast care and plans for breast preparation. *Basis:* plans to breastfeed
   - **c.** Re relationship between cats and toxoplasmosis and the need to avoid care or handling of cats and any contact with their excrement. *Basis:* lives in a housing complex with a high population of cats
   - **d.** Re rest periods and positioning while resting, during the day and while at work. *Basis:* works as a secretary in an insurance office
   - **e.** Re relief measures for her right-sided round ligament pain. *Basis:* see 3 above
   - **f.** Re use of the vaginal medication prescribed for treatment of her monilial infection. *Basis:* see 1 above and Step 5, item 13

g. Re classes for preparation for childbirth and parenthood and the La Leche League. *Basis:* desires natural childbirth, plans to breastfeed
h. Re diabetic screening (why and how). *Basis:* see 2 above
i. Re pelvic measurements and question of pelvic adequacy. *Basis:* see 4 above and Step 3

Step 3. Anticipation of Related Potential Problems Possible cephalopelvic disproportion (CPD) yielding possible cesarean section. *Basis:* borderline pelvis with anthropoid tendency

Step 4. Need for Immediate Intervention or Consultation Neither is indicated at this visit.

Step 5. Management Plan Each item in the management plan will be correlated with the related interpretation of the database and subsequent anticipated problems, or marked with an asterisk (*) to denote that this is a routine item of management of the woman at the initial antepartal visit.

*1. Pap smear (done during pelvic examination)
*2. Specimen for GC and chlamydia testing (done during pelvic examination)
3. PPD test for tuberculosis (risk factors: married student housing; African American)
*4. ABO and Rh
*5. Antibody screen/antibody titers
6. Sickle cell prep or hemoglobin electrophoresis (risk factor: African American)
*7. Rubella titer
8. Varicella antibody screen (no history of disease or vaccine)
*9. VDRL or RPR
*10. Hepatitis B surface antigen
*11. Hemoglobin and hematocrit
*12. Urinalysis and urine culture
13. Monistat cream; one applicatorful intravaginally hs × 7 days (treatment of monilial vaginal infection; correlates with interpretations 1 and 6f)
14. Schedule and instruct for a 1-hour glucose challenge test (see Chapter 24) (diabetic diagnostic screening test that correlates with interpretations 2 and 6h)
15. Reevaluate pelvis upon entry into labor in relation to estimated size of the baby (correlates with interpretation 4 and anticipated potential problem of CPD)
16. Teaching about the following (correlates with interpretation 6):
    a. not douching
    b. breast care and plans for breast preparation in her last month of pregnancy
    c. cats and toxoplasmosis
    d. rest periods and positioning
    e. round ligament pain relief measures
    f. how to insert and use the Monistat vaginal cream
    g. names and telephone numbers for teachers of classes in preparation for childbirth and parenthood and for La Leche League
    h. diabetic screening and test instructions
    i. pelvic measurements, pelvic adequacy, CPD, and possible C-section
*17. RTC for dietary history and calculation of nutritional intervention in 1 week
*18. RTC for antepartal revisit in 4 weeks

First Antepartal Revisit (March 22)

Step 1. Database

Chart Review. See initial antepartal examination for name; age; parity; significant findings; identified problems and treatment; desires and plans of the woman, and teaching done; medications; and dietary requirements determined at her nutritional visit on March 1.

Results from the laboratory tests and adjunctive studies ordered at the initial visit are as follows:

1. Pap smear: class 1
2. GC testing: no *Neisseria gonorrhoeae* seen
3. Chlamydia testing: negative
4. PPD: negative
5. Blood group: O, Rh positive
6. Antibody screen: negative
7. Rubella titer: more than 1:30 (immune)
8. Varicella antibody screen: negative
9. Hemoglobin electrophoresis:
   Hemoglobin A_1 98%
   Hemoglobin A_2 2%
10. VDRL: negative
11. HBsAg: negative
12. Hemoglobin: 9.8 milligrams; hematocrit: 29%
13. Microscopic urinalysis: negative; urine culture: less than 50,000 colony count
14. 1-hour 50-gram glucose challenge test: 120 milligrams/deciliter

Today Ms. Oceana is 28 weeks' gestation by dates.

History

Basic revisit history (see earlier in this chapter) is negative.

Accuracy of LMP and EDB reconfirmed with Ms. Oceana.
Complains of continuing fatigue. Is resting midmorning, noon, and midafternoon at work, and when she first arrives home after work, as discussed at her last visit.
Relief measures for round ligament pain have been helpful and this is not keeping her awake any more.
Used full regimen of Monistat cream and is no longer having malodorous vaginal discharge.
Has not douched since her last visit.
Is avoiding cats and wears gloves for gardening.
Has contacted both a teacher of Lamaze classes and a local member of the La Leche League. She and her husband attended their first Lamaze class last night and enjoyed it. Is realistic, but hopeful, re vaginal birth.
No problems with her dietary requirements; appetite good.

Physical Examination
Blood pressure: 130/84
Weight: 167 pounds
Breasts: adequate support, no crusts on nipples
Abdominal examination:
vertex presentation; ? position; not engaged
fundal height: 32 centimeters
fetal heart tones: 132 RLQ
estimated fetal weight: 1600 grams
many small parts easily felt
abdomen soft
No CVAT
No edema of the upper or lower extremities
Knee-jerk reflexes: 2+

Pelvic Examination. Speculum examination for TOC not necessary if the woman is asymptomatic.

Laboratory. Urine negative for protein and glucose

Step 2. Interpretation of the Database The basis (information from the database) for each interpretation will be given.

1. Monilial infection cured. *Basis:* no further complaint of malodorous vaginal discharge
2. Not diabetic. *Basis:* 1-hour glucose challenge test result within normal limits.
3. Measures for round ligament pain effective. *Basis:* statement of effectiveness during history
4. Anemia. ? iron deficiency anemia. *Basis:*
   a. hemoglobin 9.8 milligrams
   b. hematocrit 29%
   c. fatigue throughout pregnancy (from initial and revisit history)
   d. heavy menstrual periods (from initial history)
   e. hemoglobin electrophoresis normal, thus ruling out sickle cell anemia and other abnormalities of hemoglobin
5. Need to rule out multiple gestation or a single large-for-dates fetus. *Basis:*
   a. fundal height of 32 centimeters is greater than expected for 28 weeks' gestation
   b. fundal height of 26 centimeters at 24 weeks' gestation (early sign of trend?)
   c. estimated fetal weight in accord with 31 to 32 weeks' gestation rather than 28 weeks' gestation
   d. many small parts easily felt; indicative of multiple gestation if not a posterior position
   e. unsure of fetal position; indicative of multiple gestation
   f. soft abdomen and ease in feeling small parts rule out polyhydramnios as a possible explanation of the discrepancy between gestational age by dates and by clinical findings
   g. LMP and EDB confirmed, which rules out inaccuracy in determining gestational age by dates
   h. only one fetal heart heard, which is indicative of a single large-for-dates fetus
   i. family history of fraternal twins on maternal side

Step 3. Anticipation of Related Potential Problems Need diagnoses before further potential problems can be identified.

Step 4. Need for Immediate Intervention or Consultation Neither of these is indicated at this time. Consultation/collaboration with your consulting physician may be indicated later in this visit, or at the next visit, depending on the ultrasonography findings and the anemia work-up test results.

Step 5. Management Plan Each item in the management plan will be correlated with the related interpretation of the database.

1. Interpretation 1: share conclusion with Ms. Oceana.
2. Interpretation 2: share results of diabetic screening test with Ms. Oceana.
3. Interpretation 4:
   a. complete blood count with differential

   b. reticulocyte count
   c. serum iron
   d. serum ferritin
   e. total iron-binding capacity (TIBC)
   f. platelet count
   g. iron prescription: ferrous sulfate 65 mg of elemental iron po BID; ensure adequate supply
   h. increase dietary iron enhanced with vitamin C in orange juice
   i. prescribe vitamin C 250 mg po BID to be taken with meals
   j. discuss with Ms. Oceana findings, concerns, probable reason for her fatigue, need to recover from her caretaking of her parents, possible need for further tests, and faithful adherence to medication regimen
4. Interpretation 5:
   a. ultrasound scan to rule out multiple gestation and to determine fetal position
   b. discuss with Ms. Oceana findings, possible reasons for discrepancy between gestational age by dates, clinical findings, and ultrasound
5. RTC in 2 weeks

Common Discomforts of Pregnancy and Their Relief Measures

Not all women experience all of the following common discomforts of pregnancy, but many women experience a few to a great number of them. Relief from these discomforts can make a significant difference in how a woman views her pregnancy experience. The physiological, anatomical, and psychological bases for each discomfort (if known) are given to stimulate your thinking about further possible relief measures. Relief measures are predicated on the causes of the discomfort and are geared toward symptomatic management. Not all relief measures work for all women. The more relief measures you know for each discomfort—or can dream up on the basis of your knowledge and understanding of the cause of the discomfort—the better the chance that at least one of them will be helpful.

Nausea

Nausea, with or without vomiting, is erroneously called morning sickness but most often occurs during the day or evening or all day long. It is more apt to occur when the stomach is empty, so it is usually worse in the morning. The cause of morning sickness is not really known, although a number of ideas have been advanced. These include hormonal changes of pregnancy, low blood sugar (perhaps caused by not eating, thereby creating a vicious cycle), gastric overloading, slowed peristalsis, and emotional factors. About half of women with nausea and vomiting are over it by 14 weeks' gestation and 90 percent by 22 weeks [22]. Women with a multiple gestation often have longer-lasting and more severe nausea and vomiting [23]. Nausea is a common problem occurring in over half to three-quarters of pregnant women—so common, in fact, that it is a presumptive sign of pregnancy. The peak prevalence of nausea and vomiting in pregnant women is at 11 weeks' gestation, with the average time of onset between 5 to 6 weeks [22]. Fortunately, nausea and vomiting are limited discomforts. There is little support for the idea that nausea and vomiting of pregnancy, especially severe nausea and vomiting, reflects the transformation of psychological distress into physical symptoms [24]. Rather, it is more likely that biological, psychological, and sociocultural factors have an intricate relationship in nausea and vomiting that is poorly understood but for some women is amenable to hypnosis [24]. Persistent and severe nausea and vomiting beyond the first trimester may indicate hyperemesis gravidarum or hydatidiform mole (see Chapter 24).

The relief measures for morning sickness are numerous. One or all or any combination or none may be effective for a particular individual. It gives most women some comfort and relief just to be trying something to ease the problem. The following suggestions can be made:

1. Eat small, frequent meals, even as often as every 2 hours, as these are more apt to be retained than three large meals a day.
2. Eat dry crackers or toast before getting up in the morning.
3. Do not brush your teeth immediately after eating to avoid stimulating the gag reflex.
4. Drink carbonated beverages—especially ginger ale.
5. Avoid foods with strong or offensive odors.
6. Restrict fats in your diet.
7. Try acupressure wristbands.
8. Keep in mind that nausea will most likely end sometime during the second trimester.
9. Rest.

10. Use medication. There are two issues with the use of drugs: (1) teratogenicity and (2) effectiveness. The overriding concern is possible teratogenic effects of a drug on the embryo or fetus during this period of time (see Figure 21-5). Midwives are cautious when it comes to the use of drugs that have not been extensively studied for teratogenic effects.

    The anti-nausea drug known as Bendectin in the United States, which contained pyridoxine (vitamin B_6) and doxylamine, is safe for use in the first trimester. However, it was removed from the market because of litigation brought against the manufacturer that claimed congenital malformations resulting from use of the drug. This legal action was taken despite 19 epidemiologic studies that showed no increased risk of congenital malformations [23, 25]. This has led to use of medications about which less is known. Although antihistamines have been shown to have some effectiveness and are generally considered to be safe during pregnancy, no major epidemiological studies, with the exception of doxylamine, have been done to look for possible adverse effects on the fetus [23].

    Nonpharmacologic therapies are the first line of treatment for nausea and vomiting. If these measures are not effective and the woman is miserable, losing time at her job, or otherwise unable to keep up with her daily routine, the midwife can recommend the use of pyridoxine (vitamin B_6) either 25 mg QID or 50 mg BID, available over-the-counter. If the woman still has a problem with nausea and vomiting, even if a reduced problem, add the other effective ingredient that was in Bendectin, which was doxylamine [25]. Doxylamine, an antihistamine, is sold over-the-counter in 25 mg tablets as the hypnotic drug Unisom. Possible dosages include 50 mg of pyridoxine and 1 Unisom tablet at bedtime in addition to 25 mg pyridoxine BID; or, 25 mg pyridoxine and one-half of a Unisom tablet TID with a warning to the woman about possible drowsiness.

In addition, communicate to the woman's significant others to provide her with considerate, understanding, loving treatment with special attention to the little things that are important to her.

Ptyalism (Excessive Salivation)

Ptyalism is an unusual condition that may be caused either by increased acidity in the mouth or by the intake of starch, stimulating the salivary glands in women susceptible to excessive secretion. Women who have ptyalism frequently are also nauseated. Their condition becomes cyclic, for not only does the excessive saliva intensify the nausea but also the desire to avoid nausea causes the patient to swallow less, thus increasing the amount of saliva in the mouth.

Fatigue

Fatigue occurs during the first trimester for no known reason. One idea is that it results from the initial fall in the basic metabolic rate early in the pregnancy, but why this happens is not clear. Another idea is that the increase in progesterone has a sleep-inducing effect. Fortunately, it is a limited discomfort, usually disappearing by the end of the first trimester. It can have the effect of increasing the intensity of the psychological responses the woman is having during this time.

The relief measures are to reassure the woman of the normality of fatigue and its spontaneous remission by the second trimester. It will help her to have frequent rest periods if possible during the day until this passes. Mild exercise and good nutrition also combat fatigue.

Upper Backache (Nonpathological)

Upper backache develops during the first trimester because of the increase in size and resulting heaviness of the breasts, which is one of the presumptive signs of pregnancy. This enlargement may produce muscular strain if the breasts are not adequately supported.

The relief measure, then, is a well-fitting and supportive brassiere. The characteristics of a good bra are listed later in this chapter in the discussion of instruction and anticipatory guidance. By decreasing breast mobility, a snug, supportive bra also reduces the discomfort of breast tenderness resulting from enlargement.

Leukorrhea

Leukorrhea is a profuse, thin or thick vaginal secretion that begins during the first trimester. The secretion is acidic because of the conversion of an increased amount of glycogen in the vaginal epithelial cells into lactic acid by Döderlein's bacilli. Although this serves the function of protecting the mother and fetus against possible harmful infection, it does provide a medium that fosters the growth of the organisms responsible for vaginitis. The productivity of the cervical glands in secreting an increased amount of mucus at this time to form the cervical mucus plug may also contribute to leukorrhea. Relief measures are close attention to bodily

cleanliness in the area and frequent changes of cotton-crotch panties. The woman should not douche or use feminine hygiene sprays.

Urinary Frequency (Nonpathological)

Urinary frequency as a nonpathological discomfort of pregnancy often occurs at two different times during the antepartal period. Frequency during the first trimester is due to the increased weight in the fundus of the uterus, with the softening of the isthmus (Hegar's sign) causing increased anteflexion of the enlarging uterus, which exerts direct pressure on the bladder. This pressure lessens as the uterus continues to enlarge and rises out of the pelvis to become an abdominal organ while the bladder remains a pelvic organ. Urinary frequency during the third trimester occurs most often in primigravidas, after lightening has occurred. The effect of lightening is that the presenting part descends into the pelvis and causes direct pressure against the bladder. The pressure makes the woman feel the need to urinate. The enlarging uterus or the presenting part also takes up space in the pelvic cavity, thereby allowing less room for distention of the bladder before the woman feels the need to urinate. Also to be remembered is the reversal of the usual diurnal pattern to nocturia as dependent edema accumulated during the day is excreted (see the discussion of maternal physiological changes in Chapter 21).

The only relief measures are an explanation of why this is happening and a decrease in fluid intake before bedtime so that the woman need not make many trips to the bathroom when she is trying to sleep.

Heartburn

Heartburn—a discomfort that may start toward the end of the second trimester and extend through the third trimester—is another word for regurgitation, or the reflux, of acidic gastric contents into the lower esophagus by reversed peristalsis. The gastric contents are acidic by virtue of the hydrochloric acid in the stomach. This acidity causes the material to burn the throat and taste bad. The causes of heartburn are thought to be as follows:

1. Relaxation of the cardiac sphincter of the stomach due to the effects of increased amounts of progesterone
2. Decreased gastrointestinal motility resulting from smooth muscle relaxation, which is probably due to increased amounts of progesterone and uterine pressure
3. Lack of functional room for the stomach because of its displacement and compression by the enlarging uterus

There are numerous relief measures for heartburn. Finding the combination that will help an individual woman is largely a matter of trial and error. The following suggestions can be made:

1. Eat small, frequent meals, to avoid overloading of your stomach.
2. Maintain good posture, to give more room for your stomach to function; slumped posture only adds to the problem by allowing further pressure on your stomach.
3. Stretch your arms high over your head, to give room for your stomach to function.
4. Avoid fats with meals; fat depresses both motility of the stomach and the secretion of gastric juices needed for digestion.
5. Avoid beverages with meals, since liquids tend to inhibit gastric juices; a dry diet without breadstuffs has helped some women.
6. Avoid very cold foods with meals.
7. Avoid spicy foods or other foods causing indigestion.
8. Drink cultured milk rather than sweet milk; this has helped some women.
9. Drink skim milk and/or eat low-fat ice cream; this has helped some women.
10. Avoid heavy foods or a full meal just before bedtime.
11. Use antacid preparations with aluminum hydroxide, magnesium hydroxide, or magnesium trisilicate (e.g., Maalox, Mylanta, Gaviscon, Gelusil), Amphojel, and milk of magnesia. Sodium bicarbonate (Alka-Seltzer) should be avoided as sodium could increase edema [17].

Flatulence

Increased flatulence is thought to be due to decreased gastrointestinal motility. This probably results both from the effect of increased progesterone on relaxing smooth muscle and from the displacement of and pressure on the intestines by the enlarging uterus.

The only relief measures are a regular pattern of daily bowel movements and avoidance of gas-forming foods. The knee-chest position will help with discomfort from unexpelled gas.

Constipation

Women previously without a problem of constipation may develop this problem during the second or

third trimester. Constipation is thought to result from decreased peristalsis caused by relaxation of the smooth muscle of the large bowel in the presence of increased amounts of progesterone. The displacement and compression of the bowel by the enlarging uterus or presenting part may also contribute to decreased motility in the gastrointestinal tract and thus to constipation. One of the common side effects of iron medication is constipation; this compounds the problem for a large percentage of pregnant women.

The following relief measures for constipation are most effective when all are used in combination. Medication should be used only if the natural methods are not sufficient.

1. An adequate fluid intake, defined as a minimum of eight glasses (drinking-glass size) per day
2. Prunes or prune juice; prunes are a natural mild laxative
3. Adequate rest; this may require rest periods during the day
4. Warm liquids (e.g., water, tea) on rising, to stimulate peristalsis
5. Foods that contain roughage, bulk, and natural fiber (e.g., lettuce, celery, bran)
6. Establishment of regular and good bowel habits; this includes establishing a regular time of day for having a bowel movement and being conscious of not ignoring the "urge" or delaying having a bowel movement
7. General exercise, a daily walk, good posture, good body mechanics, and daily exercise of contracting the lower abdominal muscles; all of these measures facilitate venous circulation, thereby preventing congestion in the large intestines
8. Mild laxatives, stool softeners, and/or glycerin suppositories if indicated

Hemorrhoids

Hemorrhoids often are preceded by constipation. Therefore, all the causes of constipation have the potential of leading to the development of hemorrhoids. Progesterone also causes relaxation of the vein walls and of the large bowel. In addition, the enlarging uterus causes increasing pressure—specifically in the hemorrhoidal veins as well as generally; the pressure interferes with venous circulation and causes congestion in the pelvic veins.

There are a number of relief measures for hemorrhoids. Some solely give comfort; others both numb and reduce the hemorrhoids. The latter are noted in the following listing of relief measures for hemorrhoids:

1. Avoidance of constipation—prevention is the most effective measure
2. Avoidance of straining during defecation
3. Sitz baths; the heat of the water not only gives comfort but also increases circulation
4. Witch hazel compresses (for reduction)
5. Ice bag (for reduction)
6. Epsom salt compresses (for reduction)
7. Reinsertion of the hemorrhoids into the rectum (using lubrication) in conjunction with perineal tightening (Kegel) exercises
8. Bedrest with hips and lower extremities elevated
9. Analgesic ointments and/or topical anesthetics
10. Preparation H

Leg Cramps

The physiological basis for leg cramps is not clear. For a number of years, leg cramps were thought to be caused by inadequate or impaired calcium intake or an imbalance in the calcium-phosphorous ratio in the body, but these causes are no longer stated in current literature. Another school of thought is that the enlarged uterus exerts pressure either on the pelvic blood vessels, thereby impairing circulation, or on the nerves as they course through the obturator foramen on their way to the lower extremities. Relief measures are as follows:

1. Have the woman straighten her affected leg and point her heel (i.e., dorsiflex her foot). If the woman is in bed, she needs strong, steady pressure against the bottom of her foot, either someone's hand or the footboard of the bed, to push against; if she is standing, the floor serves this function. This measure is nearly guaranteed to instantly alleviate an acute leg cramp.
2. Encourage general exercise and a habit of good body mechanics to improve circulation.
3. Recommend leg elevation periodically throughout the day.
4. Recommend a diet that includes both calcium and phosphorous.

Dependent Edema

Dependent pedal edema is the result of impaired venous circulation and increased venous pressure in the lower extremities. These circulatory disturbances are caused by pressure of the enlarging

uterus on the pelvic veins when the woman is sitting or standing and on the inferior vena cava when she is supine. Any constrictive clothing that inhibits venous return from the lower extremities adds to the problem. Dependent edema is generally evidenced in the ankles and feet and must be carefully differentiated from edema associated with preeclampsia/eclampsia (see Chapter 24). Relief measures include the following:

1. Avoidance of constrictive clothing
2. Elevation of the legs periodically throughout the day
3. Positioning on the side when lying down
4. A maternity abdominal support or girdle, which may take the pressure off the pelvic veins

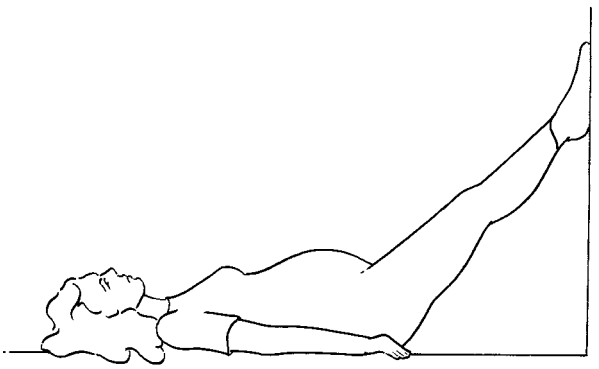

FIGURE 22-1 Right-angle position.

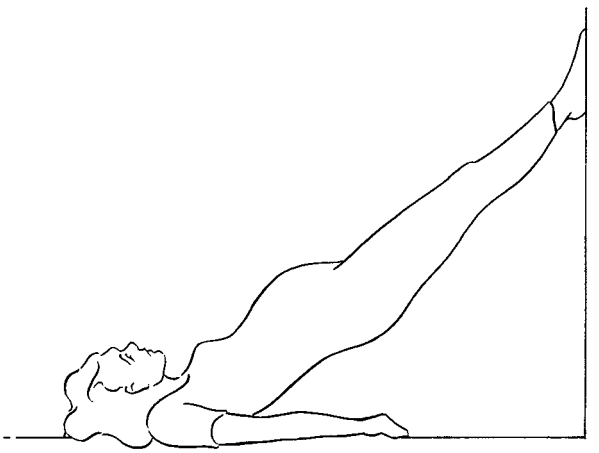

FIGURE 22-2 Incline position.

Varicosities

A number of factors may contribute to the development of varicosities during pregnancy. Varicose veins are more apt to occur in women who have a familial tendency or congenital predisposition. Varicosities may result from impaired venous circulation and increased venous pressure in the lower extremities; these changes are caused by pressure of the enlarging uterus on the pelvic veins when the woman is sitting or standing and on the inferior vena cava when she is supine. Any constrictive clothing inhibiting venous return from the lower extremities or prolonged periods of standing add to the problem. Progesterone-induced relaxation of the vein walls and valves and surrounding smooth muscle also contributes to the development of varicosities.

Varicosities during pregnancy are most pronounced in the legs and/or vulva. Relief measures specific to vulvar varicosities are so noted in the following list of suggestions to a woman:

1. Use support hose, Ace bandages, or elastic stockings; whichever is used should be put on after elevating your legs and before arising.
2. Avoid constrictive clothing (e.g., knee-high or ankle hose, round garters).
3. Avoid long periods of standing.
4. Have rest periods, with your legs elevated, periodically throughout the day.
5. Lie in the right-angle position several times daily (Figure 22-1).
6. Assume the incline position several times daily (for vulvar varicosities) (Figure 22-2).
7. Keep your legs uncrossed when sitting.
8. Sit whenever possible, preferably with your legs elevated, rather than standing.
9. Maintain good posture and good body mechanics.
10. Engage in mild exercise and walking, to facilitate increased circulation.
11. Provide physical support for vulvar varicosities with a foam-rubber pad held in place with a sanitary belt.
12. Wear a maternity abdominal support or girdle, to relieve pressure on your pelvic veins.
13. Do Kegel exercises for vulvar varicosities or hemorrhoids, to increase circulation.
14. Take warm, soothing baths.

Dyspareunia

Pain during sexual intercourse may stem from a number of causes during pregnancy. Physiological changes may be responsible, such as pelvic/vaginal congestion resulting from impaired circulation

caused by pressure of the enlarging uterus or the presenting part. Physical problems may be posed by an enlarged abdomen or may be encountered in late pregnancy when the presenting part descends into the true pelvis. Psychological factors may cause dyspareunia because of misconceptions and fears of hurting the baby when there is no basis for this concern unless there is vaginal bleeding or the membranes have ruptured. Appropriate relief measures depend on the causes.

1. Positional changes will alleviate problems that are caused by an enlarged abdomen or pain from deep penetration.
2. Ice may reduce accessible congestion but imposes its own discomforts.
3. Discussion of misconceptions and fears and the provision of facts may reassure the woman.
4. Both partners may welcome information on alternative ways of sexually satisfying each other.

Nocturia

In addition to the urinary frequency of the first trimester and possibly the third trimester discussed earlier, nocturia is thought to have a physiological basis. Venous return from the extremities is facilitated when the woman lies in a recumbent lateral position, since the uterus is no longer pressing against the pelvic vessels and inferior vena cava. When the woman lies in this position while sleeping at night, the result is a reversed diurnal pattern, which yields increased urinary output. The only relief measures consist of whatever comfort she derives from an explanation of why this is happening and reduction of fluids after the evening meal so her intake during this time does not add to the problem.

Insomnia

Insomnia in both pregnant and nonpregnant women may be due to any number of causes such as concerns, anxieties, or excited anticipation of an event the next day. The pregnant woman, however, has additional, physical reasons for insomnia. These include the discomfort of the enlarged uterus, other discomforts of pregnancy, and fetal movement, especially if the fetus is active. The time-honored relief measures for insomnia may or may not be effective. For many women they are at least something to do.

1. Warm baths
2. Warm drink (milk, decaffeinated tea with milk) before going to bed
3. Nonstimulating activity prior to going to bed
4. Use relaxation positions (e.g., Figure 22-3)
5. Use the technique of progressive relaxation

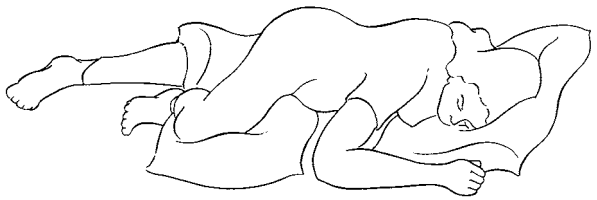

FIGURE 22-3 Side-lying relaxation position.

Round Ligament Pain

The round ligaments attach on either side of the uterus just below and in front of the insertion of the fallopian tubes; they then cross the broad ligament in a fold of peritoneum, pass through the inguinal canal, and insert in the anterior (upper) portion of the labia majora on either side of the perineum. The ligaments are composed largely of smooth muscle that is continuous with the smooth muscle of the uterus. This muscle tissue enables the round ligaments to hypertrophy during pregnancy and, in essence, stretch as the uterus enlarges. It is anatomically mandatory that the round ligaments be able to increase in length as the uterus rises high into the abdomen. Round ligament pain is thought to result from this stretching and possibly from the pressure of the increasingly heavy uterus on the ligaments. It is a common discomfort that must be differentiated from gastrointestinal tract and abdominal organ disease (e.g., appendicitis, gallbladder inflammation, and peptic ulcer). One feature that aids in this differentiation is the extension of pain into the inguinal area, which, among the conditions mentioned, is peculiar only to round ligament pain.

Relief measures are few and not always effective. Round ligament pain is one of the discomforts that a pregnant woman simply has to put up with. Explanations of why she is having pain will at least alleviate anxieties or fears and may help her to cope. Additional measures include the following:

1. Flexing her knees onto her abdomen
2. Bending toward the pain to ease the stretch on the ligament
3. Pelvic tilt
4. Taking warm baths
5. Applying a heating pad to the area; this relief measure should be used only if you are sure the pain is not caused by any medical complication such as appendicitis

6. Supporting the uterus with a pillow under it and a pillow between her knees when lying on her side (Figure 22-3)
7. Wearing a maternity abdominal support or girdle

Low Back Pain (Nonpathological)

Low back pain is backache in the lumbosacral region. The pain usually increases in intensity as the pregnancy progresses, because it results from a shift in the woman's center of gravity and thus in her posture; these changes are produced by the weight of the enlarging uterus. Unless the woman pays deliberate attention to her posture, she will walk with a swayback from increasing lordosis. This curvature strains the back muscles and causes the ache or pain. It has been suggested that students who have not experienced pregnancy should tie a 10-pound bag of sugar or flour around their waists and walk around with it to get an idea of what this localized weight does to the back.

The problem is exaggerated if the woman's abdominal muscles are lax; they fail to give any support to the heavy enlarged uterus. Without support the uterus sags, a condition that increases the curvature of the back still further. Weakness of the abdominal muscles is more common in grand multiparas who have not exercised and regained their abdominal muscle tone after each pregnancy. Primigravidas usually have excellent muscle tone, because their muscles have not been stretched before. Low back pain, thus, generally increases in severity with parity.

Backache may also result from excessive bending, walking without rest periods, and lifting, especially if any or all of these are done when the woman is tired. Such activities add strain to the back. Proper body mechanics for lifting are essential to avoid this type of muscular strain. There are two principles to be followed:

1. Stoop, rather than bend, to lift anything (e.g., toddler, groceries) so that the legs (thighs), rather than the back, bear the weight and strain.
2. Spread the feet apart and place one foot slightly in front of the other when stooping so there is a broad base for balance when rising from the stooped position (Figure 22-4).

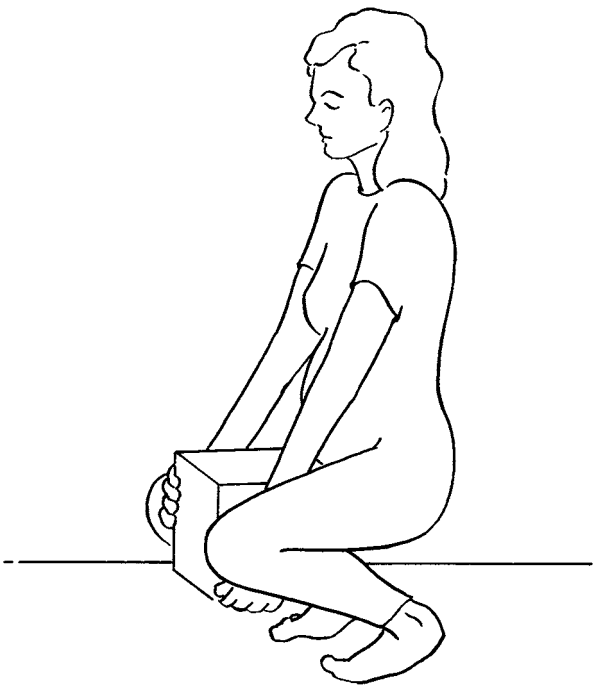

FIGURE 22-4 Proper position for lifting.

Relief measures for low back pain are as follows:

1. Good posture
2. Proper body mechanics for lifting
3. Avoidance of excessive bending, lifting, or walking without rest periods
4. Pelvic rock/pelvic tilt
5. Supportive low-heeled shoes; high heels are unstable and further exaggerate the problem of the center of gravity and lordosis
6. If the problem is severe, external abdominal support is advisable (e.g., a maternity girdle or supportive elastic "Belly Band")
7. Warmth (not too hot) on the back (e.g., heating pad, warm bath, sitting in a warm shower)
8. Ice packs on the back
9. Massage/back rub
10. For resting or sleeping:
    a. a supportive mattress
    b. positioning with pillows to straighten the back and alleviate pulling and strain

Hyperventilation and Shortness of Breath (Nonpathological)

It is thought that the increased amount of progesterone during pregnancy acts directly on the respiratory center to lower the carbon dioxide levels and increase the oxygen levels. Increased oxygen levels benefit the fetus. The increased metabolic activity that occurs with pregnancy causes an increase in carbon dioxide levels; hyperventilation lowers car-

bon dioxide levels. Women may experience this effect of progesterone early in the second trimester. (See the section on maternal physiological changes in Chapter 21.)

Shortness of breath is largely a discomfort of the third trimester. During this time, the uterus has enlarged to the point of pressing on the diaphragm. In addition, the diaphragm elevates approximately 4 centimeters during pregnancy. Although there is some widening of the transverse diameter of the thoracic cage, it is not sufficient to compensate for the elevation of the diaphragm, and a decrease in both the functional residual capacity and the residual volume of air results. This combined with the pressure being exerted on the diaphragm (possibly decreasing still further the functional residual volume) causes a feeling or awareness of slight difficulty in breathing and shortness of breath. Many women tend to respond to this by hyperventilating.

The midwife can offer the following relief measures for hyperventilation:

1. Explain the physiological basis of the problem.
2. Encourage the woman to deliberately regulate the speed and depth of her respirations at normal rates when she is aware of hyperventilating.
3. Teach the woman how to alleviate shortness of breath as a causative factor (described below).

The relief measures for shortness of breath are geared toward providing more room for abdominal contents, thereby reducing the pressure on the diaphragm and facilitating lung functioning. These are as follows:

1. Have the woman periodically stand up and s—t—r—e—t—c—h her arms above her head and take a deep breath.
2. Encourage good posture; no slumping of shoulders.
3. Teach the woman to do intercostal breathing.
4. Instruct her to do the same stretching when in bed as when standing.
5. Explain the reasons for shortness of breath; alleviation of anxieties or fears will reduce a response of hyperventilation.

Tingling and Numbness of Fingers

The change in the center of gravity resulting from the enlarged and heavy uterus may cause the woman to assume a posture in which her shoulders are too far back and her head is anteflexed in an effort to counterbalance her heavy front and curved back. This posture is thought to cause compression of the median and ulnar nerves in the arm, which would cause tingling and numbness of the fingers. Hyperventilation may also cause finger tingling and numbness, but most women do not hyperventilate enough as a result of pregnancy to have this effect. Relief measures include an explanation of the probable cause and encouraging scrupulous attention to good posture. Some women obtain relief simply by lying down.

Another possible explanation for finger tingling and numbness is carpal tunnel syndrome. Edema reduces the available space in the carpal tunnel through which the median nerve passes (see Chapter 7). Compression of the nerve causes these symptoms, which are usually bilateral, vary in severity, and at times become distressingly painful. Starting in the second or third trimester, the symptoms usually occur at night and resolve themselves by two weeks postpartum. Treatment is designed to alleviate symptoms and consists of wrist splints that keep the wrist in a neutral position and are worn while sleeping.

Supine Hypotensive Syndrome

Supine hypotensive syndrome causes the woman to feel faint; she may pass out if the problem is not immediately alleviated. Supine hypotensive syndrome occurs when the woman lies in a supine position (such as for sleep or on an examining table), because the full weight of the enlarged uterus and its contents is on the inferior vena cava and other vessels of the venous system. Venous return from the lower half of the body is inhibited, which in turn reduces the amount of blood filling the heart and subsequently lowers cardiac output. Supine hypotensive syndrome is actually obvious arterial hypotension. In addition, the weight of the enlarged uterus compresses the aorta, which also results in deleterious changes in arterial pressure.

Supine hypotensive syndrome is alleviated immediately by simply having the woman either turn on her side or sit up. Reassurance and explanation are essential, since she is likely to be frightened.

Nutritional Intervention in Pregnancy

Importance of Nutrition

The quality of life is inseparably bound not only to prenatal care in general but also to prenatal and

postnatal nutrition and environmental influences specifically. If prenatal nutrition has been inadequate, scrupulous attention to postnatal nutrition is like locking the barn door after the horse has been stolen—it is at best merely salvaging what remains.

The genetic design for fetal growth and development is determined by the genetic constitution of the individual fetus; however, it is influenced by maternal factors. Maternal factors cannot improve the genetic design, but some factors prohibit fulfillment of the design. Prohibitive factors include prenatal malnutrition, smoking, and maternal disease.

Birth weight is used as the standard evaluative measurement of a newborn all over the world, inasmuch as it is the most accurate and routinely obtained measurement. The importance of the newborn's birth weight and the importance of the factors that influence the birth weight have been identified and enumerated in a number of studies [26–35].

Maternal disease may affect the fetus in a number of ways. Maternal disease may lead to either a small-for-gestational-age infant (e.g., as a result of preeclampsia) or a large-for-gestational-age infant (e.g., as a result of gestational diabetes). Because smoking interferes with metabolic processes, it has been correlated with babies that are significantly smaller by birth weight than the babies of nonsmoking mothers.

Many studies focus on the effect of malnutrition on pregnancy outcome. This is because nutrition is a factor in all pregnancies, whereas smoking and maternal disease affect only the babies of mothers who smoke or are ill. Therefore, when these two factors (smoking and maternal disease) are controlled, differences in birth weight are directly related to nutrition during pregnancy. Maternal nutritional factors that have been shown to relate to birth weight are (1) prepregnancy weight and (2) weight gain during pregnancy.

One other factor that has an obvious direct correlation with birth weight is gestational age. As the length of gestation increases, there is an increase in birth weight (see Chapter 21). It has also been shown that male babies weigh more than female babies by an average of approximately 144 grams (5 ounces) and that birth weight increases with parity.

Other maternal factors have been studied but do not correlate with birth weight when prepregnancy weight, weight gain during pregnancy, maternal disease, and smoking are controlled. Maternal factors that do *not* correlate with birth weight include age, height, marital status, and income.

Whether it results from prematurity or from the baby's being small for gestational age, low birth weight has been shown to correlate with an increased incidence of the following:

1. Perinatal mortality (stillbirth, neonatal death)
2. Small head circumference
3. Mental retardation
4. Cerebral palsy
5. Learning problems/disabilities
6. Visual and hearing defects
7. Neurologic defects
8. Poor infant growth (stunted) and development

Conversely, a high maternal weight gain has been shown to be associated with an increased birth weight and, therefore, with the following:

1. Reduction in the rate of prematurity
2. Better postnatal growth (height and weight) as measured at 8 months and better performance (neurological, motor, and mental) as measured at 12 months in the Collaborative Study of Cerebral Palsy [28]
3. Decreased incidence of the detrimental outcomes associated with low birth weight

Furthermore, brain growth may be directly affected by maternal nutrition. There are two types of cellular growth: (1) hyperplasia, in which there is an increase in the number of cells by cell division, and (2) hypertrophy, in which there is an increase in the size of the existing cells. Malnutrition during either type of cellular growth results in a smaller organ. If the fetus suffers malnutrition during hyperplastic growth, the damage is irreversible, since the smaller size of the brain is due to a reduced number of cells. If the fetus suffers malnutrition during hypertrophic growth, the damage is reversible at any time with improved nutrition, since the smaller size of the brain results from a lack of increase in the size of the cells. Although the details of human brain growth are not known, it is generally thought that the bulk of cellular growth of the brain is from 15 weeks gestation to 2 years of age, with a peak from 28 weeks gestation to 6 months after birth. Most likely this peak period of brain growth reflects the second of the sequential three phases of growth: (1) hyperplasia only, (2) combination of hyperplasia and hypertrophy, and (3) hypertrophy only.

Thus the profound effect of malnutrition during gestation becomes obvious. However, the impact of malnutrition becomes even greater when the

causes of intrauterine growth failure are considered. Two causes have been identified: (1) uteroplacental insufficiency and (2) malnutrition or, specifically, maternal protein deficiency. With uteroplacental insufficiency, fetal growth retardation is asymmetric; that is, the body and body organs are small but the brain is of normal size with its full complement of cells. With malnutrition, fetal growth retardation is symmetric; that is, the body, body organs, and brain are all reduced both in size and in the number of cells by approximately the same percentage amount. Studies of rats show that prenatal malnutrition results in a 15 percent reduction in the number of fetal brain cells, that postnatal malnutrition results in a 15 percent reduction in the number of brain cells, and that a combination of prenatal and postnatal malnutrition results not in a 30 percent but in a 60 percent reduction in the number of brain cells [28].

The meaning of low birth weight in relation to malnutrition needs to be redefined. The traditional definition of prematurity is birth weight below 2500 grams (5 pounds 8 ounces). However, babies between 2500 and 2999 grams (5 pounds 8 ounces and 6 pounds 10 ounces) should also be considered at risk by virtue of low birth weight. Considerable focus has been concentrated on newborns that weigh less than 2500 grams, and miraculous reduction of mortality has been achieved with the technology to be found in neonatal intensive care units. The high perinatal mortality rate for newborns weighing less than 2500 grams at birth certainly warrants this attention. But the group of babies weighing between 2500 and 3000 grams at birth gets lost in the shuffle. Although this group shows much less perinatal mortality than the under-2500 gram group, its mortality rate is still three times higher than the rate for babies weighing between 3000 and 3500 grams (6 pounds 10 ounces and 7 pounds 12 ounces) at birth. Babies in the 2500 to 2999 gram weight group also show an increased incidence of the detrimental conditions listed earlier for low-birth-weight babies. Thus, 3000 grams, or approximately $6\,^1/_2$ pounds, seems to be another critical cutoff point, as is $5\,^1/_2$ pounds [31, 34, 36].

The statistics improve considerably for babies in the 3000 to 3499 gram (6 pounds 10 ounces to 7 pounds 12 ounces) group. However, the optimum birth weight seems to be between 3500 and 4000 grams (7 pounds 12 ounces to 8 pounds 14 ounces); studies show this group to have an increased incidence of higher intelligence and a decreased incidence of physical disabilities. This weight range also represents the upper end of a continuum reflecting steadily better pregnancy outcome.

As little as 120 grams (4 ounces) in birth weight can make a very real difference in pregnancy outcome. In two separate studies (one comparing private and clinic populations, the other comparing whites and blacks), a 120-gram difference in average birth weight accounted for twice as much perinatal mortality and twice the incidence of low birth weight in the clinic babies and in the black babies. Proper prenatal nutrition eradicates the differences in outcome in these populations [37].

Genetic design not only determines fetal growth potential but also appears to limit fetal growth after that potential has been attained. In other words, increased maternal caloric and nutrient (protein) intake will not result in obese, oversized babies incapable of being delivered vaginally if this is not the genetic design. The pregnancy outcome cannot surpass the potential, but it can fall considerably short. For all babies, the determinant of whether that potential is met seems to be nutrition. Some babies suffer from exposure to additional factors such as maternal disease and smoking. Even for such babies, good maternal nutrition can help ameliorate the effects of these factors.

The tragedy thus lies with the 2500 to 3000 gram (5 pounds 8 ounces to 6 pounds 10 ounces) group of babies, whose mortality is much lower than the below-2500 gram babies but who are more likely not to have met their genetic potential. Mental retardation and physical disabilities are more common in this group than in neonates weighing over 3000 grams. Although the ideal is to strive for birth weights between 3500 and 4000 grams, it is probably more realistic, and certainly a worthy goal, to strive for birth weights above 3000 grams (6 pounds 10 ounces).

It is estimated that approximately 10 percent of the population of the United States is born with mental or physical handicaps or both. Since these deficits are often directly related to prenatal malnutrition, improving maternal nutrition to the point of raising birth weights to over 3000 grams would have a profound effect on individual and societal quality of life. Its economic effect would also be felt nationally. One need only compare the cost of providing supplementary food, when needed, to a pregnant woman and the estimated economic savings if just one individual is prevented from being severely

mentally retarded. The costs of programs for the mentally retarded mount into billions of dollars each year. Between the cost for an optimal outcome and the cost of caring for the severely mentally retarded is the cost to society of those individuals who are not severely mentally retarded but who are functioning mentally and/or physically at a lower level than they would have been had their genetic potential been met. Their potential contribution to society is forever lost. And finally, there are the emotional and economic costs borne by the families of those born with mental and/or physical handicaps.

Nutritional Needs

Given the foregoing information, it suffices to say that nutrition of the mother is a prime concern in prenatal care. The woman requires specific instruction regarding certain aspects of maternal nutritional needs: calories, protein, iron, folic acid, and vitamin C.

Caloric and protein needs go hand-in-hand. This is true because the body needs calories to "protect" the protein so that it is not burned for energy. When caloric intake is insufficient, it is possible for a woman to have protein deficiency even when protein intake is adequate, because the protein will be used for meeting the metabolic energy requirements of the mother. A measurement of positive nitrogen balance indicates protein storage. If 90 to 100 percent of the protein intake is being utilized, only a small amount is being stored. The result is a smaller baby. If there is a 30 percent utilization of the protein intake, the remainder is stored and a larger baby will result. A positive nitrogen balance depends on both the calorie and the protein intake and indicates protein storage. Further, if both calorie and protein intake are so inadequate that fat is catabolized to meet the maternal metabolic energy requirements, maternal acetonuria will occur. This may result in neurological damage of the fetus.

The Recommended Daily Dietary Allowances (RDA) of the Food and Nutrition Board of the National Academy of Sciences–National Research Council indicate that in general a pregnant woman should take in 300 calories in addition to the 2200 calories recommended for nonpregnant women and 60 grams of protein, which is 10 grams per day over the 50 grams of protein recommended for nonpregnant women [38]. These numbers are based on the results of a number of studies, which have been analyzed and reanalyzed; most have some type of design or statistical flaw(s). The usual protein intake of pregnant women in the United States is in excess of the RDA, but many are below the RDA for calories [37]. The number of calories in the RDA is too generalized to assure adequate caloric intake by the *individual woman*. Further, the RDA for protein is less than the amount advocated by those researchers and clinicians who recommend 85 to 90 grams of protein per day, with calories to cover, and even more for the pregnant adolescent because of concurrent maternal growth needs. The obvious conclusion is that caloric and protein intake needs to be calculated for each individual to ensure the optimal pregnancy outcome. This calculation is described later in this chapter. Dietary restrictions, nagging and scolding the woman for weight gain, calculations of ideal weight gains based on the weight by trimester of the products of conception and pregnancy components, and reducing diets for maternal obesity should be banished forever.

The adage that protein intake indicates the adequacy of the diet in general is based on the fact that foods that are good sources of protein are also good sources of other nutrients. In other words, if the protein intake is adequate, most of the other necessary dietary nutrients are also adequate. The exceptions to this generalization during pregnancy are the inadequate intake of minerals—iron, zinc, calcium, and magnesium—and of vitamins—D, E, B_6, and folate—when compared to the RDA [37, pp. 260–263, 384]. The conclusion of experts, however, is that the RDA includes a wide margin of safety and the finding that the average nutrient intake of these minerals and vitamins is below the RDA does not warrant routine supplementation except in nutritional high risk populations, special circumstances, and for iron [37, pp. 16–18].

Nutritional high-risk populations are defined as women who use tobacco, alcohol, caffeine or coffee, marijuana, or cocaine [37, pp. 16–18]. Special circumstances include lactose intolerance (especially in black and Hispanic populations), multiple gestation, and strict vegetarianism. The concern is that these women may not consume enough vitamin D and calcium, which are usually obtained through vitamin D–fortified milk.

It is generally accepted that all pregnant women (except women who have a medical contraindication, e.g., hemochromatosis) should receive iron supplementation in the form of ferrous iron 30 milligrams daily (150 milligrams ferrous sulfate, 300 milligrams ferrous gluconate, or 100 milligrams ferrous fumarate) during the second and third trimesters [37, p. 20]. This supplementation is to

meet the demand for both maternal and fetal hemoglobin synthesis during pregnancy and to compensate for blood loss at the time of delivery. Most women do not have iron stores adequate to meet these demands, and their dietary intake is insufficient to do so. Supplemental iron reduces the incidence of iron deficiency anemia. If a woman becomes anemic, then a higher dosage is indicated. Nonheme iron comprises the vast majority of dietary iron. Meat and ascorbic acid–rich fruits and vegetables enhance absorption of nonheme iron. Tea, coffee, and milk, on the other hand, reduce absorption of nonheme iron [37, p. 281]. The pregnant woman is thus best counseled to take her iron pill between meals with orange juice. However, the need for iron supplementation in well-nourished healthy pregnant women has been questioned and some professionals have expressed concern about possible excessive iron intake, related increased blood viscosity, and stored iron as a risk factor for myocardial infarction [39].

Folic acid supplementation in the amount of an additional 200 to 400 micrograms, or a total of 0.4 to 0.8 milligrams daily, reduces considerably the incidence of megaloblastic anemia and should be used in conjunction with iron when a woman shows indications of anemia. The use of 400 micrograms of folic acid to reduce the risk of having a baby with spina bifida or other neural tube defects is effective only prior to conception and during the first 6 to 8 weeks of pregnancy.

Vitamin C, 250 milligrams daily taken with meals, enhances absorption of nonheme iron from dietary sources. Vitamin C may also enhance iron absorption from iron supplements and may be prophylactic for postpartal hemorrhage.

The long-standing practice of routinely restricting sodium intake during pregnancy or as part of the treatment for preeclampsia has been severely questioned and is considered passé. Restriction of sodium intake combined with the use of diuretics is potentially dangerous. Such practice is not considered safe management of a pregnant woman unless the woman has medical complications when she is *not* pregnant that require the restriction of sodium intake as part of the treatment regimen. During pregnancy, the body establishes a compensatory mechanism in order to conserve sodium, which would otherwise be excessively lost (with resulting electrolyte imbalance) because of a 50 percent increase in glomerular filtration rate. If a system that is trying to conserve sodium from normal physiological processes is further insulted by dietary restriction, the mechanism is compromised through overwork.

When a woman is overweight, her diet must be analyzed to ascertain if the overweight is due to edema only, fat only, or a combination of the two. Overweight due to fat is caused by the intake of too many calories. Overweight as a result of edema most likely is due to inadequate protein and caloric intake. It may well be that increased protein and calories will reduce the incidence of preeclampsia and eclampsia.

Assessment of Weight and Weight Gain

The Institute of Medicine's Subcommittee on Nutritional Status and Weight Gain During Pregnancy proposed that gestational weight gain be predicated on a woman's prepregnancy body mass index (BMI, or "weight for height"). Body mass index is defined as weight divided by height squared (kilograms/meter^2 or pounds/inches^2) multiplied by 100. Note that if height is measured in centimeters, then the result of the formula must be multiplied by 100 again to obtain the BMI. The subcommittee used metric units to make their calculations, created weight-for-height categories, and made recommendations for each category of the total weight gain during pregnancy. As shown in Table 22-2 and its notes, there are four categories of BMI—low (underweight), normal, high (overweight), and obese. The first three of these categories roughly correspond to 90, 120, and 135 percent of the

TABLE 22-2 Recommended Total Weight Gain Ranges for Pregnant Women,[a] by Prepregnancy Body Mass Index (BMI)[b]

	Recommended Total Gain	
Weight-for-Height Category	*kg*	*lb*
Low (BMI < 19.8)	12.5–18	28–40
Normal (BMI of 19.8 to 26.0)	11.5–16	25–35
High[c] (BMI > 26.0 to 29.0)	7.0–11.5	15–25

[a] Young adolescents and black women should strive for gains at the upper end of the recommended range. Short women (< 157 cm, or 62 in.) should strive for gains at the lower end of the range.

[b] BMI is calculated using metric units.

[c] The recommended target weight gain for obese women (BMI > 29.0) is at least 6.0 kg (15 lb).

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Metropolitan Life Insurance Company's 1959 weight-for-height charts, which have been and are the most commonly used standards in the United States [37, pp. 5–12].

The methodology for determining optimum weight gain during pregnancy is first to ascertain the woman's prepregnancy BMI. Table 22-3 provides weight, height, and metric BMI figures. The shaded area and staircase lines indicate the cutoff values for obese, high, normal, and low BMI. Height and weight should be measured when the woman is not wearing shoes. Height is determined with the woman's heels, buttocks, and back against a flat vertical surface. The recommended range of total weight gain during pregnancy is then determined by the prepregnancy BMI, as shown in Table 22-2. The woman and the health care provider should agree on a weight gain goal (preferably a range rather than a single number). The woman should achieve at least the lower limit of the weight gain specified by her BMI.

Intervention Methodology*

The method presented here is known as the *Higgins Intervention Method for Nutritional Rehabilitation During Pregnancy*. Its usability has been demonstrated by the staff of the Montreal Diet Dispensary and by others who have been taught the method [35, 40, 41]. Its effectiveness has been clearly shown in studies of the pregnancy outcomes of those receiving the services of the Montreal Diet Dispensary, both at the Diet Dispensary and at the Royal Victoria Hospital Maternity Clinics in Montreal [31, 34, 36].

The Higgins Intervention Method uses the 1948 Canadian Dietary Standard (CDS), approved by the Canadian Council on Nutrition, as a baseline for establishing what the client's nonpregnant calorie and protein intake should be (Table 22-4). The CDS determines calorie and protein intake on the basis of (1) ideal body weight and (2) individual activity level. This method of establishing the recommended intake is more specific than the U.S. RDA and has a profound effect on calorie and protein levels. When the pregnancy allowance is added to the CDS values, the resulting total amounts of calories and protein vary much more than those of the U.S. RDA and are more in accord with women. Ideal body weight is determined by using the actuarial tables of the Metropolitan Life Insurance Company for desirable weights of women, based on height and body frame (Table 22-5). Individual activity level is a subjective evaluation.

Determination of Calorie and Protein Requirements

Calorie and protein requirements according to the Higgins Intervention Method consist of the normal requirements plus additional corrective allowances. The method is applied as follows:

1. Collection of baseline data:
   - a. age
   - b. height
   - c. body frame
   - d. nonpregnant weight
   - e. weeks' gestation
   - f. present weight
   - g. activity level
   - h. present dietary intake
   - i. existence of any of the following conditions:
     - (1) pernicious vomiting
     - (2) pregnancy spacing less than 1 year apart
     - (3) poor obstetrical history (stillbirths, spontaneous abortions, preterm babies)
     - (4) failure to gain 10 pounds by the twentieth week of gestation
     - (5) serious emotional upset or problems
2. Determination of normal requirements:
   - a. For a mother 20 years of age or more:
     - (1) Locate the client's height and body frame on the Table of Desirable Weights for Women (Table 22-5).* Determine the ideal weight based on these data.
     - (2) Locate the client's ideal weight, as determined in (1), and her activity level on the Canadian Dietary Standard (Table 22-4); and ascertain the woman's nonpregnant calorie and protein requirements.
     - (3) After 20 weeks' gestation, add 500 calories and 25 grams of protein to the woman's daily nonpregnant calorie and protein requirements, as determined

* This method is presented with the permission of the late Mrs. Agnes Higgins, former Executive Director of the Montreal Diet Dispensary, Montreal, Canada.

* In using this table, be sure to use the height figure 2 inches taller than your client measures in her stocking feet, since the heights in the table include shoes with 2-inch heels. For example, if your client measures 5'4" in her stocking feet, use the row of figures for 5'6" in the table.

TABLE 22-3 Body Mass Index Figures[a]

Weight		Height, in. (and cm)																							
		55.9	*56.7*	*57.5*	*58.3*	*59.1*	*59.8*	*60.6*	*61.4*	*62.2*	*63.0*	*63.8*	*64.6*	*65.4*	*66.1*	*66.9*	*67.7*	*68.5*	*69.3*	*70.1*	*70.9*	*71.7*	*72.4*	*73.2*	*74.0*
lb	*kg*	*(142)*	*(144)*	*(146)*	*(148)*	*(150)*	*(152)*	*(154)*	*(156)*	*(158)*	*(160)*	*(162)*	*(164)*	*(166)*	*(168)*	*(170)*	*(172)*	*(174)*	*(176)*	*(178)*	*(180)*	*(182)*	*(184)*	*(186)*	*(188)*
220	100	49.6	48.2	46.9	45.7	44.4	43.3	42.2	41.1	40.1	39.1	38.1	37.2	36.3	35.4	34.6	33.8	33.0	32.3	31.6	30.9	30.2	29.5	28.9	28.3
218	99	49.1	47.7	46.4	45.2	44.0	42.8	41.7	40.7	39.7	38.7	37.7	36.8	35.9	35.1	34.3	33.5	32.7	32.0	31.2	30.6	29.9	29.2	28.6	28.0
216	98	48.6	47.3	46.0	44.7	43.6	42.4	41.3	40.3	39.3	38.3	37.3	36.4	35.6	34.7	33.9	33.1	32.4	31.6	30.9	30.2	29.6	28.9	28.3	27.7
213	97	48.1	46.8	45.5	44.3	43.1	42.0	40.9	39.9	38.9	37.9	37.0	36.1	35.2	34.4	33.6	32.8	32.0	31.3	30.6	29.9	29.3	28.7	28.0	27.4
211	96	47.6	46.3	45.0	43.8	42.7	41.6	40.5	39.4	38.5	37.5	36.6	35.7	34.8	34.0	33.2	32.4	31.7	31.0	30.3	29.6	29.0	28.4	27.7	27.2
209	95	47.1	45.8	44.6	43.4	42.2	41.1	40.1	39.0	38.1	37.1	36.2	35.3	34.5	33.7	32.9	32.1	31.4	30.7	30.0	29.3	28.7	28.1	27.5	26.9
207	94	46.6	45.3	44.1	42.9	41.8	40.7	39.6	38.6	37.7	36.7	35.8	34.9	34.1	33.3	32.5	31.8	31.0	30.3	29.7	29.0	28.4	27.8	27.2	26.6
205	93	46.1	44.8	43.6	42.5	41.3	40.3	39.2	38.2	37.3	36.3	35.4	34.6	33.7	33.0	32.2	31.4	30.7	30.0	29.4	28.7	28.1	27.5	26.9	26.3
202	92	45.6	44.4	43.2	42.0	40.9	39.8	38.8	37.8	36.9	35.9	35.1	34.2	33.4	32.6	31.8	31.1	30.4	29.7	29.0	28.4	27.8	27.2	26.6	26.0
200	91	45.1	43.9	42.7	41.5	40.4	39.4	38.4	37.4	36.5	35.5	34.7	33.8	33.0	32.2	31.5	30.8	30.1	29.4	28.7	28.1	27.5	26.9	26.3	25.7
198	90	44.6	43.4	42.2	41.1	40.0	39.0	37.9	37.0	36.1	35.2	34.3	33.5	32.7	31.9	31.1	30.4	29.7	29.1	28.4	27.8	27.2	26.6	26.0	25.5
196	89	44.1	42.9	41.8	40.6	39.6	38.5	37.5	36.6	35.7	34.8	33.9	33.1	32.3	31.5	30.8	30.1	29.4	28.7	28.1	27.5	26.9	26.3	25.7	25.2
194	88	43.6	42.4	41.3	40.2	39.1	38.1	37.1	36.2	35.3	34.4	33.5	32.7	31.9	31.2	30.4	29.7	29.1	28.4	27.8	27.2	26.6	26.0	25.4	24.9
191	87	43.1	42.0	40.8	39.7	38.7	37.7	36.7	35.7	34.9	34.0	33.2	32.3	31.6	30.8	30.1	29.4	28.7	28.1	27.5	26.9	26.3	25.7	25.1	24.6
189	86	42.7	41.5	40.3	39.3	38.2	37.2	36.3	35.3	34.4	33.6	32.8	32.0	31.2	30.5	29.8	29.1	28.4	27.8	27.1	26.5	26.0	25.4	24.9	24.3
187	85	42.2	41.0	39.9	38.8	37.8	36.8	35.8	34.9	34.0	33.2	32.4	31.6	30.8	30.1	29.4	28.7	28.1	27.4	26.8	26.2	25.7	25.1	24.6	24.0
185	84	41.7	40.5	39.4	38.3	37.3	36.4	35.4	34.5	33.6	32.8	32.0	31.2	30.5	29.8	29.1	28.4	27.7	27.1	26.5	25.9	25.4	24.8	24.3	23.8
183	83	41.2	40.0	38.9	37.9	36.9	35.9	35.0	34.1	33.2	32.4	31.6	30.9	30.1	29.4	28.7	28.1	27.4	26.8	26.2	25.6	25.1	24.5	24.0	23.5
180	82	40.7	39.5	38.5	37.4	36.4	35.5	34.6	33.7	32.8	32.0	31.2	30.5	29.8	29.1	28.4	27.7	27.1	26.5	25.9	25.3	24.8	24.2	23.7	23.2
178	81	40.2	39.1	38.0	37.0	36.0	35.1	34.2	33.3	32.4	31.6	30.9	30.1	29.4	28.7	28.0	27.4	26.8	26.1	25.6	25.0	24.5	23.9	23.4	22.9
176	80	39.7	38.6	37.5	36.5	35.6	34.6	33.7	32.9	32.0	31.3	30.5	29.7	29.0	28.3	27.7	27.0	26.4	25.8	25.2	24.7	24.2	23.6	23.1	22.6
174	79	39.2	38.1	37.1	36.1	35.1	34.2	33.3	32.5	31.6	30.9	30.1	29.4	28.7	28.0	27.3	26.7	26.1	25.5	24.9	24.4	23.8	23.3	22.8	22.4
172	78	38.7	37.6	36.6	35.6	34.7	33.8	32.9	32.1	31.2	30.5	29.7	29.0	28.3	27.6	27.0	26.4	25.8	25.2	24.6	24.1	23.5	23.0	22.5	22.1
169	77	38.2	37.1	36.1	35.2	34.2	33.3	32.5	31.6	30.8	30.1	29.3	28.6	27.9	27.3	26.6	26.0	25.4	24.9	24.3	23.8	23.2	22.7	22.3	21.8
167	76	37.7	36.7	35.7	34.7	33.8	32.9	32.0	31.2	30.4	29.7	29.0	28.3	27.6	26.9	26.3	25.7	25.1	24.5	24.0	23.5	22.9	22.4	22.0	21.5
165	75	37.2	36.2	35.2	34.2	33.3	32.5	31.6	30.8	30.0	29.3	28.6	27.9	27.2	26.6	26.0	25.4	24.8	24.2	23.7	23.1	22.6	22.2	21.7	21.2
163	74	36.7	35.7	34.7	33.8	32.9	32.0	31.2	30.4	29.6	28.9	28.2	27.5	26.9	26.2	25.6	25.0	24.4	23.9	23.4	22.8	22.3	21.9	21.4	20.9
161	73	36.2	35.2	34.2	33.3	32.4	31.6	30.8	30.0	29.2	28.5	27.8	27.1	26.5	25.9	25.3	24.7	24.1	23.6	23.0	22.5	22.0	21.6	21.1	20.7
158	72	35.7	34.7	33.8	32.9	32.0	31.2	30.4	29.6	28.8	28.1	27.4	26.8	26.1	25.5	24.9	24.3	23.8	23.2	22.7	22.2	21.7	21.3	20.8	20.4
156	71	35.2	34.2	33.3	32.4	31.6	30.7	29.9	29.2	28.4	27.7	27.1	26.4	25.8	25.2	24.6	24.0	23.5	22.9	22.4	21.9	21.4	21.0	20.5	20.1
154	70	34.7	33.8	32.8	32.0	31.1	30.3	29.5	28.8	28.0	27.3	26.7	26.0	25.4	24.8	24.2	23.7	23.1	22.6	22.1	21.6	21.1	20.7	20.2	19.8
152	69	34.2	33.3	32.4	31.5	30.7	29.9	29.1	28.4	27.6	27.0	26.3	25.7	25.0	24.4	23.9	23.3	22.8	22.3	21.8	21.3	20.8	20.4	19.9	19.5
150	68	33.7	32.8	31.9	31.0	30.2	29.4	28.7	27.9	27.2	26.6	25.9	25.3	24.7	24.1	23.5	23.0	22.5	22.0	21.5	21.0	20.5	20.1	19.7	19.2
147	67	33.2	32.3	31.4	30.6	29.8	29.0	28.3	27.5	26.8	26.2	25.5	24.9	24.3	23.7	23.2	22.6	22.1	21.6	21.1	20.7	20.2	19.8	19.4	19.0

TABLE 22-3 Body Mass Index Figures[a] (*continued*)

Weight		Height, in. (and cm)																						
		55.9	*56.7*	*57.5*	*58.3*	*59.1*	*59.8*	*60.6*	*61.4*	*62.2*	*63.0*	*63.8*	*64.6*	*65.4*	*66.1*	*66.9*	*67.7*	*68.5*	*69.3*	*70.1*	*70.9*	*71.7*	*72.4*	*73.2*	*74.0*
lb	*kg*	*(142)*	*(144)*	*(146)*	*(148)*	*(150)*	*(152)*	*(154)*	*(156)*	*(158)*	*(160)*	*(162)*	*(164)*	*(166)*	*(168)*	*(170)*	*(172)*	*(174)*	*(176)*	*(178)*	*(180)*	*(182)*	*(184)*	*(186)*	*(188)*
145	66	32.7	31.8	31.0	30.1	29.3	28.6	27.8	27.1	26.4	25.8	25.1	24.5	24.0	23.4	22.8	22.3	21.8	21.3	20.8	20.4	19.9	19.5	19.1	18.7
143	65	32.2	31.3	30.5	29.7	28.9	28.1	27.4	26.7	26.0	25.4	24.8	24.2	23.6	23.0	22.5	22.0	21.5	21.0	20.5	20.1	19.6	19.2	18.8	18.4
141	64	31.7	30.9	30.0	29.2	28.4	27.7	27.0	26.3	25.6	25.0	24.4	23.8	23.2	22.7	22.1	21.6	21.1	20.7	20.2	19.8	19.3	18.9	18.5	18.1
139	63	31.2	30.4	29.6	28.8	28.0	27.3	26.6	25.9	25.2	24.6	24.0	23.4	22.9	22.3	21.8	21.3	20.8	20.3	19.9	19.4	19.0	18.6	18.2	17.8
136	62	30.7	29.9	29.1	28.3	27.6	26.8	26.1	25.5	24.8	24.2	23.6	23.1	22.5	22.0	21.5	21.0	20.5	20.0	19.6	19.1	18.7	18.3	17.9	17.5
134	61	30.3	29.4	28.6	27.8	27.1	26.4	25.7	25.1	24.4	23.8	23.2	22.7	22.1	21.6	21.1	20.6	20.1	19.7	19.3	18.8	18.4	18.0	17.6	17.3
132	60	29.8	28.9	28.1	27.4	26.7	26.0	25.3	24.7	24.0	23.4	22.9	22.3	21.8	21.3	20.8	20.3	19.8	19.4	18.9	18.5	18.1	17.7	17.3	17.0
130	59	29.3	28.5	27.7	26.9	26.2	25.5	24.9	24.2	23.6	23.0	22.5	21.9	21.4	20.9	20.4	19.9	19.5	19.0	18.6	18.2	17.8	17.4	17.1	16.7
128	58	28.8	28.0	27.2	26.5	25.8	25.1	24.5	23.8	23.2	22.7	22.1	21.6	21.0	20.5	20.1	19.6	19.2	18.7	18.3	17.9	17.5	17.1	16.8	16.4
125	57	28.3	27.5	26.7	26.0	25.3	24.7	24.0	23.4	22.8	22.3	21.7	21.2	20.7	20.2	19.7	19.3	18.8	18.4	18.0	17.6	17.2	16.8	16.5	16.1
123	56	27.8	27.0	26.3	25.6	24.9	24.2	23.6	23.0	22.4	21.9	21.3	20.8	20.3	19.8	19.4	18.9	18.5	18.1	17.7	17.3	16.9	16.5	16.2	15.8
121	55	27.3	26.5	25.8	25.1	24.4	23.8	23.2	22.6	22.0	21.5	21.0	20.4	20.0	19.5	19.0	18.6	18.2	17.8	17.4	17.0	16.6	16.2	15.9	15.6
119	54	26.8	26.0	25.3	24.7	24.0	23.4	22.8	22.2	21.6	21.1	20.6	20.1	19.6	19.1	18.7	18.3	17.8	17.4	17.0	16.7	16.3	15.9	15.6	15.3
117	53	26.3	25.6	24.9	24.2	23.6	22.9	22.3	21.8	21.2	20.7	20.2	19.7	19.2	18.8	18.3	17.9	17.5	17.1	16.7	16.4	16.0	15.7	15.3	15.0
114	52	25.8	25.1	24.4	23.7	23.1	22.5	21.9	21.4	20.8	20.3	19.8	19.3	18.9	18.4	18.0	17.6	17.2	16.8	16.4	16.0	15.7	15.4	15.0	14.7
112	51	25.3	24.6	23.9	23.3	22.7	22.1	21.5	21.0	20.4	19.9	19.4	19.0	18.5	18.1	17.6	17.2	16.8	16.5	16.1	15.7	15.4	15.1	14.7	14.4
110	50	24.8	24.1	23.5	22.8	22.2	21.6	21.1	20.5	20.0	19.5	19.1	18.6	18.1	17.7	17.3	16.9	16.5	16.1	15.8	15.4	15.1	14.8	14.5	14.1
108	49	24.3	23.6	23.0	22.4	21.8	21.2	20.7	20.1	19.6	19.1	18.7	18.2	17.8	17.4	17.0	16.6	16.2	15.8	15.5	15.1	14.8	14.5	14.2	13.9
106	48	23.8	23.1	22.5	21.9	21.3	20.8	20.2	19.7	19.2	18.8	18.3	17.8	17.4	17.0	16.6	16.2	15.9	15.5	15.1	14.8	14.5	14.2	13.9	13.6
103	47	23.3	22.7	22.0	21.5	20.9	20.3	19.8	19.3	18.8	18.4	17.9	17.5	17.1	16.7	16.3	15.9	15.5	15.2	14.8	14.5	14.2	13.9	13.6	13.3
101	46	22.8	22.2	21.6	21.0	20.4	19.9	19.4	18.9	18.4	18.0	17.5	17.1	16.7	16.3	15.9	15.5	15.2	14.9	14.5	14.2	13.9	13.6	13.3	13.0
99	45	22.3	21.7	21.1	20.5	20.0	19.5	19.0	18.5	18.0	17.6	17.1	16.7	16.3	15.9	15.6	15.2	14.9	14.5	14.2	13.9	13.6	13.3	13.0	12.7
97	44	21.8	21.2	20.6	20.1	19.6	19.0	18.6	18.1	17.6	17.2	16.8	16.4	16.0	15.6	15.2	14.9	14.5	14.2	13.9	13.6	13.3	13.0	12.7	12.4
95	43	21.3	20.7	20.2	19.6	19.1	18.6	18.1	17.7	17.2	16.8	16.4	16.0	15.6	15.2	14.9	14.5	14.2	13.9	13.6	13.3	13.0	12.7	12.4	12.2
92	42	20.8	20.3	19.7	19.2	18.7	18.2	17.7	17.3	16.8	16.4	16.0	15.6	15.2	14.9	14.5	14.2	13.9	13.6	13.3	13.0	12.7	12.4	12.1	11.9
90	41	20.3	19.8	19.2	18.7	18.2	17.7	17.3	16.8	16.4	16.0	15.6	15.2	14.9	14.5	14.2	13.9	13.5	13.2	12.9	12.7	12.4	12.1	11.9	11.6
88	40	19.8	19.3	18.8	18.3	17.8	17.3	16.9	16.4	16.0	15.6	15.2	14.9	14.5	14.2	13.8	13.5	13.2	12.9	12.6	12.3	12.1	11.8	11.6	11.3

[a] Use of table: The intersection of the woman's weight (row) and height (column) is her metric BMI.

Calculations:

BMI (metric) = $(kg/m^2) \times 100$; BMI (English) = $(lb/in.^2) \times 100$.

BMI (metric) $\times$ 0.142 = BMI (English); BMI (English) $\times$ 7 = BMI (metric).

= obese = normal

= overweight = underweight

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TABLE 22-4 Canadian Dietary Standard for Female Adults[a]

	Sedentary Activities		Moderate Activities		Heavy Activities	
Ideal Body Weight (lb)	*Calories*	*Protein*	*Calories*	*Protein*	*Calories*	*Protein*
80	1600	40	1900	40	2400	40
85	1650	43	1950	43	2450	43
90	1700	45	2000	45	2500	45
95	1750	48	2050	48	2550	48
100	1800	50	2100	50	2600	50
105	1875	51	2175	51	2675	51
110	1950	53	2250	53	2750	53
115	2025	54	2325	54	2825	54
120	2100	55	2400	55	2900	55
125	2150	57	2450	57	2950	57
130	2200	58	2500	58	3000	58
135	2250	59	2550	59	3050	59
140	2300	60	2600	60	3100	60
145	2350	63	2650	63	3150	63
150	2400	65	2700	65	3200	65
155	2450	68	2750	68	3250	68
160	2500	70	2800	70	3300	70

[a] 1948.

TABLE 22-5 Desirable Weights for Women[a]

Height (includes 2-inch heels)	Small Frame (range in pounds and average)	Medium Frame (range in pounds and average)	Large Frame (range in pounds and average)
4'10"	92–98 (95)	96–107 (101.5)	104–119 (111.5)
4'11"	94–101 (97.5)	98–110 (104)	106–122 (114)
5'0"	96–104 (100)	101–113 (107)	109–125 (117)
5'1"	99–107 (103)	104–116 (110)	112–128 (120)
5'2"	102–110 (106)	107–119 (113)	115–131 (123)
5'3"	105–113 (109)	110–122 (116)	118–134 (126)
5'4"	108–116 (112)	113–126 (119.5)	121–138 (129.5)
5'5"	111–119 (115)	116–130 (123)	125–142 (133.5)
5'6"	114–123 (118.5)	120–135 (127.5)	129–146 (137.5)
5'7"	118–127 (122.5)	124–139 (131.5)	133–150 (141.5)
5'8"	122–131 (126.5)	128–143 (135.5)	137–154 (145.5)
5'9"	126–135 (130.5)	132–147 (139.5)	141–158 (149.5)
5'10"	130–140 (135)	136–151 (143.5)	145–163 (154)
5'11"	134–144 (139)	140–155 (147.5)	149–168 (158.5)
6'0"	138–148 (143)	144–159 (155.5)	153–173 (163)

[a]1959 Actuarial Tables. Courtesy of the Metropolitan Life Insurance Company.

above. These now become her normal pregnancy calorie and protein requirements. If the pregnancy is a multiple gestation, add 500 calories and 25 grams of protein for each fetus.

b. For a mother 19 years of age or less:

(1) Locate the client's age on Table 22-6, taken from the 1958 U.S. RDA. (Both the calorie and protein allowances for these ages, or any ages, were higher in 1958 than in any subsequent RDA.) This determines the woman's nonpregnant calorie and protein requirements. This use of higher nonpregnant calorie and protein requirements as the baseline for adolescent pregnancy is in keeping with the fact that the dietary require-

TABLE 22-6 Calorie and Protein Requirements for Women under 19, U.S. RDA

Age	Calories	Protein
13–15	2600	80 g
16–19	2400	75 g

Source: From the Food and Nutrition Board, National Academy of Sciences–National Research Council, 1958.

ments for pregnancy are superimposed on the adolescent's own dietary requirements for this period of growth in her life. The nonpregnant adolescent would normally be gaining weight as a reflection of her own growth; the averages are shown in Table 22-7. Therefore, weight gain during and after the adolescent's pregnancy must be evaluated in view of what she normally would gain if she were not pregnant.

(2) After 20 weeks' gestation, add 500 calories and 25 grams of protein to the woman's daily nonpregnant requirements, as determined above. These now become her normal pregnancy calorie and protein requirements. If the pregnancy is a multiple gestation, 500 calories and 25 grams of protein are added for each fetus.

3. Determine additional corrective allowances: Additional corrective allowances of calories and protein are given for three categories of identifiable nutritional conditions that may adversely affect pregnancy outcome if not considered: (1) undernutrition, (2) underweight, (3) nutritional stress. Each requires a separate addition to the daily normal pregnancy requirements for protein and calories.

a. Undernutrition assessment and corrective allowance: Undernutrition is defined as a deficit in protein between the normal pregnancy protein requirements for an individual woman and her actual dietary intake of protein, as determined by calculations performed on the data collected from a diet history, described later in this section. The corrective allowance is as follows:

(1) *protein*—the number of grams of protein deficit is added to the daily normal pregnancy requirements for protein

(2) *calories*—for each gram of protein deficit, 10 calories are added to the daily normal pregnancy requirements for calories (i.e., 10 calories × the number of grams of protein deficit = the total calorie addition)

b. Underweight assessment and corrective allowance: Underweight is defined as the mother's prepregnant weight being 5 percent or more under the ideal weight as determined from Table 22-5, the Table of Desirable Weights. The corrective allowance is as follows:

(1) *protein*—20 grams per day

(2) *calories*—500 calories per day

Both the protein and calorie corrections are added to the daily normal pregnancy requirements for protein and calories. This corrective allowance of protein and calories will permit an additional weight gain of 1 pound per week and should be continued for the number of weeks equivalent to the number of pounds the mother was underweight prior to conception. The allowance may be cut in half if needed for a weight gain of $^1/_2$ pound per week or increased to a maximum addition of 1000 calories and 40 grams protein daily if a weight gain of 2 pounds per week is needed in order to make up the deficit by the time of delivery.

c. Nutritional stress assessment and corrective allowance: Nutritional stress is defined as the existence of one or more of the following conditions:

(1) pernicious vomiting

(2) pregnancy spacing less than 1 year apart

(3) poor obstetrical history

(4) failure to gain 10 pounds by the twentieth week of gestation

(5) serious emotional upset or problems

The corrective allowance is an additional 200 calories and 20 grams protein for each stress condition present (up to a maximum allowance of 400 calories and 40 grams protein) to be added to the daily normal pregnancy requirements for protein and calories.

4. The foregoing calculations may be summarized as in Table 22-8 for ease in totaling the woman's daily caloric and protein requirements.

TABLE 22-7 Average Nonpregnant Adolescent Female Weight Gain

Age	Average Weight Gain per Year
11–13	11 lb
13–15	8 lb
15–17	3 lb
17–19	1 lb

TABLE 22-8 Summary Format for Calculating Calorie and Protein Requirements During Pregnancy

	Calories	Protein (g)
Nonpregnant requirements	_____	_____
Addition for pregnancy (after 20th week)	500	25
Undernutrition corrective allowance	_____	_____
Underweight corrective allowance	_____	_____
Nutritional stress corrective allowance	_____	_____
TOTAL	_____	_____

Evaluation of Dietary Adequacy; Nutrition Counseling To evaluate dietary adequacy, the midwife takes a 24-hour recall diet history. This is cross-checked against the client's responses to a list of common foods and food categories (e.g., citrus fruits) and, if necessary, further checked by questioning the woman about food purchasing (i.e., what foods she purchases and in what amounts for how many people). The daily number of calories and grams of protein in the woman's diet is then determined by calculations based on the information obtained from a standard food composition table. These figures are then used to compare the woman's usual actual calorie and protein intake against her requirements.

Nutrition counseling is most effective when the woman's dietary patterns and eating habits are changed as little as possible. Milk primarily is used to make up any deficiency between the woman's intake and her calorie and protein requirements. Peanut butter, cheese, bread, and eggs can also be used to meet calorie and protein requirements. Nutrition counseling includes attempting to motivate the woman to follow her diet. Telling her that she is drinking the supplementary milk to "feed her baby" is helpful in overcoming any negative feelings she might have about drinking milk (and also in discouraging her from giving the milk to other children in the family instead if she obtained the milk through WIC).

Mrs. Higgins suggests that a mother-to-be mark milk cartons with *B* for baby. This reinforces the idea of feeding her baby. The mother knows the baby is fed milk after being born, so it usually makes sense to her that her baby needs milk before being born as well. Mrs. Higgins has been quite successful in motivating clients at the Montreal Diet Dispensary by promoting the concept of the mother's having "a blue-ribbon baby." The nutritionists at the Montreal Diet Dispensary make a home visit to each client to establish a friendly contact, to evaluate the food storage and preparation facilities in the home (e.g., refrigerator, stove, running water), and to ascertain the response of other family members to the pregnancy.

After the initial visit and calculations, the woman's diet is periodically reviewed utilizing a 24-hour recall diet history. The midwife should completely reevaluate the woman nutritionally at critical nutritional points during the pregnancy. For example, a woman first seen during the first trimester should have a nutritional reevaluation as follows:

1. *At 20 weeks' gestation:* The diet is recalculated at this time so the pregnancy allowance of 500 calories and 25 grams protein can be added.
2. *At 28 weeks:* The peak in cellular growth of the brain begins at this time.
3. *At 36 weeks:* Encouragement should be offered through the last critical month of pregnancy and a contribution made to a total evaluation of the woman's well-being (since she is also being reevaluated obstetrically at this time).

Instruction and Anticipatory Guidance

Anticipatory guidance and instruction during the antepartal period relate largely to the activities of daily life, the common discomforts of pregnancy and their relief measures, nutrition preparation for childbirth and parenthood, the danger signs, an understanding of the physical and psychological changes taking place, and the basics of fetal growth and development. The section below outlines these topics, with the exception of the common discomforts of pregnancy and their relief measures, and nutritional intervention in pregnancy, which were discussed above.

This material is presented in topical outline with only occasional further notations for several reasons: (1) most nurse-midwifery students will have taught this material as student nurses or in nursing practice, (2) some of the material appears elsewhere in this book, and (3) there are innumerable pamphlets, booklets, books, and textbooks that detail this instruction. Those who are unfamil-

iar with this teaching can use the topical outline to identify areas in which they need instruction, refer to the literature, and observe classes and discussion groups dealing with the information.

Principles of Antepartal Teaching

As in any teaching, be sure you have an audience in your potential learner before talking. Otherwise, you may be wasting her time and your time. Common mistakes are trying to teach too much at one time and trying to teach at the end of an exhausting day for her in the clinic or office. An interested learner at such a time would be rare. Some information is mandatory to communicate—danger signs of critical complications; the avoidance of over-the-counter drugs; the potential dangers of cat care; and so forth. Joyce Roberts [42] advocates using the following priority ranking in giving information:

1. Information given in response to specific questions, problems, or experiences of a woman at the particular time in her pregnancy
2. Information that is essential for a woman to have for her own or her baby's health and safety
3. Anticipatory guidance that will facilitate a woman's efforts to deal realistically with the pregnancy and with issues or aspects of childbirth that she is likely to encounter
4. Additional information regarding pregnancy progress, childbirth, or institutional policies that may be helpful but is not related to the immediate needs of the woman

Not all women have learning needs for all of the instruction and anticipatory guidance you have to give. You should avoid making unvalidated assumptions regarding a woman's learning needs. Find out first if she wants the information you have to share with her on a given topic. Be especially alert not to make assumptions about what pregnant health care professionals (e.g., nurse-midwives, nurses, midwives, physicians, physician assistants) want and need to know. Most such women do not want to rely on themselves or to feel they should act as though they know it all—they may know for other women, but this is their own experience, which is new and fraught with its unique set of anxieties and joys.

Antepartal Teaching Outline

1. Interpretation of physical findings and laboratory results
2. Value of keeping appointments for antepartal revisits
3. Signs and symptoms of complications that indicate a need to call the midwife immediately:
   - **a.** vaginal bleeding
   - **b.** facial or hand edema
   - **c.** prolonged nausea and vomiting
   - **d.** fever, chills
   - **e.** sudden, sharp, continuing abdominal pain
   - **f.** sudden gush of fluid from the vagina
   - **g.** continuing severe headache
   - **h.** visual changes (e.g., blurring of vision, dizziness, spots before eyes)
   - **i.** any change from normal urination
4. Perineal and vaginal care
   - **a.** direction of wiping (front to back)
   - **b.** cotton-crotch panties
   - **c.** frequent change of underwear
   - **d.** no douching
5. Breast care
   - **a.** daily cleansing with warm water and a soft, clean cloth followed by careful drying
   - **b.** if colostrum is crusted on the nipple, softening with an application of nipple cream or lanolin before trying to remove
   - **c.** gentle handling
   - **d.** good breast support (see 6, below)
   - **e.** preparation for breastfeeding in the ninth month of pregnancy (see Chapter 62)
6. Breast support. A good brassiere is essential for preventing or alleviating upper backache; it gives comfort for tender enlarged breasts and provides alignment for facilitating ductile functioning. There is little change in breast size during the remainder of the antepartal period after the fourth to fifth lunar month of gestation. A good bra has the following characteristics:
   - **a.** supportive, porous, soft, washable material
   - **b.** shaped to avoid compression and irritation of the breasts and nipples, while giving snug support
   - **c.** wide, adjustable shoulder straps
   - **d.** wide back band with a number of available fastening adjustments
   - **e.** support is from below upward and from the sides inward
7. Abdominal support
   - **a.** abdominal muscle tightening exercises (e.g., chin-chest, controlled breathing, sit-ups)
   - **b.** maternity girdle, if needed
   - **c.** maternity abdominal support or binder, if needed

8. Clothing
   a. supportive, washable, loose-fitting (never binding or constrictive of circulation), mood-lifting
   b. adjustable
   c. comfortable shoes with a broad base; avoidance of high heels, which are unstable and increase any problem with lordosis
   d. maternity clothes (usually not needed until around the fifth calendar month of pregnancy)
9. Fetal growth and development appropriate for the period of gestation now and until the next antepartal revisit
10. Bodily and psychological changes appropriate for the period of gestation now and until the next antepartal revisit
11. Possible discomforts for the period of gestation now and until the next antepartal revisit
12. Explanation of relief measures for any present discomforts
13. Dental care
   a. appointment with dentist
   b. cleaning of teeth after meals
   c. gum care; explanation that gums will tend to bleed because of hyperemia by midpregnancy
14. Avoidance of cats; explanation of toxoplasmosis
15. Avoidance of alcohol; explanation of fetal alcohol syndrome (see Chapter 12)
16. Smoking: If the woman smokes, she should be encouraged to stop or at least reduce smoking; women who smoke have an increased risk for perinatal mortality, fetal wastage, preterm labor and delivery, and small-for-gestational-age babies (see Chapter 12).
17. Avoidance of all medicines and drugs, including aspirin and BC powder, except those prescribed by the midwife or physician working with the midwife. The woman should be told to consult with the midwife before taking over-the-counter drugs or any prescription obtained from any other physician for any other condition.
18. Immunizations: At the time of this writing, the most recent recommendations available from the American College of Obstetricians and Gynecologists regarding specific immunizations during pregnancy were those prepared in 1991 [43]. They are reproduced as Appendix A to this chapter with additional information from Travelers' Health document issued by the National Center for Infectious Diseases at the Centers for Disease Control and Prevention 2002 [44]. "The use of immunobiologic agents during pregnancy should be limited to a few well-defined situations" [43, p. 3]. Factors to be considered include risk of exposure to the disease in question, risk of morbidity or mortality if the woman contracts the disease, and risk from the immunobiologic agent, especially if from live virus or live bacteria.
19. Nutrition
20. Food cravings/pica: Food cravings (e.g., pickles and ice cream) are usually transient and are of no concern as long as the diet is otherwise nutritionally adequate. Pica, a craving for clay or dirt (or ice shavings or laundry starch if the former are not available), is basically sociocultural in origin and is best indulged in limited quantities, if possible, in order to not interfere with a nutritious diet.
21. Rest: In addition to whatever amount of sleep she needs, the woman should have periodic rest periods during the day, preferably with her feet elevated. She should avoid sitting or standing for prolonged periods of time.
22. Exercise and activity: The woman should do whatever she is *accustomed to*, stopping short of fatigue—exercise should never be excessive. No other limits are needed if the woman is experienced in whatever form of exercise she wishes to pursue. Pregnancy is not the time, however, to be learning new strenuous sports (e.g., skiing, skydiving). Daily exercise such as walking outdoors is good for mental health, relaxation, bowels, and muscle conditioning (see Chapter 9).
23. Work: The decision as to whether to continue working should be left to the woman's discretion, within the following limits:
   a. A rest period should be taken approximately every 2 hours (this is equivalent to taking a lunch period and a morning and afternoon break during an eight-hour workday).
   b. Fatigue should be avoided.
   c. Severe physical strain should be avoided.
   d. The decision to work should be reassessed in the event any complications develop.
24. Body mechanics
   a. posture
   b. lifting (see the section on low back pain earlier in this chapter)
   c. getting up from a supine position:
      (1) bend knees
      (2) turn to side
      (3) push up with arms to a sitting position

25. Bathing
- **a.** no hot baths (exhausting)
- **b.** no cold baths (chilling)
- **c.** choice between shower and tub bath a matter of personal preference
- **d.** later in pregnancy a shower may be safer than a tub bath because of awkwardness arising from a change of center of gravity and balance; be sure tub bottom and shower floor are nonskid

26. Sexual intercourse
- **a.** changes in position to accommodate enlarged abdomen
- **b.** alternative methods of satisfying male and female sexual needs
- **c.** alleviation of any unnecessary concerns or fears regarding harming the baby with sexual intercourse
- **d.** abstinence if necessary (e.g., suspected premature rupture of membranes, bleeding, bleeding and cramps in first trimester, preterm labor)

27. Travel: If the pregnancy is progressing normally, the woman may travel as desired, keeping in mind
- **a.** the need to walk periodically (every two hours) to encourage circulation and avoid venous stasis
- **b.** if close to term, the need for alternative plans for giving birth at her destination and for any emergencies en route

28. Domestic violence
- **a.** Statistics and facts
  - **(1)** Twenty-three percent of pregnant women seeking routine prenatal care are battered women [45].
  - **(2)** Battering may be initiated or become more acute during pregnancy.
- **b.** risk factors in staying in or leaving the abusive situation, with an emphasis on safety
- **c.** resources available to the woman
- **d.** components of an emergency plan of action

29. Preparation for childbirth and parenthood (varies according to anticipated site of birth): The woman should be encouraged to attend classes (Figure 22-5); general areas of content may include the following:
- **a.** reproductive anatomy; bodily changes during pregnancy and related discomforts and relief measures
- **b.** exercises to promote relaxation (Figure 22-6), condition specific muscle groups, relieve discomforts, use during labor; positioning; breathing exercises for working with contractions; posture; body mechanics
- **c.** nutrition
- **d.** substance abuse
- **e.** fetal growth and development
- **f.** signs of impending labor; process and progress of labor; comfort measures; what to do, what to expect
- **g.** preparation for breastfeeding
- **h.** preparations for baby in the home; what to bring to the hospital or birth center for taking the baby home; basics of baby care

FIGURE 22-5 Childbirth education class.

FIGURE 22-6 Helping a couple with relaxation exercise.

- **i.** general hygiene (e.g., breast care, perineal care, bowel habits)
- **j.** potential problems: danger signs, what to do, prevention; use of medications
- **k.** postpartal course: what to expect in the hospital (individualized to the hospital) if birth occurs in this setting, sibling rivalry, 2-week and 4–6-week checkup
- **l.** antepartal/postpartal adjustments in relationships, especially between the woman and her partner
- **m.** response to concerns, questions, and so forth

30. Sibling preparation for birth
- **a.** selecting an adult sibling attendant
- **b.** attending classes for siblings, sibling attendant, and parents
- **c.** involving siblings in antepartal visits (Figure 22-7), according to age level (e.g., listening to fetal heart, feeling fetal movement, feeling baby parts)
- **d.** involving siblings in baby preparations

31. Superstitions: "Old wives' tales" should be countered with facts, reason, and understanding.

32. Breathing and relaxation exercises: Techniques should be taught, or what is learned in classes for preparation for childbearing and parenthood should be reinforced.

33. La Leche League meetings: These provide a particularly good antepartal learning experience for a woman who plans to breastfeed, especially if this will be her first breastfeeding experience. Practical tips and a chance to observe other women breastfeeding will answer many questions and provide an opportunity to see individual variations of nursing and mother-baby interactions. La Leche League members also can be a source of help if needed after birth.

34. Signs and symptoms of labor and when to call the midwife and/or come to the hospital or birth center

35. Preparations for coming to the hospital or birth center if not giving birth at home (e.g., what to pack for self and baby, where to go, admissions procedures, what to expect, and so forth)

36. What to do in the event of emergency childbirth

37. Baby preparations
- **a.** supplies, furniture, equipment, clothing
- **b.** purchase and installation of infant car seat
- **c.** decision regarding method of infant feeding (i.e., by breast or bottle)
- **d.** preparation of couple for changes in life necessitated by a baby
- **e.** care of siblings during intrapartal and immediate postpartal period

FIGURE 22-7 Sibling listening to fetal heart tones.

References

1. Hall, R. E. The supreme court decision on abortion. *Am. J. Obstet. Gynecol.* 116:1, 1973.
2. Alpern, D. M. Abortion and the law. *Newsweek*, March 3, 1975.
3. National Abortion Federation and American College of Obstetricians and Gynecologists. *Who Will Provide Abortions? Ensuring the Availability of Qualified Practitioners*. Washington, DC: National Abortion Federation, 1991.
4. Summers, L. The genesis of the ACNM 1971 statement on abortion. *J. Nurse-Midwifery* 37(3):168–174 (May/June) 1992.
5. McKee, K., and Adams, E. Nurse-midwife attitudes toward abortion performance and related procedures. *J. Nurse-Midwifery* 39(5):300–311 (September/October) 1994.
6. American College of Nurse-Midwives Position Statement. *Reproductive Choices*. Washington, DC: ACNM, 1991.
7. American College of Obstetricians and Gynecologists, Committee on Practice Bulletins. *ACOG Practice Bulletin: Medical Management of Abortion*. Washington, DC: ACOG, 2001.
8. National Abortion and Reproductive Rights Action League. *Fact Sheet: Mifepristone, Methotrexate, and Emergency Contraception*. Washington, DC: NARAL, January 14, 2002.

9. Creinin, M. D., Vittinghoff, E., Schaff, E., Klaisle, C., Darney, P. D., and Dean, C. Medical abortion with oral methotrexate and vaginal misoprostol. *Obstet. Gynecol.* 90:611–616, 1997.

10. Kahn, J. G., et al. The efficacy of medical abortion: a meta-analysis. *Contraception* 61:29–40, 2000.

11. Schaff, E. A., Fielding, S. L., Eisinger, S. H., Stadalius, L. S., and Fuller, L. Low-dose mifepristone followed by vaginal misoprostol at 48 hours for abortion up to 63 days. *Contraception* 61:41–61, 2000.

12. Fielding, S. L., Lee, S. S., and Schaff, E. A. Professional considerations for providing mifepristone-induced abortion. *Nurs. Pract.* 26(11)44–53 (November) 2001.

13. Knowles, J., and Dimitrov, D. *Medical Abortion—Questions & Answers*. New York: Planned Parenthood Federation of America, June 2002.

14. Wilcox, A. J., Baird, D. D., Dunson, D., McChesney, R., and Weinberg, C. R. Natural limits of pregnancy testing in relation to the expected menstrual period. *JAMA* 286(14):1759–1761 (October 10) 2001.

15. Centers for Disease Control and Prevention. Prevention of perinatal Group B Streptococcal disease. *MMWR* 51 (No. RR-11):4 (August 16) 2002.

16. U.S. Public Health Service Expert Panel on the Content of Prenatal Care. *Caring for Our Future: the Content of Prenatal Care*. Washington, DC: U.S. Public Health Service, Department of Health and Human Services, 1989.

17. Cunningham, F. G., Gant, N. F., Leveno, K. J., et al. *Williams Obstetrics*, 21st ed. New York: McGraw-Hill, 2001. Parkland Hospital Prenatal Visit Schedule, p. 224.

18. Binstock, M. A., and Wolde-Tsadik, G. Alternative prenatal care: impact of reduced visit frequency, focused visits and continuity of care. *J. Reprod. Med.* 40:507–512, 1995.

19. McDuffie, R. S. Jr., Beck, A., Bischoff, K., Cross, J., and Orleans, M. Effect of frequency of prenatal care visits on perinatal outcome among low-risk women: a randomized controlled trial. *JAMA* 275(11):847–851 (March 20) 1996.

20. Sikorski, J., Wilson, J., Clement, S., Das, S., and Smeeton, N. A randomised controlled trial comparing two schedules of antenatal visits: the antenatal care project. *Br. Med. J.* 312:546–553, 1996.

21. Rising, S. S. Centering pregnancy: an interdisciplinary model of empowerment. *J. Nurse-Midwifery* 43(1):46–54 (January/February) 1998.

22. Lacroix, R., Eason, E., and Melzack, R. Nausea and vomiting during pregnancy: a prospective study of its frequency, intensity, and patterns of change. *Am. J. Obstet. Gynecol.* 182(4):931–937 (April) 2000.

23. Enkin, M., Keirse, M. J. N. C., Neilson, J. P., et al. *A Guide to Effective Care in Pregnancy and Childbirth*, 3rd ed. Oxford: Oxford University Press, 2000.

24. Buckwalter, J. G., and Simpson, S. W. Psychological factors in the etiology and treatment of severe nausea and vomiting in pregnancy. *Am. J. Obstet. Gynecol.* 186(5c, part 2 suppl.):S210–214 (May) 2002.

25. Niebyl, J. R., and Goodwin, T. M. Overview of nausea and vomiting of pregnancy with an emphasis on vitamins and ginger. *Am. J. Obstet. Gynecol.* 186(5c, part 2 suppl.):S253–255 (May) 2002.

26. Warkany, J. The importance of prenatal diet. In *New Steps in Public Health*. Milbank Medical Foundation, 1945.

27. Churchill, J. A., et al. Birth weight and intelligence. *Obstet. Gynecol.* 28:425, 1966.

28. Singer, J. E., Westphal, M., and Niswander, K. Relationship of weight gain during pregnancy to birth weight and infant growth and development in the first year of life: A report from the Collaborative Study of Cerebral Palsy. *Obstet. Gynecol.* 31:417, 1968.

29. Dobbing, J. Undernutrition and the developing brain. *Am. J. Dis. Child.* 120:411, 1970.

30. Primrose, T., and Higgins, A. A study in human antepartum nutrition. *J. Reprod. Med.* 7:251, 1971.

31. Higgins, A. C. Montreal Diet Dispensary study. In *Nutritional Supplementation and the Outcome of Pregnancy*. Proceedings of a workshop conducted on November 3–5, 1971. Washington, DC: National Academy of Sciences, 1973.

32. Subcommittee on Nutrition, Brain Development, and Behavior of the Committee on International Nutrition Programs, Food and Nutrition Board, National Research Council. *The Relationship of Nutrition to Brain Development and Behavior*. Washington, DC: National Academy of Sciences, 1973.

33. Winick, M., et al. Effects of prenatal nutrition upon pregnancy risk. *Clin. Obstet. Gynecol.* 16:184, 1973.

34. Higgins, A. C. Nutritional status and the outcome of pregnancy. *J. Can. Diet. Assoc.* 37:17, 1976.

35. Piechnik, S. L., and Corbett, M. A. Reducing low birth weight among socioeconomically high-risk adolescent pregnancies: successful intervention with certified nurse-midwife-managed care and a multidisciplinary team. *J. Nurse-Midwifery* 30(2):88–98 (March/April) 1985.
36. Higgins, A. C. *A Preliminary Report of a Nutrition Study on Public Maternity Patients: 1963–1972*. Unpublished report of the Montreal Diet Dispensary, 1973.
37. Institute of Medicine, Committee on Nutritional Status During Pregnancy and Lactation. *Nutrition During Pregnancy*. Washington, DC: National Academy Press, 1990.
38. National Research Council, Food and Nutrition Board, Commission on Life Sciences. *Recommended Daily Dietary Allowances*, 10th ed. Report of the Subcommittee on the Tenth Edition of the RDAs. Washington, DC: National Academy Press, 1989.
39. Long, P. Rethinking iron supplementation during pregnancy. *J. Nurse-Midwifery* 40(1):36–40 (January/February) 1995.
40. Corbett, M. A., and Burst, H. V. Nurse-midwives and adolescents: The South Carolina experience. *J. Nurse-Midwifery* 21(4):13–17 (Winter) 1976.
41. Corbett, M. A., and Burst, H. V. Nutritional intervention in pregnancy. *J. Nurse-Midwifery* 28(4):23–29 (July/August) 1983.
42. Roberts, J. E. Priorities in prenatal education. *J. Obstet. Gynecol. Nurs.* 17–20 (May/June) 1976.
43. American College of Obstetricians and Gynecologists. *Immunization During pregnancy*. ACOG Technical Bulletin No. 160. October 1991.
44. Centers for Disease Control and Prevention, National Center for Infectious Diseases, *Travelers' Health: Pregnancy, Breast-Feeding, and Travel*. February 25, 2002.
45. Helton, A. S., Anderson, E., and McFarlane, J. Battered and pregnant: a prevalence study with intervention measures. *Am. J. Public Health* 77(10):1337–1339, 1987.

• • • Bibliography

A Home Study Program on Domestic Violence. *J. Nurse-Midwifery* 41(6):entire issue (November/December) 1996.

Alpern, D. M. Abortion and the law. *Newsweek*, March 3, 1975.

Alpert, E. J. Have we overlooked the most common cause of maternal mortality in the United States? *J. Midwifery Womens Health* 46(1):3 (January/February) 2001.

American College of Nurse-Midwives Position Statement. *Reproductive Choices*. Washington, DC: ACNM, 1991, updated 1997.

American College of Nurse-Midwives Position Statement. *Violence Against Women*. Washington, DC: ACNM, 1995, updated 1997.

American College of Nurse-Midwives Division of Standards and Practice, Section on Clinical Standards and Documentation. *Early-Onset Group B Strep Infection in Newborns: Prevention and Prophylaxis*. Clinical Bulletin No. 2. Washington, DC: ACNM, January, 1997.

American College of Obstetricians and Gynecologists, Committee on Practice Bulletins. *ACOG Practice Bulletin: Medical Management of Abortion*. Washington, DC: ACOG, 2001.

American College of Obstetricians and Gynecologists. *Immunization During Pregnancy*. ACOG Technical Bulletin No. 160. October 1991.

American College of Obstetricians and Gynecologists. *Planning for Pregnancy, Birth, and Beyond*, 2nd ed. Washington, DC: ACOG, 1995.

Andrews, C. M., and O'Neill, L. M. Use of pelvic tilt exercise for ligament pain relief. *J. Nurse-Midwifery* 39(6):370–374 (November/December) 1994.

Atlay, R. D., Gillison, E. W., and Horton, A. L. A fresh look at pregnancy heartburn. *J. Obstet. Gynaecol. Br. Commonwealth* 80:63, 1973.

Binstock, M. A., and Wolde-Tsadik, G. Alternative prenatal care: impact of reduced visit frequency, focused visits and continuity of care. *J. Reprod. Med.* 40:507–512, 1995.

Bohn, D. K., and Parker, B. Domestic violence and pregnancy. In Campbell, J., and Humphreys, J. (Eds.). *Nursing Care of Survivors of Family Violence*. St. Louis, MO: Mosby, 1993.

Brewer, T. H. *Metabolic Toxemia of Late Pregnancy*. Springfield, IL: Thomas, 1966.

Buckwalter, J. G., and Simpson, S. W. Psychological factors in the etiology and treatment of severe nausea and vomiting in pregnancy. *Am. J. Obstet. Gynecol.* 186(5c, part 2 suppl.):S210–214 (May) 2002.

Cadwell, K. (Ed.) *Reclaiming Breastfeeding for the United States: Protection, Promotion, and Support*. Sudbury, MA: Jones and Bartlett, 2002.

Caring for Our Future: The Content of Prenatal Care. A Report of the Public Health Service Expert Panel on the Content of Prenatal Care. Washington, DC: Department of Health and Human Services, U.S. Public Health Service, 1989.

Carrington, B. W., et al. Modifying a childbirth education curriculum for two specific populations: inner-city adolescents and substance-using women. *J. Nurse-Midwifery* 39(5):312–320 (September/October) 1994.

Centers for Disease Control and Prevention. Prevention of perinatal Group B Streptococcal disease. *MMWR* 51(No. RR-11):4, August 16, 2002.

Centers for Disease Control and Prevention, National Center for Infectious Diseases, *Travelers' Health: Pregnancy, Breast-Feeding, and Travel*. February 25, 2002.

Chesley, L. C. *Hypertensive Disorders in Pregnancy*. New York: Appleton-Century-Crofts, 1978.

Chez, R. A., et al. Advising pregnant women about nutrition. *Contemp. OB/GYN* 36(1):80–97 (January) 1991.

Churchill, J. A., et al. Birth weight and intelligence. *Obstet. Gynecol.* 28:425, 1966.

Corbett, M. A., and Burst, H. V. Nurse-midwives and adolescents: The South Carolina experience. *J. Nurse-Midwifery* 21(4):13–17 (Winter) 1976.

Corbett, M. A., and Burst, H. V. Nutritional intervention in pregnancy. *J. Nurse-Midwifery* 28(4):23–29 (July/August) 1983.

Cranley, J. J. Managing varicose veins in pregnancy. *Contemp. OB/GYN* 7:139, 1976.

Creinin, M. D., Vittinghoff, E., Schaff, E., Klaisle, C., Darney, P. D., and Dean, C. Medical abortion with oral methotrexate and vaginal misoprostol. *Obstet. Gynecol.* 90:611–616, 1997.

Cross-Cultural Counseling: A Guide for Nutrition and Health Counselors. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, 1986.

Cunningham, F. G., Gant, N. F., Leveno, K. J., et al. *Williams Obstetrics*, 21st ed. New York: McGraw-Hill, 2001.

Daniels, M. B. The birth experience for the sibling: description and evaluation of a program. *J. Nurse-Midwifery* 28(5):15–22 (September/October) 1983.

Davis, D. C. The discomforts of pregnancy. *JOGNN: J. Obstet. Gynecol. Neonatal Nurs.* 25(1):73–81 (January) 1996.

Dobbing, J. Undernutrition and the developing brain. *Am. J. Dis. Child.* 120:411, 1970.

Ellertson, C., and Waldman, S. N. The mifepristone-misoprostol regimen for early medical abortion. *Curr. Womens Health Rep.* 1(3):184–190 (December) 2001.

Enkin, M., Keirse, M. J. N. C., Neilsen, J. P., et al. *A Guide to Effective Care in Pregnancy and Childbirth*, 3rd ed. Oxford: Oxford University Press, 2000.

FDA pregnancy risk categories. *Federal Register* 44:37434–37467, 1980.

Fielding, S. L., Lee, S. S., and Schaff, E. A. Professional considerations for providing mifepristone-induced abortion. *Nurse Pract.* 26(11)44–53 (November) 2001.

Fitzhugh, M. L., and Newton, M. Posture in pregnancy. *Am. J. Obstet. Gynecol.* 85:1091, 1963.

Giotta, M. P. Nutrition during pregnancy: Reducing obstetric risk. *J. Perinat. Neonatal Nurs.* 6(4):1–12 (March) 1993.

Goer, Henci. *The Thinking Woman's Guide to a Better Birth*. Perigee Publishers, 1999.

Goss, G. L. Pregnancy termination: understanding and supporting women who undergo medical abortion. *AWHONN Lifelines* 6(1):46–50 (February/March) 2002.

Gotsch, G., and Torgus, J., for La Leche League International. *The Womanly Art of Breastfeeding*, 6th ed. New York: Penguin Putnam/Plume, 1997.

Hackley, B. K. Immunizations in pregnancy: a public health perspective. *J. Nurse-Midwifery* 44(2):106–117.

Hackley, B. K. Controversies in immunization practices: vaccine safety and implications for midwifery practice. *J. Midwifery Womens Health* 47(1):16–27 (January/February) 2002.

Haire, D. *The Pregnant Patient's Bill of Rights*. New York: Committee on Patients' Rights, 1974.

Hall, R. E. The supreme court decision on abortion. *Am. J. Obstet. Gynecol.* 116:1, 1973.

Helton, A. S., Anderson, E., and McFarlane, J. Battered and pregnant: a prevalence study with intervention measures. *Am. J. Public Health* 77(10):1337–1339, 1987.

Higgins, A. C. *A Preliminary Report of a Nutrition Study on Public Maternity Patients: 1963–1972*. Unpublished report of the Montreal Diet Dispensary, 1973.

Higgins, A. C. Montreal Diet Dispensary study. In *Nutritional Supplementation and the Outcome of Pregnancy*. Proceedings of a workshop conducted on November 3–5, 1971. Washington, DC: National Academy of Sciences, 1973.

Higgins, A. C. Nutritional status and the outcome of pregnancy. *J. Can. Diet. Assoc.* 37:17, 1976.

Ho, P. C., Yu Ng, E. H., and Tang, O. S. Mifepristone: contraceptive and noncontraceptive uses. *Curr. Opinion Obstet. Gynecol.* 14(3):325–330 (June) 2002.

Holtzman, L. C. Sexual practices during pregnancy. *J. Nurse-Midwifery* 21:29, 1976.

Institute of Medicine. *Preventing Low Birthweight*. Washington, DC: National Academy Press, 1985.

Institute of Medicine, Committee on Nutritional Status During Pregnancy and Lactation. *Nutrition During Pregnancy*. Washington, DC: National Academy Press, 1990.

Jimenez, S. L. M. *The Pregnant Woman's Comfort Guide*. Englewood Cliffs, NJ: Prentice Hall, 1983.

Kahn, J. G., et al. The efficacy of medical abortion: a meta-analysis. *Contraception* 61:29–40, 2000.

Keller, C., and Copeland, P. Counseling the abortion patient is more than talk. *Am. J. Nurs.* 72:102, 1972.

King, C. M., and Ryan, J. Woman abuse: the role of nurse-midwives in assessment. *J. Nurse-Midwifery* 41(6):436–441 (November/December) 1996.

Kitzinger, S. *The Complete Book of Pregnancy and Childbirth*. New York: Knopf, 1996.

Knowles, J., and Dimitrov, D. *Medical Abortion—Questions & Answers*. New York: Planned Parenthood Federation of America, June 2002.

Krulewitch, C. J. Hidden from view: violent deaths among pregnant women in the District of Columbia, 1988–1996. *J. Midwifery Womens Health* 46(1):4–10 (January/February) 2001.

Lacroix, R., Eason, E., and Melzack, R. Nausea and vomiting during pregnancy: a prospective study of its frequency, intensity, and patterns of change. *Am. J. Obstet. Gynecol.* 182(4):931–937 (April) 2000.

Lehrman, E. J. Nurse-midwifery practice: A descriptive study of prenatal care. *J. Nurse-Midwifery* 26(3):27–41 (May/June) 1981.

Long, P. Rethinking iron supplementation during pregnancy. *J. Nurse-Midwifery* 40(1):36–40 (January/February) 1995.

Low Dog, T., and Crawford, A. M. *Syllabus: Herbs and the Reproductive Cycle*. ACNM Regional Educational Workshop, 1993–1994.

MacLaughlin, S. M., and Johnston, K. B. The preparation of young children for the birth of a sibling. *J. Nurse-Midwifery* 29(6):371–376 (November/December) 1984.

Malnory, M. E. A prenatal assessment tool for mothers and fathers. *J. Nurse-Midwifery* 27(6):26–34 (November/December) 1982.

Maternity Center Association. *Preparation for Childbearing*, 3rd. ed. New York: 1969.

McCormick, M. C. The contribution of low birth weight to infant mortality and childhood morbidity. *N. Eng. J. Med.* 312(2):82–90 (January 10) 1985.

McDuffie, R. S. Jr., Beck, A., Bischoff, K. Cross, J., and Orleans, M. Effect of frequency of prenatal care visits on perinatal outcome among low-risk women: a randomized controlled trial. *JAMA* 275(11):847–851 (March 20) 1996.

McFarlane, J., and Gondolf, E. Preventing abuse during pregnancy: a clinical protocol. *MCN, J. Maternal/Child Nurs.* 23(1):22–26 (January/February) 1998.

McKee, K., and Adams, E. Nurse-midwife attitudes toward abortion performance and related procedures. *J. Nurse-Midwifery* 39(5):300–311 (September/October) 1994.

Merkatz, I. R., and Thompson, J. E. *New Perspectives on Prenatal Care*. New York: Elsevier Science, 1990.

Moore, D. S. Prepared childbirth: The pregnant couple and their marriage. *J. Nurse-Midwifery* 22(2):18–26 (Summer) 1977.

Murphy, P. A. Risk, risk assessment, and risk labels. *J. Nurse-Midwifery* 39(2):67–69 (March/April) 1994.

National Abortion Federation and American College of Obstetricians and Gynecologists. *Who Will Provide Abortions? Ensuring the Availability of Qualified Practitioners*. Washington, DC: National Abortion Federation, 1991.

The National Abortion and Reproductive Rights Action League. *Fact Sheet: Mifepristone, Methotrexate, and Emergency Contraception*. Washington, DC: NARAL, January 14, 2002.

National Research Council, Food and Nutrition Board, Commission on Life Sciences. *Recommended Daily Dietary Allowances*, 10th ed. Report of the Subcommittee on the Tenth Edition of the RDAs. Washington, DC:

National Academy Press, 1989.
Newhall, E. P., and Winikoff, B. Abortion with mifepristone and misoprostol: regimens, efficacy, acceptability, and future directions. *Am. J. Obstet. Gynecol.* 183(2 suppl.):S44–53 (August) 2000.
Newman, V., and Fullerton, J. T. Role of nutrition in the prevention of preeclampsia: Review of the literature. *J. Nurse-Midwifery* 35(5):282–291 (September/October) 1990.
Niebyl, J. R., and Goodwin, T. M. Overview of nausea and vomiting of pregnancy with an emphasis on vitamins and ginger. *Am. J. Obstet. Gynecol.* 186(5c, part 2 suppl.):S253–255 (May) 2002.
Norton, L. B., Peipert, J. F., Zierler, S., Lima, B., and Hume, L. Battering in pregnancy: an assessment of two screening methods. *Obstet. Gynecol.* 85(3):321–325 (March) 1995.
Palomaki, J. F. Abortion techniques: What are their risks and complications? *Contemp. OB/GYN* 9:73, 1977.
Paluzzi, P. A., and Quimby, C. H. *Domestic Violence Education Module*. Washington, DC: American College of Nurse-Midwives, Special Projects Section, 1995.
Paluzzi, P. A. Nurse-midwives and domestic violence. *J. Nurse-Midwifery* 41(6):428–429 (November/December) 1996.
Paluzzi, P., Graffikin, L., and Nanda, J. The American College of Nurse-Midwives' domestic violence education project: evaluation and results. *J. Midwifery Womens Health* 45(5):384–391 (September/October) 2000.
Parma, S. A family centered event? Preparing the child for sharing in the experience of childbirth. *J. Nurse-Midwifery* 24(3):5–10 (May/June) 1979.
Piechnik, S. L., and Corbett, M. A. Reducing low birth weight among socioeconomically high-risk adolescent pregnancies: successful intervention with certified nurse-midwife-managed care and a multidisciplinary team. *J. Nurse-Midwifery* 30(2):88–98 (March/April) 1985.
Primrose, T., and Higgins, A. A study in human antepartum nutrition. *J. Reprod. Med.* 7:251, 1971.
Riordan, J., and Auerbach, K. *Breastfeeding and Human Lactation*, 2nd ed. Sudbury, MA: Jones and Bartlett, 1999.
Rising, S. S. Centering pregnancy: an interdisciplinary model of empowerment. *J. Nurse-Midwifery* 43(1):46–54 (January/February) 1998.
Roberts, J. E. Priorities in prenatal education. *J. Obstet. Gynecol. Nurs.* 17–20 (May/June) 1976.
Robinson, M. Salt in pregnancy. *Lancet* (1):178, 1958.
Schaff, E. A., Fielding, S. L., Eisinger, S. H., Stadalius, L. S., and Fuller, L. Low-dose mifepristone followed by vaginal misoprostol at 48 hours for abortion up to 63 days. *Contraception* 61:41–61, 2000.
Schreier, A. C. The nurse-midwifery management of physiological edema in pregnancy. *J. Nurse-Midwifery* 21:18, 1976.
Schwarz, R. H. Considerations of antibiotic therapy during pregnancy. *Obstet. Gynecol.* 58(5 suppl.):S95–99 (November) 1991.
Sikorski, J., Wilson, J., Clement, S., Das, S., and Smeeton, N. A randomised controlled trial comparing two schedules of antenatal visits: the antenatal care project. *Br. Med. J.* 312:546–553, 1996.
Simkin, P., Whalley, J., and Keppler, A. *Pregnancy, Childbirth, and the Newborn: The Complete Guide, Rev.* Minnetonka, MN: Meadowbrook Press, 2001.
Singer, J. E., Westphal, M., and Niswander, K. Relationship of weight gain during pregnancy to birth weight and infant growth and development in the first year of life: a report from the Collaborative Study of Cerebral Palsy. *Obstet. Gynecol.* 31:417, 1968.
Smoking and pregnancy. In *Health Consequence of Smoking: A Report of the Surgeon General.* Washington, DC: U.S. Dept. of Health, Education, and Welfare, 1971.
Stephenson, J. N. Pregnancy testing and counseling. *Ped. Clin. N. Am.* 36(3):681–696 (June) 1989.
Subcommittee on Nutrition, Brain Development, and Behavior of the Committee on International Nutrition Programs, Food and Nutrition Board, National Research Council. *The Relationship of Nutrition to Brain Development and Behavior*. Washington, DC: National Academy of Sciences, 1973.
Summers, L. The genesis of the ACNM 1971 statement on abortion. *J. Nurse-Midwifery* 37(3):168–174 (May/June) 1992.
Trupin, S. R., and Moreno, C. Medical abortion: overview and management. *Medscape Womens Health* 6(6):4 (December) 2001.
U.S. Public Health Service Expert Panel on the Content of Prenatal Care. *Caring for Our Future: the Content of Prenatal Care*. Washington, DC:

U.S. Public Health Service, Department of Health and Human Services, 1989.

Warkany, J. The importance of prenatal diet. In *New Steps in Public Health*. Milbank Medical Foundation, 1945.

Wellman, L. G. *The Role of Nutrition in the Etiology of Preeclampsia/Eclampsia*. Masters thesis. New Haven, CT: Yale University School of Nursing, 1989.

Wiedenbach, E. *Family-Centered Maternity Nursing*. New York: Putnam's, 1958 and 1967.

Wilcox, A. J., Baird, D. D., Dunson, D., McChesney, R., and Weinberg, C. R. Natural limits of pregnancy testing in relation to the expected menstrual period. *JAMA* 286(14):1759–1761 (October 10) 2001.

Winick, M. *Nutrition and Pregnancy*. White Plains, NY: March of Dimes Birth Defects Foundation, 1986.

Winick, M., et al. Effects of prenatal nutrition upon pregnancy risk. *Clin. Obstet. Gynecol.* 16:184, 1973.

Worthington-Roberts, B., and Williams, S. R. *Nutrition in Pregnancy and Lactation*, 6th ed. New York: McGraw-Hill, 1996.

APPENDIX A Immunization During Pregnancy

Immunobiologic Agent	Risk from Disease to Pregnant Woman	Risk from Disease to Fetus or Neonate	Type of Immunizing Agent	Risk from Immunizing Agent to Fetus	Indications for Immunization During Pregnancy	Dose Schedule	Comments
			Live Virus Vaccines				
Measles	Significant morbidity, low mortality; not altered by pregnancy	Significant increase in abortion rate; may cause malformations	Live attenuated virus vaccine	None confirmed	Contraindicated (see immune globulins)	Single dose SC, preferably as measles-mumps-rubella[a]	Vaccination of susceptible women should be part of postpartum care
Mumps	Low morbidity and mortality; not altered by pregnancy	Probable increased rate of abortion in first trimester	Live attenuated virus vaccine	None confirmed	Contraindicated	Single dose SC, preferably as measles-mumps-rubella	Vaccination of susceptible women should be part of postpartum care
Poliomyelitis	No increased incidence in pregnancy, but may be more severe if it does occur	Anoxic fetal damage reported; 50% mortality in neonatal disease	Live attenuated virus (oral polio vaccine [OPV]) and enhanced-potency inactivated virus (e-IPV) vaccine[b]	None confirmed	Not routinely recommended for women in United States except persons at increased risk of exposure	Primary: Two doses of e-IPV SC at 4- to 8-week intervals and a third dose 6–12 months after the second dose. Immediate protection: One dose OPV orally (in outbreak setting)	Vaccine indicated for susceptible pregnant women traveling in endemic areas or in other high-risk situations
Rubella	Low morbidity and mortality; not altered by pregnancy	High rate of abortion and congenital rubella syndrome	Live attenuated virus vaccine	None confirmed	Contraindicated	Single dose SC, preferably as measles-mumps-rubella	Teratogenicity of vaccine is theoretic, not confirmed to date; vaccination of susceptible women should be part of postpartum care
Yellow fever	Significant morbidity and mortality; not altered by pregnancy	Unknown	Live attenuated virus vaccine	Unknown	Contraindicated, except if exposure is unavoidable	Single dose SC	Postponement of travel preferable to vaccination, if possible; *breastfeeding mothers should also postpone travel as the neonate cannot be immunized because of vaccine-associated encephalitis

Source: Reprinted by permission of the American College of Obstetricians and Gynecologists. Immunization During Pregnancy. *Technical Bulletin* No. 160. Washington, DC, ACOG, 1991.

* Additional information from Centers for Disease Control and Prevention, National Center for Infectious Diseases, *Travelers' Health: Pregnancy, Breast-Feeding, and Travel*, February 25, 2002.

APPENDIX A Immunization During Pregnancy *(continued)*

Immunobiologic Agent	Risk from Disease to Pregnant Woman	Risk from Disease to Fetus or Neonate	Type of Immunizing Agent	Risk from Immunizing Agent to Fetus	Indications for Immunization During Pregnancy	Dose Schedule	Comments
			Inactivated Virus Vaccines				
Influenza	Possible increase in morbidity and mortality during epidemic of new antigenic strain	Possible increased abortion rate; no malformations confirmed	Inactivated virus vaccine	None confirmed	Women with serious underlying diseases; public health authorities to be consulted for current recommendation	One dose IM every year	
Rabies	Near 100% fatality; not altered by pregnancy	Determined by maternal disease	Killed virus vaccine	Unknown	Indications for prophylaxis not altered by pregnancy; each case considered individually	Public health authorities to be consulted for indications, dosage, and route of administration	
Hepatitis B	Possible increased severity during third trimester	Possible increase in abortion rate and prematurity; neonatal hepatitis can occur; high risk of newborn carrier state	Recombinant vaccine	None reported	Pre- and post-exposure for women at risk of infection	Three- or four-dose series IM	Used with hepatitis B immune globulin for some exposures; exposed newborn needs vaccination as soon as possible
			Inactivated Bacterial Vaccines				
Cholera	Significant morbidity and mortality; more severe during third trimester	Increased risk of fetal death during third-trimester maternal illness	Killed bacterial vaccine	None confirmed	Indications not altered by pregnancy; vaccination recommended only in unusual outbreak situations	Single dose SC or IM, depending on manufacturer's recommendations, when indicated	
Plague	Significant morbidity and mortality; not altered by pregnancy	Determined by maternal disease	Killed bacterial vaccine	None reported	Selective vaccination of exposed persons	Public health authorities to be consulted for indications, dosage, and route of administration	
Pneumococcus	No increased risk during pregnancy; no increase in severity of disease	Unknown	Polyvalent polysaccharide vaccine	No data available on use during pregnancy	Indications not altered by pregnancy; vaccine used only for high-risk individuals	In adults one SC or IM dose only; consider repeat dose in 6 years for high-risk individuals	

APPENDIX A Immunization During Pregnancy *(continued)*

Immunobiologic Agent	Risk from Disease to Pregnant Woman	Risk from Disease to Fetus or Neonate	Type of Immunizing Agent	Risk from Immunizing Agent to Fetus	Indications for Immunization During Pregnancy	Dose Schedule	Comments
			Inactivated Bacterial Vaccines (continued)				
Typhoid	Significant morbidity and mortality; not altered by pregnancy	Unknown	Killed or live attenuated oral bacterial vaccine	None confirmed	Not recommended routinely except for close, continued exposure or travel to endemic areas	Killed: (*vaccine of choice during pregnancy) *Primary:* Two injections SC at least 4 weeks apart. *Booster:* Single dose SC or ID (depending on type of product used) every 3 years. Oral: (*safety not known) *Primary:* Four doses on alternate days *Booster:* Schedule not yet determined	
			Toxoids				
Tetanus-diphtheria	Severe morbidity; tetanus mortality 30%, diphtheria mortality 10%; unaltered by pregnancy	Neonatal tetanus mortality 60%	Combined tetanus-diphtheria toxoids preferred: adult tetanus-diphtheria formulation	None confirmed	Lack of primary series, or no booster within past 10 years	Primary: Two doses IM at 1–2-month interval with a third dose 6–12 months after the second Booster: Single dose IM every 10 years, after completion of primary series	Updating of immune status should be part of antepartum care *Preferably administered during second or third trimester
			Specific Immune Globulins				
Hepatitis B	Possible increased severity during third trimester	Possible increase in abortion rate and prematurity; neonatal hepatitis can occur; high risk of carriage in newborn	Hepatitis B immune globulin	None reported	Postexposure prophylaxis	Depends on exposure; consult Immunization Practices Advisory Committee recommendations (IM)	Usually given with HBV vaccine; exposed newborn needs immediate postexposure prophylaxis

APPENDIX A Immunization During Pregnancy *(continued)*

Immunobiologic Agent	Risk from Disease to Pregnant Woman	Risk from Disease to Fetus or Neonate	Type of Immunizing Agent	Risk from Immunizing Agent to Fetus	Indications for Immunization During Pregnancy	Dose Schedule	Comments
			Specific Immune Globulins (continued)				
Rabies	Near 100% fatality; not altered by pregnancy	Determined by maternal disease	Rabies immune globulin	None reported	Postexposure prophylaxis	Half dose at injury site, half dose in deltoid	Used in conjunction with rabies killed virus vaccine
Tetanus	Severe morbidity; mortality 21%	Neonatal tetanus mortality 60%	Tetanus immune globulin	None reported	Postexposure prophylaxis	One dose IM	Used in conjunction with tetanus toxoid
Varicella	Possible increase in severe varicella pneumonia	Can cause congenital varicella with increased mortality in neonatal period; very rarely causes congenital defects	Varicella-zoster immune globulin (obtained from the American Red Cross)	None reported	Can be considered for healthy pregnant women exposed to varicella to protect against maternal, not congenital, infection	One dose IM within 96 hours of exposure	Indicated also for newborns of mothers who developed varicella within 4 days prior to delivery or 2 days following delivery; approx. 90–95% of adults are immune to varicella; not indicated for prevention of congenital varicella
			Standard Immune Globulins				
Hepatitis A	Possible increased severity during third trimester	Probable increase in abortion rate and prematurity; possible transmission to neonate at delivery if mother is incubating the virus or is acutely ill at that time	Standard immune globulin	None reported	Postexposure prophylaxis	0.02 mL/kg IM in one dose of immune globulin	Immune globulin should be given as soon as possible and within 2 weeks of exposure; infants born to mothers who are incubating the virus or are actually ill at delivery should receive one dose of 0.5 mL as soon as possible after birth
Measles	Significant morbidity, low mortality; not altered by pregnancy	Significant increase in abortion rate; may cause malformations	Standard immune globulin	None reported	Postexposure prophylaxis	0.25 mL/kg IM in one dose of immune globulin up to 15 mL	Unclear if it prevents abortion; must be given within 6 days of exposure

Abbreviations: SC = subcutaneously; PO = orally; IM = intramuscularly; ID = intradermally.

[a] Two doses necessary for adequate vaccination of students entering institutions of higher education, newly hired medical personnel, and international travelers.

[b] Inactivated polio vaccine recommended for nonimmunized adults at increased risk.

CHAPTER

23

Fetal Assessment

One of the hallmarks of midwifery care is the appropriate use of technology. Determining what is appropriate for an individual woman is one of the most complex areas of decision-making the midwife faces. Technology—in the form of laboratory tests, genetic assessments, ultrasound examinations, electronic fetal monitoring, and invasive testing—is growing at an exponential rate. The trend in medical management is often that "more is better." The midwife can easily be caught amidst medical standards, societal demands, women's issues, cost-benefit ratios, legal implications, the philosophy of pregnancy as a normal condition, and the wishes of an individual woman. This chapter is a guide to the array of testing that can provide information regarding fetal well-being from conception until the onset of labor. As in other areas of clinical care, there are few absolute rights and wrongs. Instead, a midwife's thorough knowledge of what methods of fetal assessment are available and the advantages and disadvantages of each is essential to counseling each woman in midwifery care to the safest and most satisfying pregnancy and birth possible for her individual situation.

Using technology with respect for the concerns of women and families also adds to the quality of midwifery practice. This chapter discusses many screening procedures and tests of fetal well-being. Knowing the indications, possible results, and implications of these tests and procedures is only a beginning. Experience with their use will assist the midwife in walking the fine line between offering useful information for management of pregnancy and sliding down the proverbial "slippery slope" toward overreliance on medical technology.

First Trimester Assessment of Pregnancy Well-Being

Confirmation of pregnancy is the initial reason women utilize medical technology during pregnancy. For most women, a single urine pregnancy test in the office and an initial prenatal visit comprise appropriate assessment of early pregnancy. Urine tests are now accurate once a woman has missed her menstrual cycle, as they are sensitive to human chorionic gonadotropin (hCG) levels below 50 mIUs. False positives (a positive urine test when no pregnancy actually exists) are rare; false negatives (a negative test when the woman is truly pregnant) can occur if the test is done too soon after conception. When the woman has a normal history and her clinical examination concurs with menstrual dates, additional assessment with technology such as ultrasound is not necessary to verify what the woman and her midwife have established. This early pregnancy period is a time to begin discussion about appropriate options among screening tests (e.g., maternal serum multiple marker screening) at various times during pregnancy. Directed teaching at this time regarding normal pregnancy growth and development as well as warning signs offers reassurance to women about normal pregnancy.

A woman who has an uncertain menstrual history, chronic disease, a history of repeated pregnancy loss, ectopic pregnancy, or congenital anomalies may require more complete assessment in early pregnancy. When a woman presents with pelvic pain, vaginal bleeding, loss of pregnancy symptoms, or unusual pelvic findings such as an adnexal mass, evaluation such as measurement of

serum beta human chorionic gonadotropin (B-hCG) levels and/or use of ultrasound may be necessary to establish that she is experiencing a viable, intrauterine pregnancy. When a woman has undergone assisted reproductive technology (ART)—such as intrauterine insemination (IUI), in vitro fertilization (IVF), gamete intrafallopian transfer (GIFT), or other procedures—use of serum B-hCG level and ultrasound may also be necessary for complete evaluation of the pregnancy.

The use of quantitative serum B-hCG levels is recommended for a pregnancy in which there is a question of normal development. An initial B-hCG level offers a baseline to which further assessment of the embryo can be added. Serum B-hCG can be detected within 8 to 11 days after conception [1]. After that it doubles every 2 days in the first weeks of pregnancy, peaking at about 10 weeks' gestation. As shown in Figure 23-1, there is then a rapid decrease in B-hCG between 12 and 16 weeks' gestation [2].

Because multiple gestation, spontaneous abortion, ectopic pregnancy, and hydatidiform mole may all affect B-hCG levels, any abnormality in these values merits further evaluation (see Chapter 24). Serum hCG levels that are doubling appropriately are usually associated with a normal pregnancy. Very rapidly increasing values may indicate a multiple pregnancy or a hydatidiform mole. Slowly rising or leveling hCG levels may represent an ectopic pregnancy [3]. In the case of rapid or very slow increase of serum hCG levels, ultrasound examination is required. Dropping hCG levels represent either early pregnancy loss or a viable pregnancy that is actually more than 12 weeks' gestation. Abnormal laboratory findings may precede physical signs and symptoms.

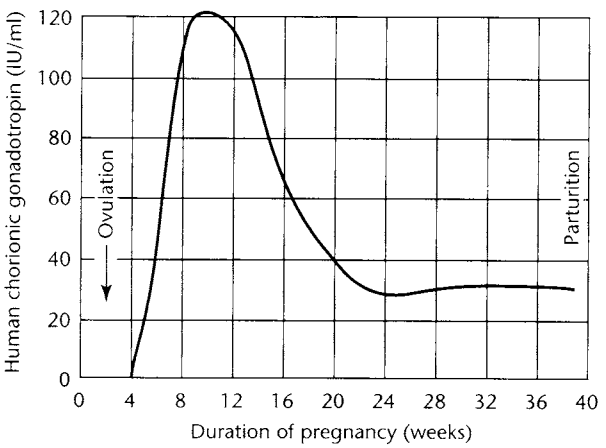

FIGURE 23-1 Hormonal excretion during pregnancy.

Source: Reproduced by permission from Guyton, A.C. *Human Physiology and Mechanisms of Disease*, 4th ed. Philadelphia: W.B. Saunders, 1987, p. 643.

When pain or bleeding occurs during the first 3 months of pregnancy, assessment for spontaneous abortion and ectopic pregnancy is made more accurate with the use of ultrasound. The transvaginal ultrasound transducer allows identification of a gestational sac by 5 postmenstrual weeks and of fetal heart motion by 7 weeks [4]. Women who have conceived with the assistance of reproductive technology are generally assessed using ultrasound to establish the implantation site, number, and viability of the embryos.

Careful history taking, thorough physical assessment, and ultrasound examination in combination with urine or serum B-hCG quantification can assist the midwife in making a correct assessment of the gestational age of the fetus and any abnormalities of the first trimester pregnancy. Whenever results of any pregnancy testing are abnormal, medical consultation or collaboration is indicated. The midwife must thus have resources immediately available for urgent referrals when the situation warrants, as well as the ability to offer urine, hematologic, and ultrasound screening. (See Chapter 24.)

Screening for Anomalies

One effect of the Human Genome Project and our increasing awareness of the role genetic changes play in many, if not most, health problems, has been to increase the importance of genetic history taking and patient counseling during pregnancy. All midwives should be able to identify common risk factors and historical events that increase a family's chance of having a child with a genetic birth defect, as well as other developmental or teratogenic complications.

The current standard of care is to offer all women screening for open neural tube defects and trisomies 21 and 18 and to counsel them in the implications of testing and of test results. All women are at some risk for genetic defects in their children. However, not all women are appropriate candidates for invasive genetic testing, such as chorionic villus sampling or amniocentesis, because of their very low risk status. Today, a woman who will be 35 on or before her expected delivery date, a woman with a personal or family history of defects for which diagnostic tests are available, or a woman who has abnormal screening test results is identified as a candidate for complete genetic evaluation [5]. However, 95 percent of all open neural tube defects, occur in previously unaffected families [6], and although the rate of genetic anomalies rises rapidly with maternal

age, 70 to 80 percent of all trisomies occur in women under 35 years of age [7]. Therefore, offering screening to all women permits the identification of an additional population of women who may benefit from genetic assessment. Maternal serum alpha-fetoprotein (MSAFP) or triple screening is performed on a maternal blood sample, usually between 15 and 18 weeks of pregnancy.

Assessment for Structural and Genetic Abnormality

History Taking The initial pregnancy history elicits information about the woman's age, ethnic background, history of pregnancy losses, congenital anomalies in her and her partner's families, and exposure to substances that may be mutagenic or teratogenic. Each of these may be an indication for testing.

Maternal age is probably the most widely known indication for genetic assessment. Table 23-1 lists the risk of chromosomal abnormalities in general and in Down syndrome, specifically, based on maternal age [6]. Indeed, as maternal age increases, the risk for congenital anomalies also increases. However, the maternal age of 35 is not a time of sudden increase in anomalies; rather, the equivalence of risk between a fetal chromosomal disorder and pregnancy loss due to amniocentesis makes age 35 the cutoff point for routinely offering a complete genetic evaluation.

TABLE 23-1 Risk of Down Syndrome by Maternal Age

Maternal Age	Risk for Down Syndrome	Risk for any Chromosomal Abnormality
21	1/1667	1/526
23	1/1429	1/500
25	1/1250	1/476
27	1/1111	1/455
29	1/1000	1/417
31	1/909	1/385
33	1/625	1/317
35	1/385	1/204
37	1/227	1/130
39	1/137	1/82
41	1/82	1/51
43	1/50	1/32
45	1/30	1/20
47	1/18	1/12
49	1/11	1/7

Source: Reprinted from Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York. p. 193. Copyright © 2001 with permission from Elsevier.

Table 23-2 lists many diseases and anomalies that currently can be diagnosed prenatally [8]. As research continues, this list will expand rapidly. The ethnic background of both partners should be taken into consideration. Table 23-2 also includes the primary ethnicity-linked disorders to be assessed in history taking. Awareness of a positive history in either the woman's or her partner's family of chromosomal disorders is critical to evaluation of risk.

Genetic Counseling

When genetic testing is offered during prenatal care, whether for screening or diagnosis, the midwife's role is to educate the pregnant woman and her family about the testing options and indications and the implications of the results. The midwife must be certain that the lab she recommends meets generally accepted criteria for safety and accurate results. A woman must be advised that not being tested is one of her options and that no single test or combination of tests can guarantee a healthy child.

Prior to offering genetic screening tests, the midwife should counsel the woman about the possible findings, the risk of both false positives and false negatives, and the range of options available to her for follow-up. This counseling should be nondirective and should allow the woman and her family to make the choices they are most comfortable with. The midwife documents counseling given, the woman's response, the woman's decision, and any referrals made.

When a woman meets age criteria, or after an abnormal finding on history or screening, women are counseled again about their specific risks. Appropriate diagnostic tests are explained and scheduled. Whenever possible, a genetic counselor should be involved at this point. Families deserve accurate information and the opportunity to understand the range of expression of possible anomalies. The performance of tests designed to identify fetuses at risk does not mandate any single course of action when a problem is found. Some families choose to terminate a pregnancy when a problem is discovered; others welcome information to allow them to prepare for their child's special needs.

Studies of women receiving abnormal results on screening tests have demonstrated their increased anxiety and negative attitudes toward the pregnancy. They experience increased distress compared to women offered testing because of advanced maternal age, who are already aware of their risks. The elevated level of anxiety generally

TABLE 23-2 Conditions Calling for Prenatal Diagnosis and Counseling, with Incidences and Carrier Frequencies

Conditions	Carrier Frequencies	Prenatal Diagnostic Methods
Couples at an increased risk		
Maternal age >35 years		US, AC, CVS
Balanced chromosome rearrangement		
Previous child with chromosome abnormality		
Low maternal serum alpha-fetoprotein		
Family history of birth defects and/or mental retardation		
Congenital heart disease	8/1000	Echocardiography
Neural tube defect	1.5/1000	US, AC
Cleft lip and/or palate	1/700	US
Multiple congenital anomalies		US
Mental retardation		
Family history of known or suspected Mendelian genetic disorder		
Cystic fibrosis	1/2500 (whites) 1/17,000 (blacks)	CVS
Hemophilia A	1/10,000 males	
Hemophilia B	1/1500–1/2000 males	FBS
Duchenne muscular dystrophy	1/4000 males	CVS, AC
Becker muscular dystrophy		CVS, AC
Fragile X	1/2000 males 1/4000 females	CVS, AC
Carriers	1/700 males 1/250 females	
Ethnicity		
African population		
Sickle cell disease	1/600 US blacks	CVS, AC
Trait carriers	1/12	CVS, AC
Mediterranean/Indian;		
Beta-thalassemia		CVS, AC
Jewish: Tay-Sachs disease		CVS, AC
Occurrence in Ashkenazi Jews	1/3600	
Trait carriers—Ashkenazi Jews	1/30	
Occurrence—general population	1/360,000	
Trait carriers—general population	1/300	CVS
Exposure to possible teratogens		
Alcohol		US
Radiation		US
Occupational chemical exposures		US
Toxoplasmosis		US, FBS
Rubella		US, FBS
Cytomegalovirus		US, FBS
Syphilis		US
Insulin-dependent diabetes mellitus		US
Epileptic disorder: drugs		US, AC
Patients with low or high MSAFP		US, AC
Fetal abnormalities diagnosed by ultrasonogram		CVS, AC, and FBS
Consanguinity		US
Multiple pregnancy losses, stillbirth, infertility		US
Anxiety		US

US: ultrasound; AC: amniocentesis; FBS: fetal blood sampling; CVS: chorionic villus sampling.

Source: From Bauman, P., and McFarlin, B., Prenatal diagnosis. *J. Nurse-Midwifery* 39(2 suppl.):37S. Copyright 1994 by the American College of Nurse-Midwives. Reprinted by permission of Elsevier Science Inc.

decreases with the receipt of normal results on follow-up diagnostic tests, but in some cases anxiety persists throughout pregnancy [9, 10]. These findings emphasize the importance of pretest teaching and of supportive counseling for women who receive abnormal results.

Because the process of testing for fetal anomalies as well as concern about risks to her child may raise a woman's anxiety [11], the midwife has an obligation to note signs of increased anxiety and negative attitudes about pregnancy. Assessment of a woman's knowledge and fears allows the midwife to provide realistic reassurance and support as well as further education as needed.

When genetic evaluation reveals an abnormal fetus, the family needs support and information to assist them in their decision-making regarding continuation or termination of the pregnancy. A small number of these identifiable conditions can be treated prenatally with medications or surgery. Others are amenable to carefully planned treatment after birth. In most cases, however, the woman and her family must face the diagnosis of an abnormal fetus. Most midwives find that a genetic counselor or pediatrician can help them explain the nature and possible severity of a fetus's condition. In addition, support from a psychiatric counselor or social worker may be invaluable.

It is the midwife's obligation to assist the woman in understanding what tests are available to her and the relative value of a given test. One example of these tests is couple screening for cystic fibrosis, which can identify 72 percent of CF cases prenatally [12]. Both partners must agree to provide mouth rinse samples, which are checked for known cystic fibrosis alleles. This allows genetic diagnostic testing to be offered to couples at risk when both may be carrying a recessive trait.

First Trimester Evaluation of Fetal Risks: Biochemical Markers

First trimester screening for Down syndrome through measurement of hCG and pregnancy associated plasma protein A (PAPP-A) is not yet widely available, but is being examined as a potentially effective replacement for second trimester screens. Fetuses with Down syndrome have been found to have an elevation of PAPP-A and a lower quantity of hCG. Taken together, they offer detection rates of approximately 60 percent, with false-positive rates of 5 percent. The benefits of early screening, if it matches the predictive value of current second trimester screens, are obvious. Among them are greater patient privacy in decision-making and safer procedures for families electing to terminate an affected pregnancy. However, the increased risk of miscarriage associated with chorionic villus sampling, the increased costs associated with offering multiple testing schemes, and the fact that some affected fetuses will abort spontaneously before second trimester screening would have been done, may affect the desirability of these tests [13, 14].

Nuchal Translucency Screening

Ultrasound is now being used to measure the neural tube at the level of the fetal neck. On ultrasound examination between 10 and 14 weeks of gestation, an increase in the sonolucent area at the back of the fetal neck to greater than 3 millimeters or the presence of cystic hygroma indicates an increased risk of fetal aneuploidy, including trisomies 21, 18, and 13, Turner syndrome (45, X), cardiac defects, and other anomalies [15–17]. An increase in the rate of fetal loss has also been reported, even in chromosomally normal fetuses [18]. When performed in skilled hands, sensitivity of this method approaches 80 percent. However, inaccuracies of measurement such as inclusion of the umbilical cord, poorly placed neck position during scanning, and fetal position near the unfused amniotic membrane, will yield false results [16]. The greatest benefit from nuchal translucency measurements will probably come from their inclusion in combined ultrasonographic and biochemical screens (see below).

Second Trimester Screening

Alpha-Fetoprotein Testing

Alpha-fetoprotein (AFP) is a protein synthesized first by the yolk sac and then primarily by the fetal liver. The fetal AFP level increases until about 20 weeks and then declines to term. The normal AFP levels in maternal serum continue to rise until around 32 weeks [19]. Alterations in AFP levels in either amniotic fluid or maternal serum have multiple possible etiologies. In general, an increase in maternal serum AFP is due to "leaking" of fetal AFP through an opening in the fetal skin—that is, an open neural tube defect or an open ventral wall defect. Table 23-3 identifies the major reasons for maternal serum alpha-fetoprotein (MSAFP) elevations.

Normative levels of MSAFP are dependent on many factors: gestational age, maternal age, race,

TABLE 23-3	Major Reasons for MSAFP Elevations
Underestimation of gestational age	
Multiple gestations	
Neural tube defects	
Ventral wall defects (omphalocele, gastroschisis)	
Renal anomalies (renal agenesis, urethral obstruction)	
Severe oligohydramnios	
Ectopic (including abdominal) pregnancy	
Fetal-maternal hemorrhage (may occur spontaneously or following CVS or amniocentesis)	
Underweight mother	
Black race	
Increased placental size	

Source: From Thomas, R. L., and Blakemore, K. J. Evaluation of elevations in maternal serum alpha-fetoprotein: A review. *Obstet. Gynecol. Surv*. 45(5):269–283, 1990. Reprinted with permission.

weight, and diabetes. Therefore, careful assessment of gestational age and accurate reporting of maternal factors to the lab play a part in getting accurate screening results. About 1 to 2 percent of all women who undergo AFP testing have positive test results [6]. Such testing identifies 80 to 90 percent of fetuses with anencephaly, spina bifida, and omphalocele, using a cutoff value of 2.5 multiples of the mean (MOM) adjusted for maternal age, weight, and race. Women with diabetes have a higher incidence of structural fetal anomalies, and, therefore, a cutoff of 2.0 MOM is used. Some labs have slight variations in these normative values. The midwife must be aware of the limits used in the reference laboratory. Identification of multiple pregnancy is also critical for accurate screening results, as more than one fetus will elevate the MSAFP result.

Only about 1 in 15 women offered amniocentesis as a follow-up to MSAFP screening is found to be carrying a fetus with structural fetal defects. The number of false-positive screens is reduced as dating accuracy is improved. Therefore, women with uncertain dates or those with abnormal findings on examination need ultrasound confirmation of their gestational age [6]. As the quality of ultrasound anatomy assessment has improved, use of these scans has in large part replaced the use of amniocentesis as the evaluation following increased risk of open neural tube defects.

The placenta also plays a role in elevated MSAFP levels. If the placenta is large or malpositioned, more AFP may cross into the maternal circulation; a placental defect may also allow an abnormal amount of fetal AFP to pass from the fetal blood to the maternal serum. Many times when the MSAFP is elevated, the fetus is found to be structurally normal and the amniotic fluid AFP is also normal. An abnormal placenta or implantation site is a likely explanation for the increased risk of adverse pregnancy outcome with increased MSAFP when no obvious etiology is found [19]. Although MSAFP screening was initiated for identification of structural fetal anomalies, it has been found that there is a relationship between very low MSAFP levels and infants with Down syndrome. MSAFP alone identifies 25 percent of cases of Down syndrome among women younger than 35 [20].

Multiple Marker Screening

Multiple marker screening (also often referred to as a triple screen) was introduced in the late 1980s and improves the percentage of chromosomal anomaly cases detected to 60 percent among women who are at a risk level of greater than 1:270 [21]. Multiple marker screening most commonly consists of MSAFP, hCG, and unconjugated estriol, and it has replaced MSAFP alone as the most common screening test for ONTD and fetal aneuploidy. Both trisomy 21 (Down syndrome) and Edwards syndrome (trisomy 18) have increased detection rates with multiple marker screening. In trisomy 21, hCG levels are high, while estriol and AFP levels are relatively decreased. In trisomy 18, all three values are low. These tests are well demonstrated to increase the detection rates of chromosomal abnormalities, identifying about 60 percent of fetuses with trisomies 21 or 18 [22–24]. The same holds true for women over 35, who may in some cases be reluctant to undertake amniocentesis if their risk of anomaly is lower than their risk of procedure-related loss [25]. However, false-positive rates (positive test results in an unaffected fetus) remain a concern which should be addressed as women are counseled. It is essential that women understand that these tests are done to identify a large group of women whose pregnancies deserve closer evaluation, not to diagnose disease. Since Down syndrome is by far the most common chromosomal abnormality in live-born children, most focus is placed on this condition. Table 23-4 illustrates the detection and false-positive rates for Down syndrome associated with various maternal ages [26]. When a sonographic gestational age using the biparietal diameter is available, it is the preferred value for use in establishing gestational age in multiple marker screening programs, since anencephaly, spina bi-

TABLE 23-4 Age-Related Detection Rates and False-Positive Rates for Women Ages 16 to 44 with Risk Cutoff of 1:300

Age (y)	Detection Rate of AFP, hCG, and Unconjugated Estriol	False-Positive Rate
16	44.3%	3.1%
18	44.3%	3.1%
20	44.7%	3.2%
22	45.2%	3.2%
24	46.5%	3.6%
26	48.5%	4.1%
28	51.6%	4.7%
30	56.0%	6.1%
32	62.0%	8.7%
34	69.5%	12.5%
36	78.0%	19.0%
38	85.5%	28.6%
40	91.6%	40.9%
42	95.7%	55.3%
44	98.1%	70.0%

Source: From Reynolds, T. M., Nix, A. B., Dunstan, F. D., and Dawson, A. J. Age-specific detection and false-positive rates: an aid to counseling in Down syndrome risk screening. *Obstet. Gynecol.* 81:449, 1993.

fida, and Down syndrome all may affect this measurement [27]. Reducing the false-positive rates for Down syndrome reduces the burden of amniocentesis in normal pregnancies, without affecting diagnosis rates negatively.

It is important to recognize that elevated MSAFP screens and possibly abnormal hCG levels have been linked with an increase in poor perinatal outcomes even in the face of normal ultrasound and amniocentesis results. Specifically, an increased risk of stillbirth and preterm delivery has been identified [28, 29]. However, not all studies agree, and efforts to link second trimester biochemical markers to the prediction of preeclampsia have met with little success [30–32].

Modifications of screening programs are part of the continuing efforts to recognize pregnancy complications. Currently, the addition of inhibin A to second trimester screens, creating a quadruple test, is becoming available. When all four values are computed, the ability to identify cases of Down syndrome is raised to 80 to 85 percent with a false-positive rate of 5 percent [33, 34].

Multiple marker screening should be offered between 15 and 20 weeks' gestation. Earlier screening allows time for evaluation and management of abnormal results.

Integrated Screening

Several authors now advocate various combinations of first or second trimester biochemical screens with nuchal translucency testing. Such combinations, because the measurements are independently variable, maximize the benefit to the family. That is, they give the highest possible sensitivity, while reducing the need for invasive diagnostic testing. Probably the most commonly available is nuchal translucency measurement plus second trimester multiple marker screening [34, 35].

Management of Abnormal Screening

As a rule, abnormal AFPs should be tested again after confirmation of dates; thus, offering the test as close to 15 weeks as possible is important. An abnormal triple screen is generally not repeated but may be recalculated based on a new assessment of gestational age. When a triple screen is abnormal, the most common reason is miscalculation of gestational age. Therefore, an ultrasound examination is indicated to confirm dating as well as to rule out the presence of structural anomalies. Follow-up of abnormal findings should be performed in a timely manner to allow families to make decisions regarding genetic counseling and the possible need for more invasive testing. Triple screen dating criteria may be clarified at the same time as the 16- to 20-week ultrasound anomaly screen.

Genetic tests, biochemical evaluation, and ultrasound are used to make diagnoses following abnormal screens. Women with an increased risk for an open neural tube defect may be offered amniocentesis for amniotic fluid AFP, acetylcholinesterase testing, and karyotyping, in addition to a comprehensive ultrasound examination. In tertiary care centers, a comprehensive ultrasound examination is the preferred means of evaluation for neural tube or ventral wall defects. Because ultrasound performed by very skilled sonographers using high-resolution ultrasound equipment is a highly effective means of ruling out these specific anomalies, an amniocentesis may be considered unnecessary in these cases [36]. A combination of ultrasound and amniocentesis is necessary to diagnose chromosomal anomalies. Because extremely skilled sonographers and state-of-the-art high-resolution instrumentation are not widely available, the combination of amniocentesis and ultrasound remains the most common diagnostic approach in the United States for abnormal triple screen results.

Women at increased risk for Down syndrome and other chromosomal anomalies are offered re-

ferral for genetic amniocentesis. Ultrasound evaluation for associated structural defects is also usually recommended. Multiple sonographic markers have been associated with Down syndrome and are thought to improve the identification of affected fetuses. Because reliance on ultrasound alone has not been proved to be diagnostic of Down syndrome, amniocentesis remains the definitive diagnostic tool [37]. The performance of invasive diagnostic tests for genetic disorders, such as CVS or amniocentesis, itself carries a risk of pregnancy injury or loss. These tests also require specialized training and equipment and are expensive to perform. Women should be informed regarding procedure-related risks and their options, including no testing at all. In addition, every woman should be advised that no individual test or combination of tests can guarantee the eventual well-being of her child.

Invasive Fetal Assessment Throughout Gestation

Chorionic Villus Sampling

In the first trimester of pregnancy, chorionic villus sampling (CVS) is used to identify genetic diseases that affect the fetus. This test offers the advantages of early diagnosis, opportunity to terminate an affected pregnancy during the first trimester, and greater privacy for the woman and her family. It has been suggested that CVS might also facilitate prenatal bonding by providing early reassurance of the fetus's well-being [36]. CVS may be the test of choice for women who are more willing to terminate a pregnancy [38]. Rapid results for many of the common genetic abnormalities can now be obtained with polymerase chain reaction (PCR) technology in CVS specimens [39].

A disadvantage of CVS is that it carries a slightly increased risk of pregnancy loss compared to second trimester amniocentesis. After correction for the background rate of spontaneous abortion in the late first trimester, the increased risk of pregnancy loss amounts to approximately 0.8 percent [40]. Oligohydramnios, rupture of the amniotic membranes, and subchorionic hematoma have all been reported as sequelae of CVS. Another concern is the risk of limb reduction defects reported in some studies, particularly with CVS at 8 to 9 weeks' gestation. There appears to be no increase in the risk of these defects when CVS is performed at or after 10 weeks' gestation [19]. It is important to know the experience of the individuals actually performing the procedure in order to have a true estimate of risk.

Chorionic villus sampling is most often performed transcervically (Figure 23-2). In some cases, placental location, uterine position, cervical stenosis, or the woman's discomfort may lead the physician to enter the uterus transabdominally (see Figure 23-3). Ultrasound is used to guide the placement of a flexible catheter through which placental villi are removed. Villi from the developing placenta are then karyotyped. Adequate tissue will be obtained in 97 to 98 percent of all CVS samples, which will then culture successfully. The tissue samples undergo both direct analysis (which gives results in 48 hours) and more accurate culture techniques (with results in 10 to 14 days). Because chromosomal mosaicism can be evident in the placenta but not the fetus, in rare instances abnormal results may require amniocentesis in the second trimester [36, 41]. Mosaicism would be noted by the geneticist and included in the report.

Women who are Rh negative should receive Rh immune globulin (e.g., RhoGam) following invasive procedures. When a woman shows evidence of prior Rh sensitization, amniocentesis is preferred to CVS to delay any possible effects on the fetus [36, 40].

Women undergoing CVS should be advised that MSAFP testing for open neural tube defects is still

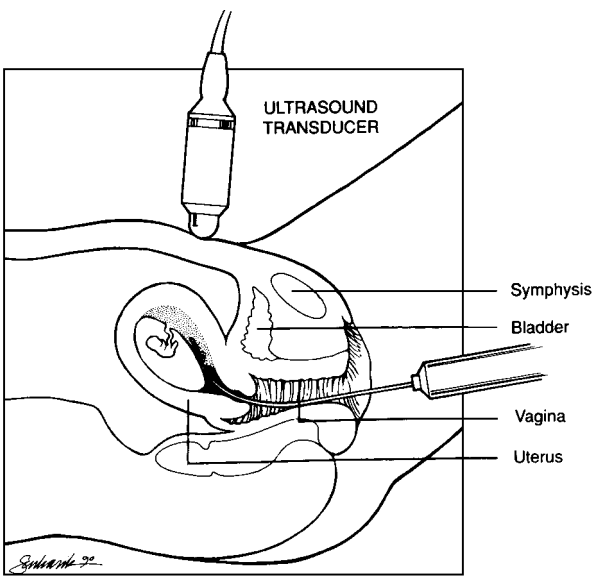

FIGURE 23-2 Transcervical chorionic villus sampling.

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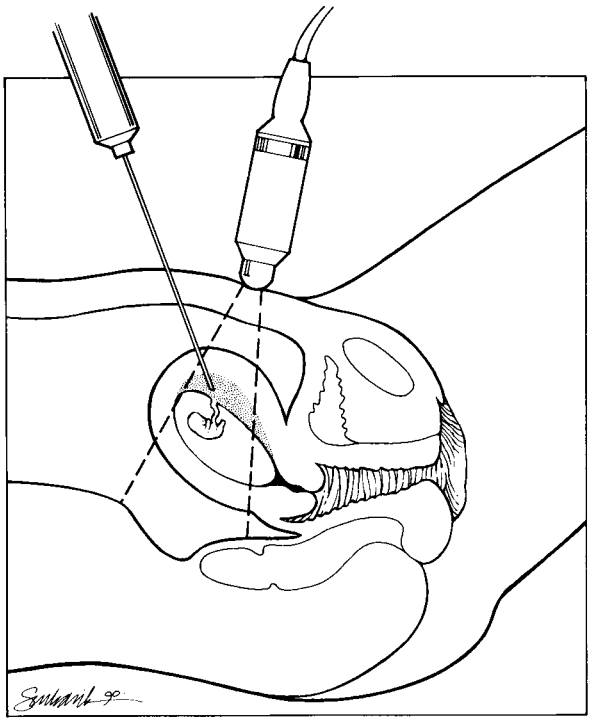

FIGURE 23-3 Transabdominal chorionic villus sampling.
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recommended. It is important to note, however, that because CVS may allow maternal-fetal blood exchange, there is the possibility that CVS may cause a falsely elevated MSAFP [19]. Ultrasound scans for anatomy and/or amniocentesis for AFP and acetylcholinesterase may be suggested when an abnormal MSAFP follows a normal CVS [41].

Amniocentesis

When both procedures are available in her community, a woman can choose amniocentesis or CVS based on personal preference, gestational age at registration, and concerns about risk. Standard genetic amniocentesis is performed at 15 to 16 weeks' gestation, when indicated. For women at risk for open neural tube defects, amniocentesis will provide specific measures of amniotic fluid alpha-fetoprotein and acetylcholinesterase, which CVS does not.

The technique of amniocentesis for removal of fluid from the uterine cavity is a century old. In the last 40 years, its usefulness has expanded to encompass genetic and biochemical diagnosis, assessment of fetal disease, and evaluation for fetal maturity. The procedure is performed under direct ultrasound guidance to reduce the risk of piercing the fetus and to avoid the placenta whenever possible. If the placenta lies anteriorly and cannot be avoided by needle puncture, the clinician must make a decision regarding the safest place in the placenta to pass the needle through; in the case of Rh isoimmunization, the decision may be to reevaluate the risk-benefit ratio of the amniocentesis. About 99 percent of amniocenteses for genetic testing are successful. Results are commonly available within 2 to 3 weeks, although FISH technology can make rapid results available for common aneuploidies.

Risks of amniocentesis include fetal loss in about 0.5 to 1.0 percent of all cases. There is a 0.1 percent risk of amnionitis; there have been rare reports of fetal injury. Maternal spotting or fluid leakage following the procedure is not usually associated with poor pregnancy outcomes. Rh negative mothers receive Rh immune globulin to prevent isoimmunization [36, 40].

Early Amniocentesis

Prior to 15 weeks of gestation, a modified amniocentesis can be used as an alternative to CVS, if technical considerations preclude CVS. As with second trimester amniocentesis, neural tube defect identification is enhanced, but at this early gestation, fewer cells are available for detecting metabolic errors. The relative risk of this procedure probably exceeds that of either CVS or later amniocentesis. Reasons for this increased risk include incomplete fusion of the amnion and chorion prior to 13 weeks gestation and less total amniotic fluid [42]. Several reports of trials of early amniocentesis indicated a significantly increased risk of fetal loss, leakage of amniotic fluid, and an increased incidence of talipes equivarnus. [43–45]. However, not all studies do so; also, some spontaneous losses will occur during the time frame separating early and standard amniocenteses, partially explaining the difference in rates of fetal loss or morbidity following the two procedures.

Amniocentesis After 20 Weeks

As the fetus reaches viability, the primary use of amniocentesis changes from genetic diagnosis to monitoring of fetal lung maturity. It is more common to use CVS for rapid karyotyping late in pregnancy. Testing of amniotic fluid obtained through amniocentesis prior to scheduled cesarean deliveries and elective labor inductions, particularly those scheduled before 39 weeks, can assist in the pre-

vention of iatrogenic prematurity and respiratory distress syndrome. Lecithin/sphingomyelin ratios (L/S) and phosphatidylglycerol (PG) tests can evaluate lung maturity. When PG is present in amniotic fluid, the risk of respiratory distress syndrome is minimal, even when the L/S ratio is less than 2 [40, 42]. The "shake" and "tap" tests and optical density assessments also utilize amniotic fluid samples. Pregnancies complicated by Rh isoimmunization can be monitored with optical density assessment based on the bilirubin content of the amniotic fluid [36].

Cordocentesis

Cordocentesis, also known as percutaneous umbilical blood sampling (PUBS), is the most current method of directly sampling fetal blood. This process utilizes ultrasound visualization of the fetus and the cord in order to allow needle puncture of the fetal cord to withdraw a sample of the fetal blood. This method can also be used to transfuse or to medicate the fetus.

The indications for cordocentesis are few and pertain to only a small number of very high-risk patients. The indications include the need for rapid karyotyping of the fetus by DNA, assessment and treatment of Rh isoimmunization, measurement of cord blood gases for severe intrauterine growth restriction (IUGR), diagnosis of fetal infection such as cytomegalovirus (CMV) or toxoplasmosis, and treatment of fetal disorders (e.g., use of digitalis for fetal cardiac arrhythmias). Risks of the procedure include spontaneous abortion, rupture of membranes, preterm labor, infection, bleeding, fetal trauma, and isoimmunization [46]. Figure 23-4 shows two methods for approaching the cord at its insertion to the placenta, the preferred site of sampling because of its relative stability [47]. With research and experience, more applications for this procedure will most likely evolve. Clearly, this invasive procedure is outside of the scope of midwifery practice. Women under the care of a midwife may require referral for complications of their pregnancies that necessitate this approach. It is currently being utilized only in large tertiary settings and is best performed by trained professionals.

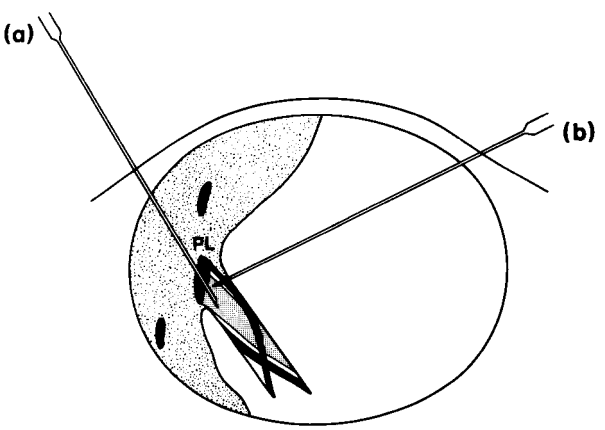

FIGURE 23-4 (a) Transplacental and (b) transamniotic cordocentesis.

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Third Trimester Fetal Assessment

The purpose of fetal assessment in the third trimester is primarily the prevention of fetal death [48]. During the third trimester, assessment of fetal well-being is made by using nontechnological methods such as fetal movement counting (FMC) and the auscultated acceleration test (AAT) and/or technological methods of ultrasound and fetal monitoring, either independently or in combination. The midwife must be knowledgeable regarding the potential uses of each of these fetal assessment methods. Depending on the practice setting, midwives may be involved in performing and interpreting nonstress tests (NST), contraction stress tests (CST), the biophysical profile (BPP), amniotic fluid index (AFI), doppler velocimetry, or other limited ultrasound examinations.

Fetal Movement Counting

Fetal movement counting is by far the simplest of all fetal assessment techniques, and it is applicable to the largest group of women. Research has confirmed what mothers and midwives have known for centuries: fetal activity is reassuring and a dramatic decrease in fetal activity or cessation of movements is worrisome [48–51]. The total number of movements made by the fetus may be quite variable. The most important point is that a marked decrease in movement from a fetus's usual pattern is cause for concern and cessation of movements is highly correlated with impending fetal death [48, 51, 52]. Perinatal deaths from cord accidents, placental abruption, and other causes cannot be totally prevented [61, 62], but women should be aware of the potential concerns associated with a decrease in fetal movement and be enabled to report any concerns in a timely fashion.

Fetal movement has many influences, including the time of day, gestational age, glucose loading, sound stimulus, fetal behavioral states, maternal smoking, and maternal use of certain medications as well as hypoxia and acidemia [51–59]. Maternal perception of fetal movement can be diminished by the presence of polyhydramnios or oligohydramnios as well as by an anterior placenta [59]. Maternal obesity, however, has been shown not to interfere with maternal perception of fetal movement. Babies are also affected by diurnal variations, with fetuses being most active late at night and least active in the morning hours between 2:00 a.m. and 8:00 a.m. [53]. As pregnancy nears term, there may be a slight decrease in the actual number of movements. The amplitude of fetal movement tends to diminish as the volume of amniotic fluid decreases. This decrease in fluid volume leaves less space for fetal limb excursion, thereby producing a decrease in maternal perception of fetal movement.

Smoking only two cigarettes has been shown to decrease fetal activity for as long as 80 minutes [55]. Although it is ideal for pregnant women not to smoke, they should at least refrain from smoking for a 2-hour period before fetal movement counting or antepartum fetal testing in order to avoid false-positive test results.

Many methods of counting fetal movements have been proposed [50–52, 58, 60, 61], but none has been shown to be superior to another in predicting fetal outcome [48, 62]. The most important thing is that women be aware that consistent fetal movement patterns are important—they must report a decrease or cessation of fetal movement [54, 57, 61]. When selecting a fetal movement counting method, take the educational level of the woman into consideration. If your client is able to read and understand basic graphing procedures, the Count-to-Ten method described in Table 23-5 [53] and the chart in Figure 23-5 will be satisfactory. The Count-to-Ten method has the advantages of being simple to use, brief, and easy to interpret [53, 60]. If, however, graphing daily movement counts frustrates your client, then the documentation method must be changed. Use a time frame such as a 30-minute television program, during which the woman counts the baby's movements, and have her simply write down the date and time of the counts. Another method would be to have the woman put ten pennies out on the kitchen table each morning. For each fetal movement she feels, she places one penny in a cup. If the pennies are not all in the cup by lunchtime, she is to call the clinic to report diminished fetal movement [61]. Ways to document movement are many, but using a consistent method with daily documentation is important. The message to all women should be clear: Fetal movement and their own report of it are very important. It can be empowering to women to be responsible for their own fetal surveillance [61].

TABLE 23-5 Count-to-Ten Movement Counting Method

1. Schedule one count session daily.
2. Schedule session for the same time each day—e.g., at 8:00 a.m., or select a time when you have the time to count and when the fetus is usually active.
3. Chart how long it takes to reach 10 movements.
4. There must be at least 10 movements identified in 10 hr.
5. If there are fewer than 10 movements in 10 hr, if it takes an increasing time to reach 10 movements, or if no movements are felt within 10 hr, call your midwife.

Fetal movement counting should be started at 34 to 36 weeks for women at low risk for uteroplacental insufficiency. For those with identifiable risk factors, 28 weeks is a reasonable time to initiate formal fetal movement counting. When a woman reports decreased fetal movement, the midwife should follow the steps in Figure 23-6 [61].

History taking is a critical step. Women often report decreased fetal movement because they do not remember feeling activity for a period of time, but they may not have been paying close attention. Ask a woman to focus on fetal activity for a period of an hour, preferably when she is resting, well fed, and hydrated. If, during that hour, the woman feels at least three movements, reinforcement of fetal movement counting is all that is required. If, however, she reports only two or fewer movements, a nonstress test (NST) should be performed immediately. Often, the fetus has a reactive nonstress test, demonstrating adequate activity and fetal well-being. This can be a positive learning experience for mothers that reinforces them to be more aware of the sensation of fetal movement and to trust themselves to report even small moves that they previously may have thought insignificant. When the fetus has a reactive test, serial fetal assessment is not indicated. If fetal movement has been decreased in response to fetal compromise, there will be nonreassuring indicators, such as a nonreactive NST or a decreased biophysical profile score. It is then necessary to evaluate quickly for risk of fetal demise.

A very small group of women do not perceive fetal movement. The fetuses of these women are

Name ____________________

At the same time each day, count the baby's movements. When you have felt 10 movements, record the length of time it took. All movements, even small ones, count toward the total. If you have not felt 10 movements in the usual amount of time, please call your midwife.

Week of____________________

Hours taken to feel 10 movements of the baby

Day	Start Time	1	2	3	4	5	6	7	8	9	10
M											
T											
W											
T											
F											
S											
S											

Week of____________________

Hours taken to feel 10 movements of the baby

Day	Start Time	1	2	3	4	5	6	7	8	9	10
M											
T											
W											
T											
F											
S											
S											

Week of____________________

Hours taken to feel 10 movements of the baby

Day	Start Time	1	2	3	4	5	6	7	8	9	10
M											
T											
W											
T											
F											
S											
S											

FIGURE 23-5 Fetal movement counting chart.

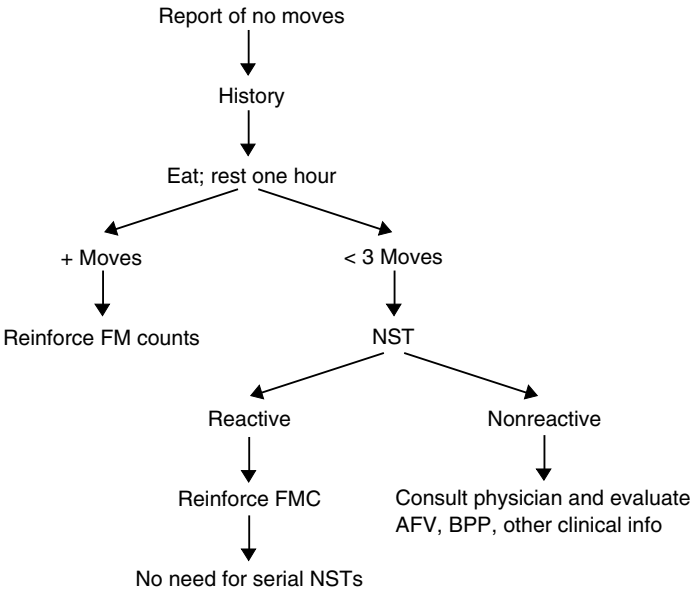

FIGURE 23-6 Fetal movement assessment paradigm for response to a woman's report of decreased fetal movement.

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best evaluated by weekly nonstress testing, beginning at 34 to 36 weeks, to document fetal activity and heart rate accelerations [61]. Often these are women who have a history of previous stillborns or are very anxiety ridden for other reasons. The weekly NST can serve as an indicator of fetal well-being to both the provider and the mother.

Auscultated Acceleration Tests

For years, midwives and physicians used auscultation with a fetoscope to evaluate fetal status and in some cases to detect fetal heart rate (FHR) accelerations as reassurance of a healthy fetus [63–65]. Auscultation of the FHR with a fetoscope at or near 20 weeks' gestation continues to be of recognized clinical value [66, 67]. In the 1960s, however, handheld electronic devices for the detection of the FHR precipitated a general decline in the use of the fetoscope during labor and other periods of gestation [61].

During the 1980s, Paine researched the use of auscultation of the FHR as a means of predicting fetal well-being during the antepartum period. From this work, a method of auscultation was proposed as a simple alternative to the nonstress test and as a formal method of auscultation for antepartum use [61, 65–70]. The resulting 6-minute auscultated acceleration test (AAT) has shown promise as a predictor of both reactive and nonreactive NST results [65]. Table 23-6 is a description of the AAT procedure and interpretation [67]. The AAT graph shown in Figure 23-7 is used to document the FHR pattern [67]. Figure 23-8 illustrates a completed AAT and includes an inset of an NST completed simultaneously, for comparison.

The AAT has been proposed for women beyond 34 weeks' gestation with a single fetus. In general, use of the AAT may be of benefit for low-risk women who do not otherwise undergo antepartum testing by NST, particularly if combined with fetal movement counting. Anecdotal accounts indicate that use of both low-technology techniques has led

TABLE 23-6 AAT Procedure and Interpretation

Procedure
Use an Allen fetoscope. Auscultate the FHR for 6 min, counting during every other 5-sec interval. Document auscultated FHRs on AAT graph.
Interpretation
Identify the baseline FHR. An acceleration is present when the FHR is up by two grid points (2 beats per 5-sec period). A single FHR acceleration indicates reactivity.

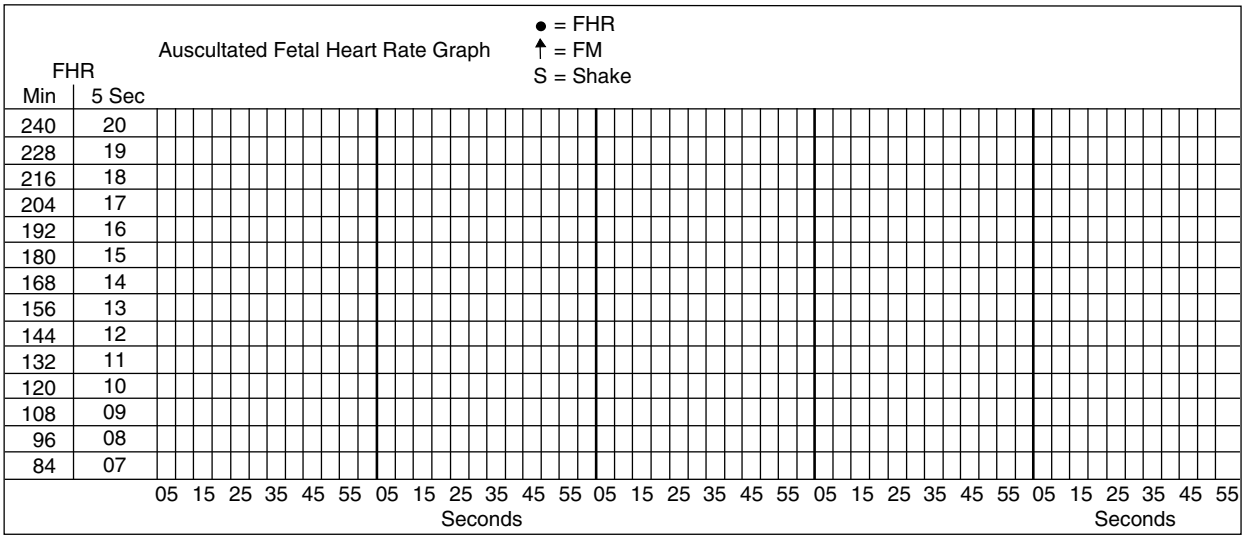

FIGURE 23-7 The AAT graph used to document the FHR pattern.

Source: Reprinted from *Journal of Nurse-Midwifery*, 31(2), Paine, L.L., Payton, R. G., and Johnson, T. R. B., Auscultated fetal heart rate and accelerations: Part I. Accuracy and documentation, 70, © 1986 American College of Nurse-Midwives, with permission from American College of Nurse-Midwives.

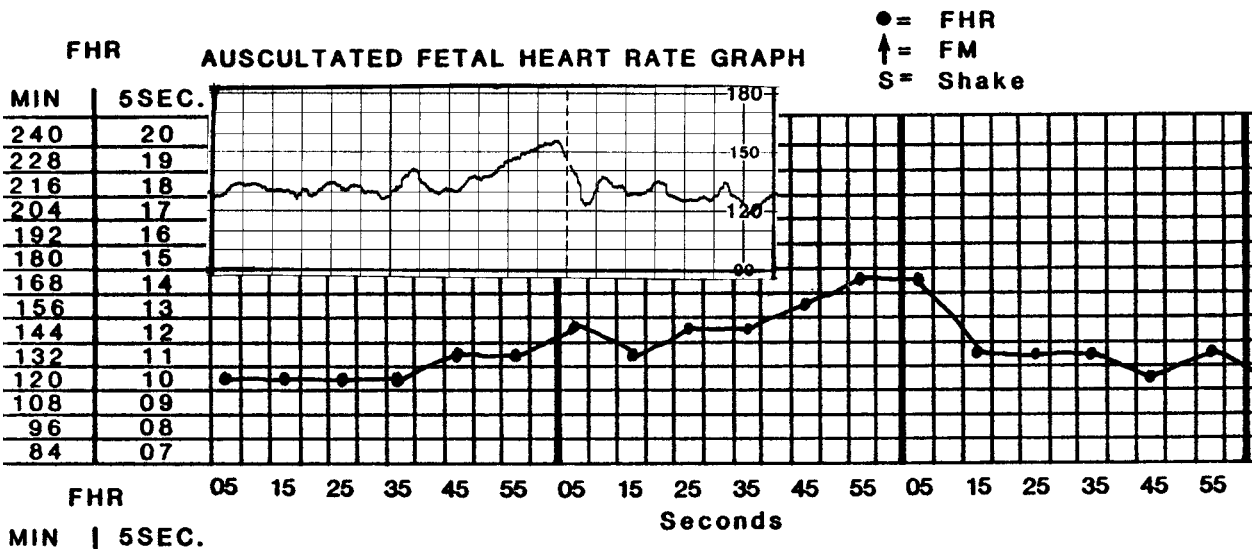

FIGURE 23-8 AAT with inset of an NST completed simultaneously.

Source: Reprinted from *Journal of Nurse-Midwifery*, 31(2), Paine, L.L., Payton, R. G., and Johnson, T. R. B., Auscultated fetal heart rate and accelerations: Part I. Accuracy and documentation, 70, © 1986 American College of Nurse-Midwives, with permission from American College of Nurse-Midwives.

to appropriate management of compromised fetuses that would not otherwise have been identified as high risk by the usual criteria used in midwifery practice.

Nonstress Test

The most commonly used third trimester test of fetal well-being is the nonstress test (NST). The NST is performed using an external electronic fetal monitor. This test is indicated for women whose pregnancies are complicated by or have increased risk for uteroplacental insufficiency (UPI). Table 23-7 lists the most common obstetric indications for conducting an NST as a component of antepartum testing, while Table 23-8 identifies maternal indications for testing.

The method for performance of the NST is relatively standard and is outlined in Table 23-9. However, interpretation of the NST varies in the medical literature and in current clinical practice.

TABLE 23-7	Obstetric Indications for Antepartum Testing

Suspected intrauterine growth restriction (IUGR) in this pregnancy
History of IUGR in previous pregnancy
Pregestational diabetes
Gestational diabetes
Chronic hypertension
Pregnancy-induced hypertension
Preeclampsia
Multiple gestation
Oligohydramnios
Post dates
Rh isoimmunization
Preterm rupture of membranes (PROM)
Decreased fetal movement
Previous stillbirth

TABLE 23-8	Maternal Indications for Antepartum Testing

Antiphospholipid syndrome
Hyperthyroidism (poorly controlled)
Hemoglobinopathies (hemoglobin SS, SC, or S-thalassemia)
Cyanotic heart disease
Systemic lupus erythematosus
Chronic renal disease
Type I diabetes mellitus
Hypertensive disorders

TABLE 23-9	Performance of the Nonstress Test (NST)

1. Place woman in a side-lying position (left or right side).
2. Initiate external electronic fetal monitoring (both FHR and contraction monitoring).
3. Identify the baseline FHR (minimum of 3 min).
4. Continue monitoring for a minimum of 20 min.

Note: A fetal event marker is not required for performance of the NST. FHR accelerations are associated with fetal movement, and maternal perception of this movement is not required.

Midwives must be familiar with the criteria used in the practice setting where they order or interpret the NST. For the sake of consistency in this chapter, the interpretation criteria in Table 23-10 will be used.

A reactive NST (Figure 23-9) is considered to be an excellent indicator of fetal well-being in the third trimester, because a fetus must receive adequate oxygen and other nutrients through the placenta and be neurologically not depressed in order to have accelerations of the fetal heart rate associated with fetal movement. FHR reactivity is a developmental milestone of the fetus that is usually achieved between 28 and 32 weeks' gestation [71, 72].

TABLE 23-10	Interpretation Criteria for the Nonstress Test (NST)
Interpretation	**Criteria**
Reactive	At least two accelerations of the FHR within a 20-min period that are off the baseline for at least 15 sec and that have a minimum amplitude of 15 bpm
Nonreactive	FHR tracing that fails to demonstrate adequate number or amplitude of FHR accelerations within any 20-min period
Inconclusive	A tracing of FHR that is uninterpretable because of difficulty obtaining the EFM tracing, or a tracing that does not demonstrate an FHR baseline (common with very vigorous fetuses)

A nonreactive NST in a term fetus is considered to be a nonreassuring finding, especially when reactivity has been previously demonstrated (Figure 23-10). In the preterm fetus, however, a nonreactive NST may be appropriate because of the immaturity of the fetus [71–74]. When an NST is nonreactive, the midwife must gain additional information regarding this fetus before the woman can be discharged from the clinical setting. Additional testing may be indicated, such as prolonging the NST [73], performing a biophysical profile (BPP) [75, 76], or a contraction stress test (CST) [71]. Table 23-11 lists reasons why the NST may be nonreactive.

Because a fetus experiences sleep states [77], continuing the NST for an additional 20 minutes may provide the fetus with adequate time to complete a prolonged sleep cycle and demonstrate reactivity. A preterm 28-week fetus may not be capable of demonstrating reactivity because of immaturity of its nervous system. Occasionally, a fetus will have an FHR pattern that has accelerations as well as multiple variable decelerations, which make interpretation of well-being difficult if not impossible [71, 74]. These multiple mild variable decelerations are generally believed to represent intermittent cord compression, and are often seen with fetal movement in the presence of oligohydramnios. If the

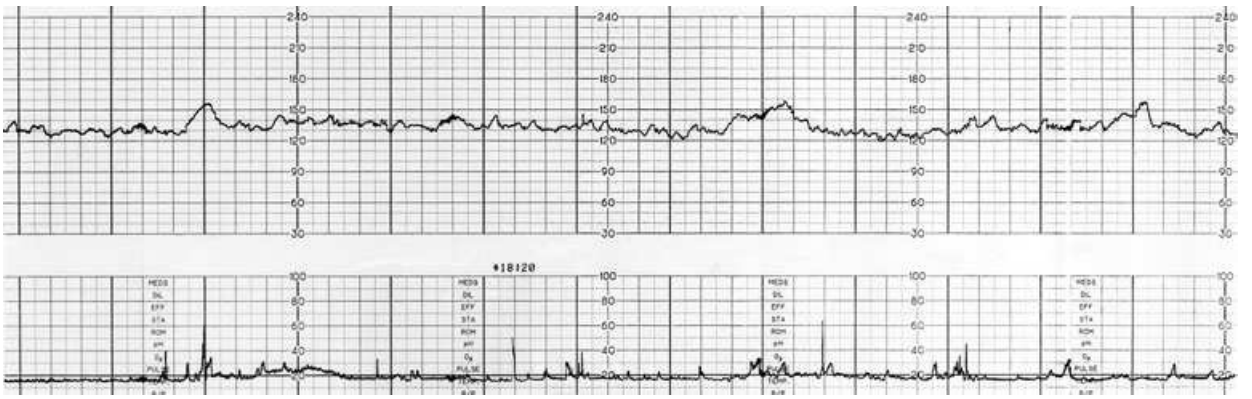

FIGURE 23-9 Reactive nonstress test.

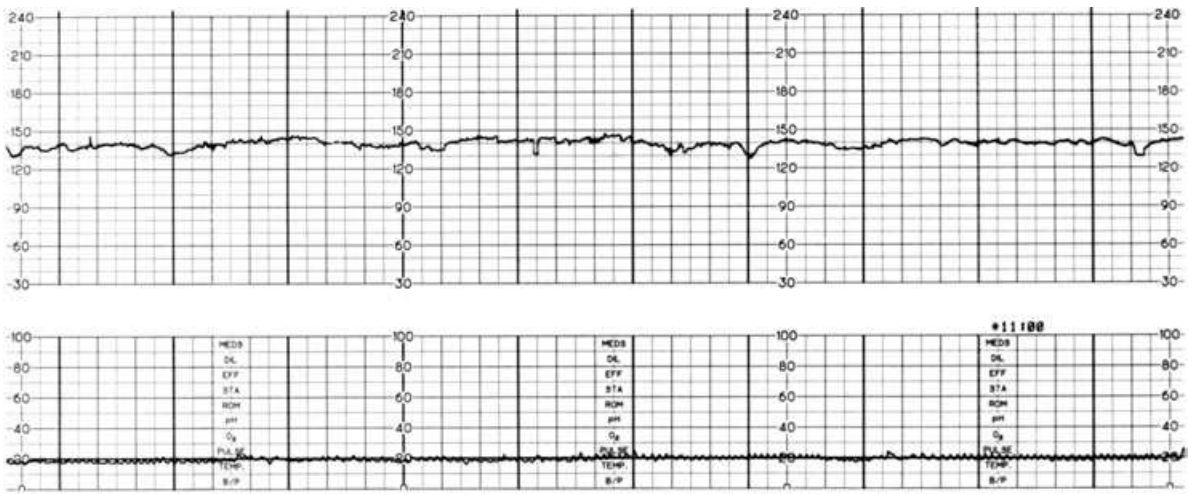

FIGURE 23-10 Nonreactive nonstress test.

variables are mild, brief (less than 30 seconds), and nonrepetitive, they are not associated with poor pregnancy outcomes [48, 78]. If, however, the decelerations are more frequent than 3 in 20 minutes, or are of a duration greater than one minute, there is an increased association with cesarean section and fetal demise [48, 78]. When an NST is nonreactive, regardless of the cause, some demonstration of fetal well-being must be obtained (e.g., BPP) before the woman is discharged from the care setting.

TABLE 23-11 Common Causes of Nonreactivity of the Nonstress Test (NST)

Fetal Causes	Maternal Causes
Gestational age (28–32 weeks)	Disease (e.g., diabetes, hypertension)
Deep sleep state	Medications (e.g., beta-blockers, CNS depressants, tocolytics, steroids)
Hypoxia	Illicit drug use
Oligohydramnios	Smoking
CNS or cardiac anomalies	Chorioamnionitis
Circadian rhythms	Dehydration

Inconclusive NSTs are usually the result of difficulty in obtaining a legible EFM tracing. This difficulty may be the result of a very active fetus, maternal obesity, or polyhydramnios. Mechanical difficulties may also be encountered. Sometimes a tracing is easily obtained, but the fetus is constantly moving, thus demonstrating a long series of accelerations with inadequate return to baseline (Figure 23-11). In this case, the NST cannot be evaluated because a baseline FHR is not obtainable. Usually, the fetus will eventually come to rest, and then the strip will be interpretable. The maximum duration of NST evaluation is disputed in the literature, ranging from 40 minutes to 2 hours [61, 74]. This

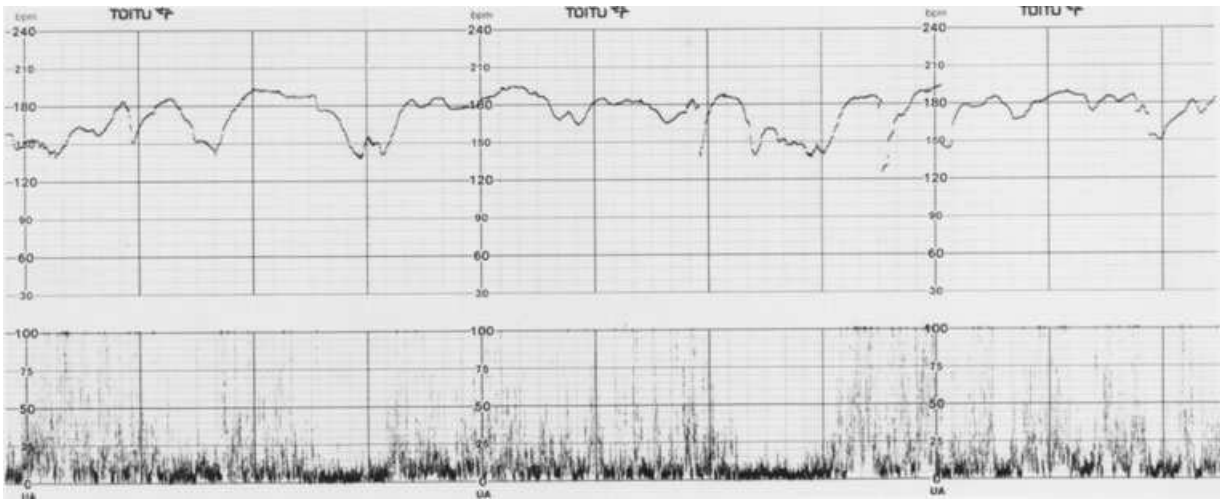

FIGURE 23-11 Inconclusive nonstress test (active, awake fetus).

time frame may depend not only on the fetus but also on the availability of ultrasound for performing a biophysical profile. If ultrasound is readily available, it may be more time efficient to stop the NST at 40 minutes and perform the BPP. However, if the ultrasound location is a great distance from the NST site, appointment times are not readily available, or cost is prohibitive for the woman, then prolonged NST may be the best option. A CST may also be considered when the NST is nonreactive and ultrasound is not readily available to perform a BPP.

Once serial testing is initiated, the frequency of testing will depend on the indication for testing, the severity of uteroplacental insufficiency (UPI), and the policies in each setting. As a test of fetal well-being, the NST should be done at least once a week. For women who have a particularly high risk of poor pregnancy outcome related to UPI, twice-weekly testing is often recommended. For women at home on bedrest, there are a growing number of services that will send nurses to perform the NST in the home; in some cases the woman herself can perform the test and send the data by phone [79]. The nurse or midwife may also elect to perform an AAT.

It is well accepted that most fetuses with a nonreactive NST are actually healthy [80–84]. Many different methods have been tried to induce a nonreactive fetus to become reactive, including shaking the baby in utero—a practice that has overall proved to be futile [80–83]. Probably the most common method of attempting to "make" a baby reactive is maternal ingestion of juice as a source of glucose. However, the research to date shows rather convincingly that a glucose load does not significantly change fetal movement or fetal heart rate reactivity [81, 83]. Other than vibroacoustic stimulation, the only intervention that increases the rate of reactivity is waiting for a longer time.

Vibroacoustic Stimulation

In an effort to decrease the number of nonreactive NSTs, vibroacoustic stimulation (VAS) was introduced [85–89]. VAS uses an artificial larynx to deliver both auditory and vibratory stimuli to the fetus. The fetus responds with a startle, activity, and FHR accelerations. Ease of use, rapidity of fetal response, low cost of equipment, and the perceived noninvasiveness of the procedure are additional reasons VAS gained popularity.

VAS is performed by placing the vibroacoustic stimulator against the maternal abdomen directly above the fetal head and causing it to emit one or several brief stimuli. The most probable effect of VAS is to startle the fetus from a sleeping to an awake state [90]. The fetal response is commonly an acceleration of the FHR followed by reactivity. A fetal response of tachycardia (over 160 beats per minute), an abnormal heart rate pattern, is also common; this response requires that a woman continue fetal monitoring for a prolonged period until a normal baseline heart rate has been reestablished, often negating any time-saving benefits of VAS [91]. Several methods of interactive stimuli are currently being investigated, including maternal voice stimulation [82] and lesser degrees of vibration and sound than current VAS.

Interpretation of VAS FHR strips varies among authors. Most do not include the initial acceleration as an interpretive criterion but rely on subsequent accelerations of the FHR to meet basic NST criteria. The midwife must be aware of accepted interpretive criteria in the practice setting when using this method of fetal assessment.

During the intrapartum period, VAS may be used to help elicit a response in order to differentiate between a fetus in a deep sleep state and a hypoxic fetus. In this case, a prolonged FHR tracing with minimal or no variability may make interpretation of fetal well-being difficult. VAS may be used in place of fetal scalp sampling in some cases (refer to Chapter 27 for more detail).

Contraction Stress Test

The contraction stress test was the first test to be widely used as a screening test for fetal well-being [71]. This test has now been mostly replaced by the NST and amniotic fluid index (AFI) or the BPP. However, the CST has two major advantages over the NST. First, the CST remains the most accurate predictor of uteroplacental insufficiency (UPI) [71, 74]. Second, the CST is a reliable test from 26 weeks until term. Disadvantages of the CST are that it has a high false-positive rate (about 30 percent of the positive results are for fetuses who are actually well), it is more expensive than the NST, takes more time, and is more invasive; in addition, women prefer the NST and/or the BPP.

Women with an indication for the CST are those with UPI or who are at high risk to experience UPI during their pregnancies. Therefore, the indications for the CST are the same as those for the NST if it is being used as the primary screening test. Currently, the CST is used mostly for women who are known to have a fetus with intrauterine growth restriction (IUGR). When the NST is nonreactive and ultrasound is not readily available to perform a BPP, the CST is the most useful test to determine fetal well-being.

Contraindications for the CST fall into two categories: absolute and relative. Absolute contraindications include clinical situations when labor would be dangerous—for example, women who have had a previous classical cesarean section or myomectomy entering the uterine cavity, those with placenta previa, or those who are at current risk for preterm labor. Relative contraindications include gestational age less than 37 weeks and multiple gestation. In the case of relative contraindications, a risk-benefit consideration is necessary, to weigh the possible consequences of an unintended labor from contraction stimulation against the need for information regarding fetal status.

The CST can be performed in two ways: the oxytocin challenge test (OCT) or nipple stimulation. Table 23-12 delineates these two procedures for inducing contractions; the criteria for choosing the procedure may be different from one practice site to another. Due to the potential for stimulation of labor and of late decelerations, it is advisable that the CST be performed in a hospital. This site may be the labor and delivery suite, a fetal assessment center, or the in-hospital obstetric clinic.

Interpretation of the CST is highly standardized in the medical literature as well as in practice. Table 23-13 lists the interpretation criteria. It is important

TABLE 23-12 Procedures for Inducing Contractions for the Contraction Stress Test (CST)

Breast Stimulation
Stimulation of one nipple, through the clothing
2 min stimulation
5 min resting
Do not stimulate through a contraction
If not successful within 45 min, perform OCT
Oxytocin Challenge Test (OCT)
Intravenous infusion, D5/0.2NS keep-vein-open rate
Oxytocin solution: 10 units pitocin in 500 cc D%/0.2NS per infusion pump
Titrate oxytocin from 1 mlU/min
Increase 1 mlU/min every 15 min
Continue until adequate contraction pattern or abnormal FHR patterns

TABLE 23-13 Contraction Stress Test (CST) Interpretation Criteria

Procedure
Establish FHR baseline prior to initiation of CST.
Prior to interpretation of FHR patterns, the EFM strip must demonstrate 3 contractions within 10 min.
Minimum contraction duration is 40 sec off the baseline (unnecessary for the woman to perceive the contractions).
Interpretation
Negative (reassuring): FHR baseline stable, without evidence of late decelerations
Positive (nonreassuring): Repetitive late decelerations
Equivocal:
Unable to obtain satisfactory tracing
Hyperstimulation
Nonrepetitive decelerations

to note that whether contractions are elicited by nipple stimulation, oxytocin challenge, or occur spontaneously, interpretation is the same and has the same predictive value. A positive CST (Figure 23-12) is a very strong predictor of uteroplacental insufficiency. As previously mentioned, the CST has about a 30 percent false-positive rate [74]. Therefore, nearly a third of women with a positive CST have a fetus that is actually normal. This is in contrast to a false-negative rate of less than 1 percent, meaning that it is rare for an affected fetus to have a negative CST. It is important to take results of the CST very seriously but also to interpret them in the context of the woman's overall clinical situation. For example, if a woman has well-controlled chronic hypertension and her pregnancy has progressed normally, with adequate fetal growth, and she then has a positive CST at 39 weeks, a false-positive test must be considered. This CST would best be followed by a BPP or by a repeat CST within 24 hours. On the other hand, if a woman with a 32-week pregnancy complicated by diabetes and hypertension and a fetus with IUGR is found to have a positive CST, the result is more likely to be accurate, and immediate assessment of the pregnancy is imperative.

A negative CST (Figure 23-13) is considered to be predictive for 7 days [71], thereby requiring no more than weekly retesting for the purpose of screening for UPI. If the negative CST also demon-

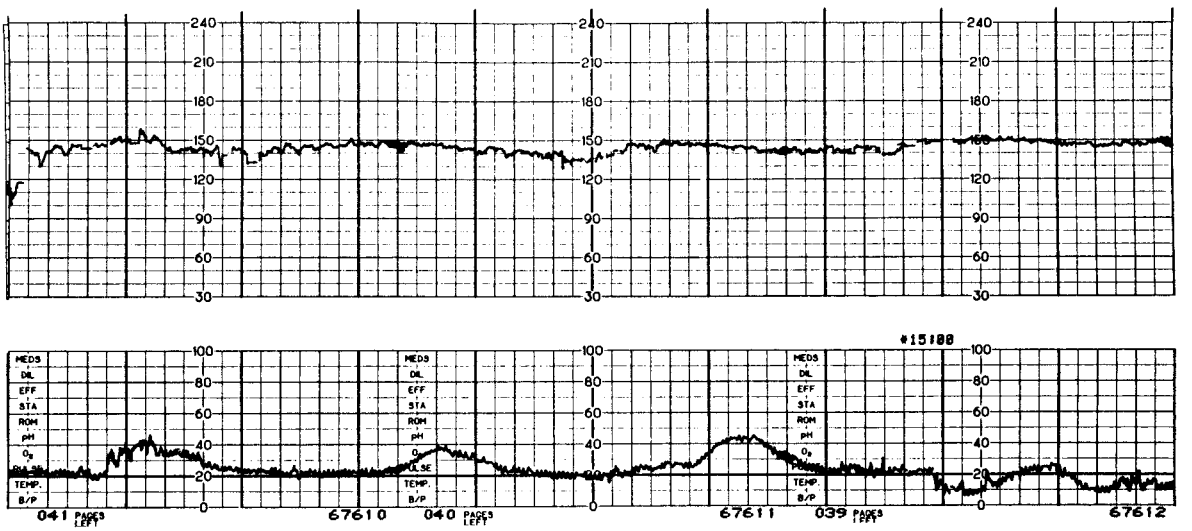

FIGURE 23-12 Positive contraction stress test. Note the presence of a late deceleration following each contraction.

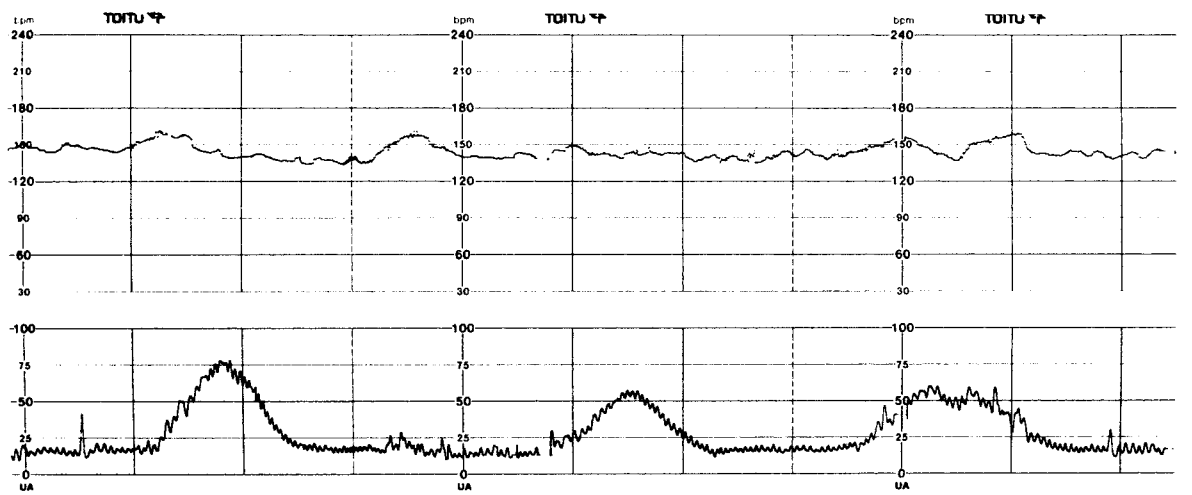

FIGURE 23-13 Negative contraction stress test.

strates FHR accelerations that meet the NST criteria, then the woman has an added measure of reassurance [74].

Equivocal CST results occur when the tracing is inadequate because of fetal or maternal activity, maternal obesity, or polyhydramnios. A test may also be considered to be equivocal if the woman shows evidence of uterine hyperstimulation, which is defined as more than 5 contractions in a 10-minute period or any single contraction lasting longer than 90 seconds. When hyperstimulation occurs, the FHR pattern cannot be evaluated to indicate uteroplacental insufficiency. The last reason for considering CST results as equivocal is when it shows nonrepetitive decelerations, suggestive of late decelerations. Because of the potential for uteroplacental insufficiency in the presence of an equivocal test, the woman must be continuously assessed in the hospital setting until more complete information is available. An equivocal CST may be repeated within 24 hours or a BPP may be performed [92, 93]. If the BPP results are reassuring, the CST need not be repeated.

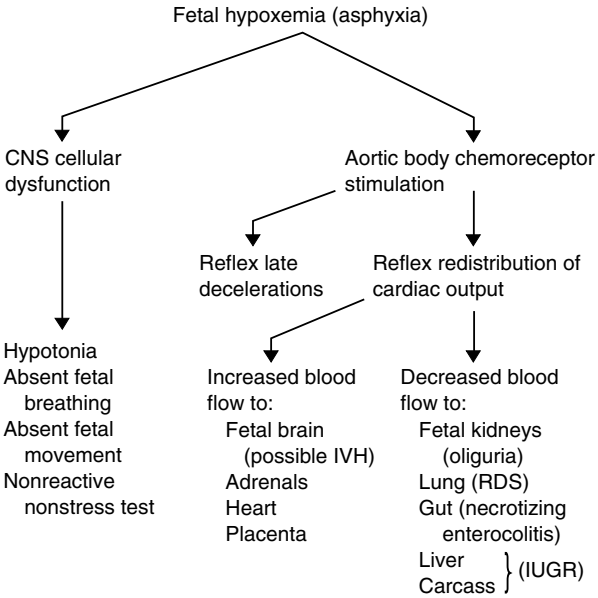

FIGURE 23-14 Biophysical effects of hypoxia on the fetus.

CNS: central nervous system; IUGR: intrauterine growth retardation; IVH: intraventricular hemorrhage; RDS: respiratory distress syndrome

Source: From Druzin, M. L. *Antepartum Fetal Assessment*. Boston, MA: Blackwell Scientific, 1992, p. 30. Reprinted by permission of Blackwell Science, Inc.

Biophysical Profile

The biophysical profile utilizes both electronic fetal monitoring and ultrasound instrumentation. The BPP evaluates the fetus by combining observation of fetal behavior with the nonstress test and measurements of the volume of amniotic fluid. The BPP is based on the premise that when a fetus is fully oxygenated and neurologically intact, it has a variety of characteristics, including muscle tone, gross movement, and respiratory activity. In addition, the mature fetus will have a reactive NST. Because the amniotic fluid is primarily fetal urine in the third trimester, it is quantified as a measure of fetal renal function. When the fetus becomes hypoxic, the criteria observed by the BPP are diminished in reverse order of their developmental appearance. Figure 23-14 shows the effects of hypoxia on the fetus in utero [94].

Indications for the BPP include known or suspected IUGR, oligohydramnios, insulin-dependent diabetes, preeclampsia, postdates, nonreactive NST or positive CST, and multiple pregnancy. Weekly testing is the usual recommendation. For insulin-dependent diabetics and for pregnancies beyond 42 weeks' gestation, a twice-weekly testing scheme is recommended [92]. In addition, any time there is a change in maternal status—e.g., rapid onset or labile hypertension—there may be need for repeated BPP. Testing is generally begun at the earliest gestational age that the clinician would consider delivery if the results indicated an acidemic fetus [92]. Specific testing strategies are discussed in the section on antepartum complications in Chapter 24, when each specific clinical indication is reviewed. Fetuses with anomalies, especially of the genitourinary, respiratory, or central nervous systems may have decreased BPP scores due specifically to their anomalies.

Evaluation of the BPP and the scoring of the examination are listed in Table 23-14 [92]. Management of the woman based on the BPP should always take the full clinical situation into consideration. If the BPP results seem not to reflect the clinical situation, then the woman must be carefully evaluated and tested again if appropriate. Table 23-15 describes the possible outcomes within 1 week of testing and identifies possible management for BPP scores with the Manning criteria [76].

A BPP score of 10/10 (read as 10 out of a possible 10), the possibility of fetal hypoxia is minimal and the fetus should do well for the following week. As noted in Table 23-15, the perinatal mortality (PMR) rate within 1 week with a score of 10/10 is < 1/1000. It is important to know that these are "adjusted" PMRs that reflect the deaths occurring due to uteroplacental insufficiency, after eliminating

TABLE 23-14 Manning Criteria for Biophysical Profile (BPP) Scoring

Biophysical Variable	Normal (Score = 2)	Abnormal (Score = 0)
Fetal tone	At least one episode of active extension with return to flexion of fetal limb(s) or trunk; opening and closing of hand considered normal tone	Either slow extension with return to partial flexion or movement of limb in full extension or absent fetal movement, or partially open fetal hand
Gross body movement	Two or more discrete body/limb movements in 30 min (episodes of active continuous movement considered a single movement)	Less than two episodes of body/limb movements in 30 min
Fetal breathing movements	At least one episode of ≥ 20 sec duration in 30 min observation	No episode of ≥ 20 sec duration in 30 min
Reactive fetal heart rate	At least two episodes of acceleration of ≥ 15 bpm and >15 sec duration in 20 min	One or no accelerations or acceleration < 15 bpm in 20 min
Amniotic fluid volume	At least one pocket of amniotic fluid measuring ≥ 2 cm in vertical axis	Either no amniotic fluid pockets or a pocket < 2 cm in vertical axis

Source: From Manning, F. A. Fetal biophysical profile. *Obstet. Gynecol. Clin. North Am.* 26(4):560, 1999. Reprinted by permission.

TABLE 23-15 Obstetrical Management Based on Biophysical Profile (BPP) Results

BPP Score	Interpretation	Percent Risk of Asphyxia (umbilical venous blood pH 7.25)	Risk of Fetal Death (per 1000/week)	Recommended Management
10/10	Nonasphyxiated	0	0.565	Conservative management
8/10 (normal AFV)	Nonasphyxiated	0	0.565	Conservative management
8/8 (NST not done)	Nonasphyxiated	0	0.565	Conservative management
8/10 (decreased AFV)	Chronic compensated asphyxia	5–10	20–30	If mature (> 37 wks), deliver; serial testing (twice weekly) in the immature fetus
6/10 (normal AFV)	Possible acute asphyxia	0	50	If mature (> 37 wks), deliver; repeat test in 24 hr in immature fetus; if < 6/10, deliver
6/10 (decreased AFV)	Chronic asphyxia w/possible acute asphyxia	>10	>50	Factor in gestational age; if > 32 wks, deliver; if < 32 wks, test daily
4/10 (normal AFV)	Acute asphyxia likely	36	115	Factor in gestational age; if > 32 wks, deliver; if < 32 wks, test daily
4/10 (decreased AFV)	Chronic asphyxia w/ acute asphyxia likely	>36	>115	If > 26 wks, deliver
2/10 (normal AFV)	Acute asphyxia nearly certain	73	220	If > 26 wks, deliver
0/10	Gross severe asphyxia	100	550	If > 26 wks, deliver

Source: From Manning, F. A. Fetal biophysical profile. *Obstet. Gynecol. Clin. North Am.* 26(4):565, 1999. Reprinted by permission.

the perinatal deaths that would be considered unpredictable—for example, from cord accidents or congenital anomalies.

A BPP score of 8/10 when the amniotic fluid volume (AFV) is normal is also predictive of a PMR < 1/1000 within 1 week. Therefore, if the NST is nonreactive, but the fetal tone, movement, breathing and amniotic fluid volume are all normal, the risk of stillbirth within 1 week is very low—the same risk as for the score of 10/10. It follows then that if the ultrasound component of the BPP is all normal—i.e., a score of 8/8 for tone, movement, breathing, and AFV—then there is no requirement to obtain a fetal heart rate tracing, as the predictive value of an 8/10 BPP with normal AFV is equivalent to a 10/10 [92]. If, however, any of the components of the ultrasound are abnormal, the nonstress test is a critical part of the fetal evaluation [92].

The role that oligohydramnios plays in the predictive value of the BPP is dramatic. As noted in Table 23-15, an 8/10 due to oligohydramnios has a perinatal mortality rate of 89/1000 within 1 week. This is based on Manning's data using a single pocket of fluid measuring less than 2.0 cm.

As the BPP score decreases to 6/10, the incidence of perinatal complications increases. If the AFV is normal, the score is equivocal, and requires careful evaluation of the individual mother and fetus. A preterm fetus may be normal with a nonreactive NST and absent fetal breathing. A term fetus, however, would be expected to earn full points for both reactivity and breathing and a score of 6/10 may be predicative of hypoxia. When the score is equivocal or does not seem to reflect the clinical picture, a repeat BPP in 12 to 24 hours may be indicated. In any event, the woman should not be discharged from the clinical setting until there is evidence of fetal well-being.

A score of 4/10 or less from the BPP is highly predictive of perinatal asphyxia and may indicate the need for delivery for fetal indications [95]. The midwife must always consult with a physician whenever the scores are nonreassuring.

Amniotic Fluid Volume

Alterations in the volume of amniotic fluid are known to be associated with untoward outcomes of pregnancy. Both maternal and fetal characteristics are related to alterations in the amniotic fluid volume [96].

Oligohydramnios, an abnormally low quantity of amniotic fluid, is highly associated with uteroplacental insufficiency and fetal hypoxia [97, 98]. A decrease in or absence of amniotic fluid may also be indicative of fetal genitourinary or lung anomalies [96]. In recent years, a significant decrease in AFV has been correlated with fetal distress in labor, poor Apgar scores, meconium-stained amniotic fluid, and meconium aspiration, as well as with postmaturity syndrome [97–100].

Polyhydramnios, an overaccumulation of amniotic fluid, is more frequently present with chromosomal disorders, structural anomalies such as tracheoesophageal fistulas, neural tube defects, and CNS malformations as well as maternal substance abuse and maternal diabetes [96]. A high percentage of polyhydramnios is of unknown etiology [101].

Measuring the AFV has been an ongoing challenge for ultrasonographers [102–109]. Until recently, the "eyeball-guesstimate" method has been the most reliable means of quantifying AFV. In more recent years, there have been several semiquantitative measurements of amniotic fluid volume introduced [75, 96, 105, 108, 109]. Most notable are the single pocket measurement, which has been suggested to be oligohydramnios if less than 1.0 centimeters or 2.0 centimeters [105–109]. Further studies have recommended use of the four-quadrant amniotic fluid index (AFI) [100–103]. The evaluation of AFV has been enhanced with the use of the amniotic fluid index (AFI), an assessment of the depth of the fluid pockets in each quadrant of the uterus [101–104]. The procedure for performing an AFI is shown in Table 23-16; Figure 23-15 shows the four quadrants within which the amniotic fluid is measured [110]. Figure 23-16 shows a sonogram of the vertical axis measurements that are made in each of the four quadrants. The AFI has the advantage of offering a measurement of amniotic fluid that permits the midwife to determine whether the volume is within a normal range as well as how the volume is changing over time [111, 112].

According to Phelan, the AFI at term will normally range between 5.0 centimeters and 23.0 cen-

TABLE 23-16 Procedure for Performing an Amniotic Fluid Index (AFI)

1. Place woman in supine position with slight left tilt.
2. Identify four quadrants of maternal abdomen.
3. Scan with the transducer placed perpendicular to the floor, aligned longitudinally with the maternal spine.
4. Measure vertical depth of largest clear pocket of amniotic fluid in each quadrant.

Note: The AFI is equal to the sum of the four quadrants.

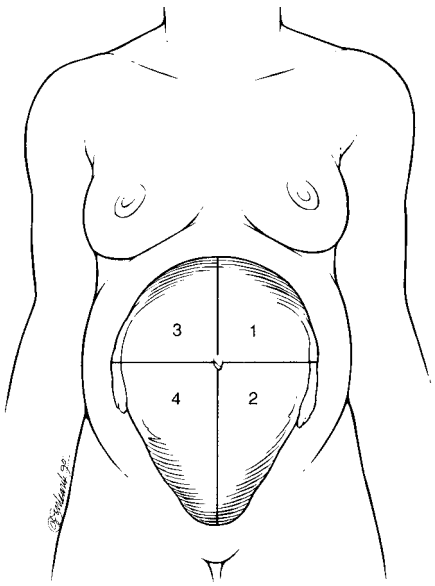

FIGURE 23-15 Schematic of the four quadrants of the maternal abdomen.

Source: Reprinted from Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York. p. 260. Copyright © 2001 with permission from Elsevier.

timeters [100, 101, 111]. Other authors have identified an AFI of 5.0 to 8.0 centimeters as borderline oligohydramnios [106]. There is disagreement in the literature regarding the appropriate management of a woman at term with oligohydramnios [107, 108]. It is important that each midwife be familiar with the accepted measurements of amniotic fluid volume and management practices in the specific clinical setting.

Modified Biophysical Profile: NST/AFI

The modified biophysical profile represents a recent trend in antepartum testing, combining the nonstress test with the amniotic fluid volume in assessing fetal well-being. It has been shown to have a predictive value similar to that of a full biophysical profile when the NST is reactive and the AFI is greater than 5.0 centimeters [113–116]. This technique is being utilized to save time for both the woman and the provider and is a more cost-effective procedure than a full BPP. If the NST is nonreactive or if the AFI is less than 5.0 centimeters, a complete BPP should be performed. It should also

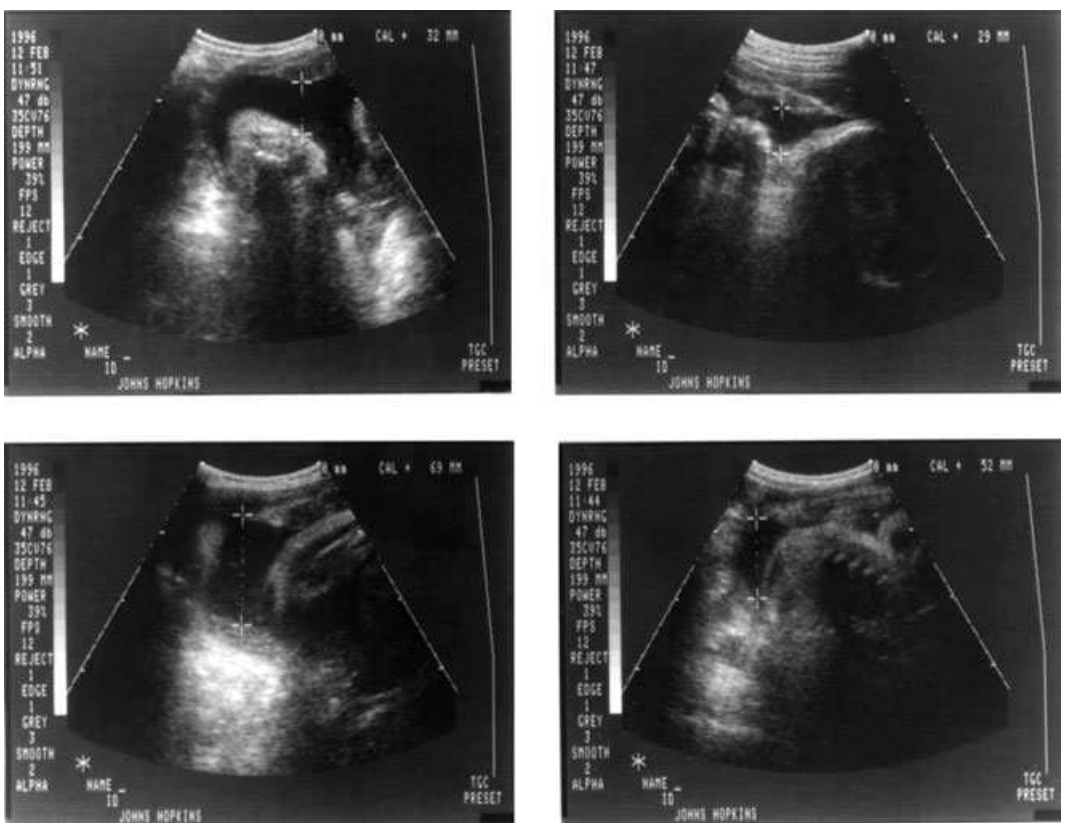

FIGURE 23-16 Sonogram of an amniotic fluid index (AFI). Note the verticle measurements in each quadrant, which are added together to total the AFI.

be noted that if the ultrasound components of the BPP are all reassuring, the NST is not necessary for confirmation of fetal well-being [48].

Doppler Velocimetry

Through the use of Doppler ultrasound, we can gain insight to the developments taking place in the maternal, fetal, and uteroplacental circulations [117]. The blood vessels most usually evaluated are the fetal umbilical arteries. However, the fetal aorta, middle cerebral, and renal arteries can also be investigated. Maternal uterine arteries and some placental vasculature are possible sites for Doppler studies.

Doppler ultrasound is used to determine the velocity of blood flow through the fetal umbilical artery to the placenta. Normally, the velocity of blood flow from the fetal heart "downstream" to the placenta is rapid, and even when the fetal heart is at rest, in diastole, the velocity of flow through an umbilical artery remains modest because the large vessels of the normal placenta have quite low resistance. In the placenta of a fetus with intrauterine growth restriction, however, these placental vessels are narrowed, and the ratio between systolic flow and diastolic flow increases [117–119]. In the case of severe IUGR, some blood still flows through the cord to the placenta during fetal systole. But in diastole, because of the severely narrowed sclerotic placental vessels, there is no longer any flow. The most severe (but rarely occurring) finding is when blood flow actually reverses direction in the cord during fetal diastole.

Doppler studies are indicated when IUGR is present or highly suspected [117–125]. Once IUGR is identified by ultrasound measurements of the fetus and clinical assessment, Doppler velocimetry studies have been demonstrated to reduce the incidence of perinatal morbidity [48, 120, 125, 126]. An in-depth discussion of identification and management of IUGR is found in Chapter 25.

The use of color flow Doppler demonstrates the direction of flow of blood in fetal blood vessels superimposed on the traditional sonogram image. "Color" Doppler is indicated specifically in the diagnosis of congenital cardiac anomalies. Currently, Doppler procedures are usually offered primarily in tertiary care centers.

Ultrasound

Diagnostic ultrasound has been used in obstetrics for nearly 50 years. During that time, the indications and usefulness of ultrasound have grown dramatically. Obstetrical ultrasound provides a "window" to the uterus and developing fetus and has offered an opportunity to learn a great deal about human growth and development as well as to understand far more regarding the pathophysiology of abnormal pregnancy. Management of pregnancy and its complications has been strongly affected. There are potential indications for the use of ultrasound in any trimester of pregnancy.

For the midwife, ultrasound presents both advantages and disadvantages. The advantages include improvement in gestational age assessment and identification of fetal anomalies. Ultrasound is also an excellent means of assessing fetal growth if this is a concern, and it accurately identifies fetal demise, placental location, fetal position, and fetal number when deviations from normal are suspected. But the disadvantages of ultrasound are that it can give a false sense of fetal well-being and false-positive diagnoses, and it can lead to overreliance on technology, not to mention an increase in health care costs. It is therefore critical that the midwife have an in-depth knowledge of the indications for ultrasound and the true value and limitations of this imaging methodology. In addition, the policies of the specific practice site must be understood.

The National Institutes of Health (NIH) delineated indications for ultrasound during all trimesters of pregnancy during a consensus conference in 1984 (see Table 23-17) [127]. These indications remain the standard for care in the United States. Use of ultrasound for specific obstetric complications is discussed in Chapters 24 and 25. Whether ultrasound is indicated for use in normal pregnancy is discussed later in this chapter. Both the American College of Obstetrics and Gynecology (ACOG) [128] and the American Institute of Ultrasound in Medicine (AIUM) [129] offer guidelines for obstetrical ultrasound examinations. The most common criteria for components of the basic ultrasound examination are listed in Table 23-18.

When ultrasound was first used clinically, there was only one "level" of obstetrical ultrasound examination. Over time, however, the improvement of imaging quality and the development of biochemical markers for identification of fetal anomalies led to structuring the obstetrical ultrasound examination based on risk status of the pregnancy. The language identifying scans as level 1 to indicate a screening examination and level 2 to indicate an in-depth examination has changed. ACOG now recommends that a "basic" ultrasound consisting primarily of fetal measurements and a brief survey

TABLE 23-17 Indications for Obstetrical Ultrasound

Estimated gestational age for patients with uncertain clinical dates
Evaluation of fetal growth
Vaginal bleeding of undetermined etiology in pregnancy
Determination of fetal presentation
Suspected multiple gestation
Adjunct to amniocentesis
Significant uterine size/clinical dates discrepancy
Pelvic mass
Suspected hydatidiform mole
Suspected ectopic pregnancy
Adjunct to special procedures, e.g., fetoscopy, cordocentesis, chorionic villus sampling, in vitro fertilization, cervical cerclage placement
Suspected fetal death
Suspected uterine abnormality
Localization of intrauterine contraceptive device
Surveillance of ovarian follicle development
Biophysical evaluation for fetal well-being
Observation of intrapartum events, e.g., version/extraction of second twin
Manual removal of placenta
Suspected polyhydramnios or oligohydramnios
Suspected abruptio placentae
Adjunct to external cephalic version
Estimation of fetal weight
Abnormal serum alpha-fetoprotein value
Follow-up observation of identified fetal anomaly
Follow-up evaluation of placental location for identified placenta previa
History of previous congenital anomaly
Serial evaluation of fetal growth in multiple gestation
Evaluation of fetal condition in late registrants for prenatal care

Source: National Institutes of Health. *Diagnostic Ultrasound Imaging in Pregnancy: Report of a Consensus Development Conference Sponsored by the National Institute of Child Health and Human Development* (DHHS publication NIH 86-667). Washington, DC: NIH, 1984, pp. 3–13.

TABLE 23-18 Components of a Basic Obstetric Ultrasound Examination

First Trimester Sonography

Scanning may be performed abdominally or vaginally, dependent on gestational age and information required. The following assessments should be made:

Gestational sac location (intra- or extra-uterine)
Identification of embryo
Crown-rump length
Presence or absence of fetal cardiac activity (identify rate when possible)
Fetal number
Evaluation of the uterus and adnexal structures for size, shape, and location

Second and Third Trimester Sonography

Unless technically impossible, the following aspects should be assessed during a basic ultrasound examination:

Fetal number
Fetal presentation
Documentation of fetal cardiac activity
Placental localization
Amniotic fluid volume assessment (single pocket measurement or amniotic fluid index)
Gestational age dating, using at least two fetal parameters (biparietal diameter, abdominal circumference, femur length)
Detection and evaluation of maternal pelvic masses
Survey of fetal anatomy for gross malformations (cerebral midline, 4-chamber heart, stomach, kidneys, bladder, and identification of all fetal limbs)

TABLE 23-19 Indications for Limited Scans

A limited ultrasound examination may be appropriate and desirable in certain circumstances—for example, when specific information is required or the clinical situation is urgent. A limited examination may be useful for the following tasks:

Assessment of amniotic fluid volume
Conducting fetal biophysical profile
Conducting ultrasound-guided amniocentesis
Guidance of external cephalic version
Confirmation of fetal life or death
Localization of placenta
Confirmation of fetal presentation

Source: American College of Nurse-Midwives. *Limited Obstetrical Ultrasound in the Third Trimester*. Clinical Bulletin. Washington, DC: ACNM, 1996. Reprinted by permission.

of fetal anatomy and maternal pelvic organs "suffices for most obstetric patients" [128]. A "comprehensive ultrasound" examination may be indicated for a woman who is suspected of carrying a physiologically or anatomically defective fetus, based on history, clinical evaluation, or prior ultrasound examination [128].

In addition to the complete basic or comprehensive studies, "in certain circumstances, a limited ultrasound examination may be appropriate and desirable" [128, p. 2]. Table 23-19 identifies the potential uses of a limited ultrasound exam. The activities on the list are often necessary during labor and delivery triage or for third trimester assessment of fetal well-being. As ultrasound equipment has become more portable and as more obstetrical providers have gained skill in scanning, the technology has become increasingly useful in bedside management decisions in clinical obstetrics. Ultrasound instrumentation is now available in many obstetri-

cal office practices. Few labor and delivery suites are without ultrasound equipment and some personnel trained in its use. Although midwives generally do not perform basic or comprehensive ultrasound examinations themselves, they must be knowledgeable regarding the scope and limitations of each study.

Limited ultrasound scans are most appropriate for women who have previously had at least a basic scan in the second trimester or later. When the limited study occurs in an urgent care setting, a follow-up basic ultrasound examination should be completed in a reasonable time frame, if indicated by the clinical situation. Therefore, if a woman is coming for sequential BPP studies, she should have had a previous basic scan. This puts the responsibility for identification of anomalies and for gestational age assessment on the sonographer and sonologist performing and interpreting a complete study. If a basic scan has not been completed prior to an emergent event, it should be performed after the emergent situation is resolved, if it is clinically indicated.

Prior to ACOG's 1991 publication of a list of "circumstances . . . when it may be unnecessary to perform a full fetal survey" [130], ultrasound professionals strongly asserted that if a scan were to be performed, a complete study would be required. They argued that a complete study is important to decrease the chances of missing critical information in the pursuit of specific data. For example, it is unacceptable to determine fetal position by finding the head but to fail to identify twins, a central placenta previa, or a fetal demise. However, it is often very useful in management of pregnancy to have specific information, such as during an emergent situation or when information such as fetal biometry is not useful or even reliable—for example, when a woman presents in labor with an uncertain lie, a large amount of vaginal bleeding, or nonreassuring fetal heart rate.

In order to bridge the gap between a complete basic ultrasound exam and the need for specific data, minimal components of a limited ultrasound examination must be determined. The demand for limited scanning has come primarily in the area of assessment of fetal well-being. A growing number of nurses and midwives are performing the limited studies of the BPP and the AFV [131, 132]. The ACOG's list of exceptions to a full fetal scan [130] has become the basis of *Nursing Practice Competencies and Educational Guidelines for Limited Ultrasound Examinations in Obstetric and Gynecologic/Infertility Settings* [133], written by the Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN, formerly NAACOG). This document establishes which limited ultrasound examinations it is appropriate for perinatal nurses to perform when they have had adequate lecture and clinical scanning education. It therefore follows that midwives may also rely on these guidelines as a basis for performing limited ultrasound studies. The guidelines clearly state the minimum components of the limited ultrasound exam. ACNM supports both AWHONN's minimum components for limited studies and the performance and interpretation by midwives of limited ultrasound examinations for assessment of fetal well-being and for labor and delivery triage [134]. This means that just finding the fetal heartbeat or just finding the fetal head is not an appropriate use of ultrasound. Instead, if midwives choose to incorporate ultrasound skills into their practice, they must follow the guidelines of the ACNM Clinical Bulletin, Limited Obstetrical Ultrasound in the Third Trimester [134], for education and clinical competence, as well as perform the minimum components for each limited ultrasound examination. The ACNM Guidelines for Incorporating New Procedures into Nurse-Midwifery Practice [135] must also be followed. Table 23-20 lists the minimum components of limited scans in the second and third trimesters.

Limited scanning in the first trimester carries the risk of missing an ectopic pregnancy, a potentially life-threatening entity. Therefore, before using ultrasound in the first trimester, it is necessary that the midwife have the skills to survey the entire pelvis, identify the maternal bladder, uterus, ovaries, and any other masses or fluid to identify clearly whether the pregnancy is in fact intrauterine and viable. Practitioners without the expertise to

TABLE 23-20 Minimum Components of Limited Obstetrical Ultrasound, Second and Third Trimester

Fetal number
Fetal cardiac activity
Fetal lie
Placental location
Biophysical profile parameters
Amniotic fluid volume

Source: American College of Nurse-Midwives. *Limited Obstetrical Ultrasound in the Third Trimester*. Clinical Bulletin. Washington, DC: ACNM, 1996. Reprinted by permission.

rule out an ectopic gestation should avoid limited scanning for identification of early pregnancy and fetal heart rates [132]. It is critical that midwives who are performing limited obstetrical ultrasound exams at any time in pregnancy have a practitioner qualified to perform complete studies available for consultation and follow-up. Ongoing competency assessment is also advisable.

Bioeffects of Ultrasound

The first commandment regarding clinical ultrasound is that the benefits to the patient must outweigh the risks of the exam [136]. The biologic effect of ultrasound on human tissue is a continuing concern for all obstetrical care providers. Studies conducted during at least 40 years of investigation have demonstrated no adverse bioeffects on the human embryo or fetus. This research includes, but is not limited to, studies evaluating fetal, neonatal, and childhood neurologic development; chromosomal anomalies; infections; abnormal hearing; visual acuity; malignancy; immunologic maturation; behavior; fetal growth; and cognitive function [136].

The 1984 National Institutes of Health (NIH) consensus conference stated that theoretically, diagnostic levels of ultrasound could cause two bioeffects: thermal effects and cavitation [127]. The actual thermal change in the fetal environment caused by ultrasound is difficult to quantify. One reason for the difficulty is that the amount of heat generated by ultrasound is so small that it is within the normal (1°C) range of fluctuation of body temperature. The American Institute of Ultrasound in Medicine (AIUM) came to this conclusion regarding a thermal bioeffects mechanism: "Based solely on a thermal criterion, a diagnostic exposure that produces a maximum temperature rise of 1°C above normal physiological levels may be used in clinical examinations without reservation" [137].

Cavitation is the process whereby tiny gas bubbles in cells can be caused to expand and contract or to burst. Cavitation in human tissue caused by diagnostic levels of ultrasound is only a theoretical danger. After careful study of all available documented evidence, the NIH concluded that there is no evidence that ultrasound causes physical or genetic damage to human embryos or fetuses [127]. The official statement of AIUM on the clinical safety of diagnostic ultrasound is as follows:

> Diagnostic ultrasound has been in use since the late 1950s. Although the possibility exists that such biological effects may be identified in the future, there are no confirmed biologic effects on patients or sonographers caused by exposure at intensities typical of present diagnostic ultrasound instruments. Given the known benefits and recognized efficacy for medical diagnosis, current ultrasound data indicate that the benefits to the patient of the prudent use of diagnostic ultrasound outweigh the risks that may be present. [137, 138]

None of this is to suggest that no effects will ever be substantiated; indeed, research on biologic effects is ongoing, which is particularly important as new technologic applications for ultrasound are developed that use higher power outputs. AIUM has indicated that each ultrasound operator has the responsibility to utilize ultrasound in a prudent manner and to "complete the examination using scan modes and power outputs which result in energy exposures which are 'as low as reasonably achievable' (ALARA)" [137].

Despite the lack of evidence of danger, many pregnant women and their partners are concerned about the bioeffects of obstetrical ultrasound. Some confuse ultrasound with ionizing radiation and unnecessarily avoid ultrasound examinations that may be advantageous. It is the responsibility of the midwife to assure a woman and her family that, when indications for ultrasound are present, any theoretical risk is overshadowed by the benefit of information that may assist in management of the pregnancy. One well-timed ultrasound exam can help lessen the need for other interventions later in pregnancy.

Routine Ultrasound Screening

Few topics in the care of pregnant women arouse such emotion and differences of opinion as the question of routine ultrasound scanning. Ultrasound has added a great deal to the potential for identifying maternal and fetal anatomy and for broadening the knowledge base regarding pregnancy and fetal development.

There is general agreement that ultrasound has value for women with indications for sonography during pregnancy, and the list of indications from NIH is the standard (see again Table 23-17). The question is whether women who are normal—at very low risk for poor pregnancy outcomes—and who do not have any specific indication for scanning have improved maternal or fetal outcomes with the routine performance of ultrasound. For midwives, long champions of nonintervention in normal pregnancy, this is an issue of special concern.

Over the past 20 years, numerous randomized controlled trials have been conducted throughout the world in an attempt to answer this question [139–143]. The majority of the trials were conducted in Europe and did not specifically differentiate between normal women and those with pregnancy-related complications [139–140, 143–145]. Each trial had slightly different outcomes; however, there are some common findings [144–145]. The primary common finding is that ultrasound is a very accurate means of assessing gestational age. During the first half of pregnancy, ultrasound predicts gestational age within 10 days. This accuracy is improved earlier in pregnancy and diminishes as pregnancy progresses. Therefore, when a woman has uncertain dates, her dates are not consistent with the clinical examination, or when she registers for care after the first trimester, ultrasound examination can improve the quality of pregnancy dating and affect the ongoing management of prenatal care [139–145]. In-depth discussion of assessment of gestational age is included in Chapter 25.

Ultrasound has also been shown to improve identification of multiple pregnancy and to identify major congenital anomalies. Conflict does exist in the literature in this regard; there is wide discrepancy in the rate of identification of anomalies [139, 141, 143, 144, 147]. In the European trials, identification rates of major anomalies ranged between 21 and 84 percent [145]. In the Routine Antenatal Diagnostic Imaging with Ultrasound (RADIUS) trial conducted in the United States, only 17 percent of major anomalies were identified prior to 24 weeks in the routine screening group compared to 11 percent in the control group [141–143]. Some authors have used identification of anomalies as the justification for routine ultrasound screening [145, 146], a practice that the RADIUS trial makes questionable. An important point about anomaly identification that is not widely discussed is that, despite a higher identification of anomalies in the routine screening group than in the control group, there was no difference in perinatal mortality rates between the groups after controlling for elective terminations in the screening group and spontaneous losses from anomalies not consistent with life in the control group [139, 144, 147]. In fact, there has been no demonstrated improvement in the live birth rate, a rate that takes into consideration all pregnancy losses, including miscarriage, elective termination, and perinatal deaths [144].

Anomaly screening has two primary benefits for women: (1) It identifies many fetuses with major structural anomalies early enough in pregnancy to allow for termination of the pregnancy if the woman elects to do so; (2) it gives the woman the opportunity to plan for the care of an abnormal fetus. In a few situations, the fetus may benefit from intrauterine treatment, and the future may well be promising in this regard. For most abnormal fetuses, a plan of delivery in a tertiary setting may improve the chances of survival and of well-being. In addition, an immeasurable potential benefit of anomaly screening is the opportunity for the parents and other family members to begin to accept the disability and to gain greater understanding of the possible range of care needed by the infant. Bucher and Schmidt, in their meta-analysis, state that women must be informed that ultrasound screening is being used as a means of prenatal diagnosis of congenital anomalies and that "if a woman does not consent to screening for malformations, . . . routine ultrasound scanning is not indicated" [144].

When referring women for obstetrical ultrasound examinations, it is important to know the experience of the ultrasound providers and the quality of their work. The quality of the information provided in the report is strongly based on the skill of the sonographer, the interpretive expertise of the interpreting physician, and the instrumentation used [143]. There is often a great difference between a community radiology group which offers a full range of scans with moderate range machines and a maternal-fetal medicine ultrasound expert using state of the art technology with extensive experience evaluating congenital anomalies and assessing fetal status. This difference in the scanning expertise of the sonographer is felt to be the reason for wide discrepancies in identification of anomalies between different studies [143]. If a woman has a history placing her at risk for anomalies or IUGR, or if a basic ultrasound has identified a problem, a scan done in a high-risk center may be indicated.

The report on the 1984 NIH Consensus Conference on Diagnostic Ultrasound in Pregnancy asserts that there remains "no evidence that the routine use of ultrasound in all pregnancies improved the perinatal outcome or decreased perinatal mortality or morbidity" [127]. The conference called for the performance of large-scale randomized controlled trials in the United States to determine whether routine scanning of normal women was appropriate; the RADIUS trial was conducted in response to this call [141, 142]. This has been the largest trial of ultrasound outcomes in the world—

53,367 women were screened for the study. After meeting rigorous exclusionary criteria that identified theirs as normal pregnancies, 15,530 women were randomized into screening and control groups [141, 142]. Those in the screening group were placed on a routine scanning schedule of one scan for dating at 18 to 20 weeks (allowable range, 15 to 22 weeks) followed by a scan at 31 to 33 weeks (range, 31 to 35 weeks) for assessment of growth. The control group had ultrasound only as indicated, based on the clinical judgment of their obstetric providers. To summarize briefly the results of this study: There were no significant differences between the groups in the areas of fetal death, neonatal death, or moderate or severe neonatal morbidity [141]. In addition, there were no differences between the groups in the areas of maternal outcome measures, including rates of induced abortion, amniocentesis, tests of fetal well-being, external version, induction, cesarean section, and/or total hospital days [142].

The data from the RADIUS trials have been criticized because of the very low-risk population that was evaluated, but that was in fact the primary intent of the study [148–150]. It is important to keep this distinction in mind and not generalize the RADIUS results to a wider population of women.

As if the controversy strictly within the medical community were not complex enough, other factors play a part in decisions regarding ultrasound screening. These include societal demands, potential psychological aspects, cost effectiveness, insurance coverage, and legal implications.

Ultrasound has become ingrained in our society's expectations of prenatal care. Today, most mothers-to-be want to "see" the baby and to ascertain its gender. Fewer women come to delivery not knowing the gender of the fetus. Levi states that parents have fears that their unborn child may have an abnormality, and therefore, "thirst for reassurance about the absence of fetal congenital anomalies" [151]. When ultrasound is not routinely offered or available, many women feel as if their care is second rate, that they are being denied an integral part of prenatal care. Little is actually known about the psychosocial effects of this technology on society and on how parents "bond" with their unborn children.

Like other screening tools for congenital anomalies, ultrasound for diagnostic purposes has been implicated as a stressor in pregnancy. Women experience significant anxiety when presented with an unexpected risk to their pregnancies. Clear explanations prior to the procedure and frequent feedback during the sonogram can help allay anxiety, as, of course, do normal results. Ultrasound has been demonstrated to be reassuring and potentially to improve bonding [152–154]. Some studies have found that use of ultrasound can reduce short-term use of tobacco and alcohol [154, 155]. These indirect, nonmedical benefits of ultrasound are additional considerations for midwives.

In the RADIUS study, women in the screened population had an average of 2.2 scans per pregnancy, as opposed to those in the control group, who had only 0.6 scans per pregnancy [142]. This increase in scans for routine screening creates increased health care expense. But according to LeFevre, "this increase in the cost of care is associated with no apparent benefit" [142, p. 488].

The use of routine ultrasound is often difficult for midwives. As clinicians whose philosophy dictates the appropriate use of technology, they are responsible for educating women about the limitations, cost-benefit ratio, and risks of ultrasound. Women also need to understand how the clinicians' choices about ultrasound are made. This holds particularly true for women whose pregnancies are low risk and well dated. At the same time, the ultrasound procedure is perceived as routine and, therefore, is expected by many women. The midwife must balance unregulated use of ultrasound with families' needs and desires for obstetric technology. Skupski and Chervenak suggest the following model of informed consent to utilize in this debate:

> Shortly after the pregnancy is diagnosed, every pregnant woman should be provided with information about the actual and theoretical benefits and harms of obstetric ultrasound. Second, the woman should evaluate this information in terms of her own values, something every autonomous patient is qualified to do. Patients routinely make complex decisions in their personal lives. . . . The third stage in prenatal informed consent for sonogram (PICS) is for the woman to articulate her preference regarding the use of ultrasound in the management of her pregnancy. The fourth stage is for the physician to [make a] recommendation, if he or she has one. The fifth stage is a thoughtful and sensitive discussion of any disagreement that may emerge. Lastly, the woman makes her final decision. This decision should then determine the use of obstetric ultrasound for that woman. [148, p. 437]

A thorough review of issues with each woman and documentation of the woman's choices will decrease the midwife's liability if a poor outcome ensues. Practice settings may define patterns of referral for ultrasound and thereby limit the opportunity for complete informed consent and autonomy by the woman. However, the midwife must be well informed regarding the indications for ultrasound and its limitations, risks, and benefits and make every attempt to individualize care for the greatest benefit to each mother and baby.

References

1. Buster, J. E., and Carson, S. A. Endocrinology and diagnosis of pregnancy. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. (Eds.) *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, pp. 3–36.
2. Guyton, A. C. *Human Physiology and Mechanisms of Disease*, 4th ed. Philadelphia, PA: W. B. Saunders, 1993, p. 643.
3. Filly, R. A., Callen, P. W., and Goldstein, R. B. Alpha-fetoprotein screening programs: what every obstetric sonologist should know. In Callen, P. W. (Ed.) *Ultrasonography in Obstetrics and Gynecology*. Philadelphia, PA: W. B. Saunders, 1994, pp. 24–34.
4. Fossum G. T., Davajan V., and Kletzky, O. A. Early detection of pregnancy with transvaginal ultrasound. *Fertil. Sterility* 49:789, 1988.
5. Alpha-fetoprotein. *ACOG Technical Bulletin* 154 (April) 1991.
6. Simpson, J. L. Genetic counseling and prenatal diagnosis. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. (Eds.) *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, pp. 187–219.
7. Haddow, J. E., Palomaki, G. E., Knight, G. J., et al. Prenatal screening for Down's syndrome with use of maternal serum markers. *N. Eng. J. Med.* 327:588–593, 1992.
8. Bauman, P., and McFarlin, B. Prenatal diagnosis. *J. Nurse-Midwifery* 39(suppl. 2):S35–51, 1994.
9. Marteau, T. M., Cook, R., Kidd, J., et al. The psychological effects of false-positive results in prenatal screening for fetal abnormality: a prospective study. *Prenat. Diagn.* 12:205–214, 1992.
10. Abuelo, D. N., Hopman, M. R., Barsel-Fauers, G., and Goldstein, A. Anxiety in women with low maternal serum alpha-fetoprotein screening results. *Prenat. Diagn.* 11:381–385, 1991.
11. Marteau, T. M., Kidd, J., Cook, R., et al. Psychological effects of having amniocentesis: Are these due to the procedure, the risk, or the behavior? *Prenat. Diagn.* 36:395–402, 1992.
12. Livingstone, J., Axton, R. A., Gilfillan, A., et al. Antenatal screening for cystic fibrosis: a trial of the couple model. In Harper, P. S. (Ed.), *Practical Genetic Counseling*. Oxford, England: Butterworth-Heinemann, 1988.
13. Canick, J. A., and Kellner, L. H. First trimester screening for aneuploidy: serum biochemical markers. *Semin. Perinatol.* 23:359–368, 1999.
14. Haddow, J. E., Palomaki, G. E., Knight, G. J., Williams, J., Miller, W. A., and Johnson, A. Screening of maternal serum for fetal Down's syndrome in the first trimester. *N. Eng. J. Med.* 338:995–961, 1998.
15. Taipale, P., Hiilesma, V., Salonen, R., and Ylostalo, P. Increased nuchal translucency as a marker for fetal chromosomal defects. *N. Eng. J. Med.* 337:1654–1658, 1997.
16. Sherer, D. M., and Manning, F. A. First-trimester nuchal translucency screening for fetal aneuploidy. *Am. J. Perinatol.* 16:103–120, 1999.
17. Jackson, M., and Rose, N. C. Diagnosis and management of fetal nuchal translucency. *Semin. Roentgenology* 33:333–338, 1998.
18. Pandya, P. P., Kondylios, A., Hilbert, L., et al. Chromosomal defects and outcome in 1015 fetuses with increased nuchal translucency. *Ultrasound Obstet. Gynecol.* 5:15–19, 1995.
19. Thomas, R. L., and Blakemore, K. J. Evaluation of elevations in maternal serum alpha-fetoprotein: a review. *Obstet. Gynecol. Surv*ey 45(5):269–283, 1990.
20. Canick, J. A., and Knight, G. J. Multiple marker screening for fetal Down syndrome. *Contemp. OB/GYN*. Technology 25–42, 1992.
21. Phillips, O. P., Elias, S., Schulman, L. P., Anderson, R. N., Morgan, C. D., and Leighton, J. L. Maternal serum screening for fetal Down syndrome in women less than 35 years of age using alpha-fetoprotein, hCG, and unconjugated estriol: a prospective 2-year study. *Obstet. Gynecol.* 80:353–358, 1992.
22. Phillips, O. P., Elias, S., Schulman, L., Andersen, R. N., Morgan, C. D., and Simpson, J. L. Maternal serum screening for fetal Down syndrome in women less than 35 years of age using alpha-fetoprotein, hCG, and unconjugated estriol: a prospective 2-year study. *Obstet. Gynecol.* 80:353–358, 1992.

23. Kellner, L. H., Weiss, R. R., Weiner, Z., et al. The advantages of using triple-marker screening for chromosomal abnormalities. *Am. J. Obstet. Gynecol.* 172:831–836, 1995.

24. Palomaki, G. E., Haddow, J. E., Knight, G.J., et al. Risk-based prenatal screening for trisomy 18 using alpha-fetoprotein, unconjugated estriol, and human chorionic gonadotropin. *Prenat. Diagn.* 15:713–723, 1995.

25. Haddow, J. E., Palomaki, G. E., Knight, G. J., Cunningham, G. C., Lustig, L. S., and Boyd, P. A. Reducing the need for amniocentesis in women 35 years of age or older with serum markers for screening. *N. Eng. J. Med.* 330:1114–1118, 1994.

26. Reynolds, T. M., Nix, A. B., Dunstan, F. D., and Dawson, A. J. Age-specific detection and false-positive rates: an aid to counseling in Down syndrome risk screening. *Obstet. Gynecol.* 81:447–445, 1993.

27. Benn, P. A., Borgida, A., Horne, D., Briganti, S., Collins, R., and Rodis, J. F. Down syndrome and neural tube defect screening: the value of using gestational age by sonography. *Am. J. Obstet. Gynecol.* 176:1956–1961, 1997.

28. Pergament, E., Stein, A. K., Fiddler, M., Cho, N. H., and Kupferminc, M. J. Adverse pregnancy outcome after a false-positive screen for Down syndrome using multiple markers. *Obstet. Gynecol.* 86:255–258, 1995.

29. Spencer, K. Second-trimester prenatal screening for Down syndrome and the relationship of maternal serum biochemical markers to pregnancy complications with adverse outcome. *Prenat. Diagn.* 20:652–656, 2000.

30. Walton, D. L., Norem, C. T., Schoen, E. J., Ray, G. T., and Colby, C. J. Second trimester serum chorionic gonadotropin concentrations and complications and outcome of pregnancy. *N. Eng. J. Med.* 341(27):2003–2038, 1999.

31. Stamilio, D. M., Sehdev, H. M., Morgan, M. A., Propert, K., and Macones, G. A. Can antenatal clinical and biochemical markers predict the development of severe preeclampsia? *Am. J. Obstet. Gynecol.* 182:589–594, 2000.

32. Lambert-Messerlian, G. M., Silver, H. M., Petraglia, F., et al. Second-trimester levels of maternal serum human chorionic gonadotropin and inhibin A as predictors of preeclampsia in the third trimester of pregnancy. *J. Soc. Gynecol. Invest.* 7:170–174, 2000.

33. Debieve, F., Bouckaert, A., Hubinont, C., and Thomas, K. Multiple screening for fetal Down's syndrome with the classic triple test, dimeric inhibin A, and ultrasound. *Gynecol. Obstet. Invest.* 49:221–226, 2000.

34. Wald, N. J., Watt, H. C., and Hackshaw, A. K. Integrated screening for Down's syndrome based on tests performed during the first and second trimesters. *N. Eng. J. Med.* 341:461–467, 1999.

35. Herman, A., Weinraub, Z., Dreazen, E., at al. Combined first trimester nuchal translucency and second trimester biochemical screening tests among normal pregnancies. *Prenat. Diagn.* 20:781–784, 2000.

36. Brumfield, C. G., and Atkinson, M. W. Invasive techniques for fetal evaluation and treatment. *Clin. Obstet. Gynecol.* 37:856–874, 1994.

37. Smith-Bindman, R., Hosmer, W., and Feldstein, V. A. Second trimester ultrasound to detect fetuses with Down syndrome: a meta-analysis. *JAMA* 285:1044–1055, 2001.

38. Burke, B. M., and Kolker, A. Clients undergoing chorionic villus sampling versus amniocentesis: contrasting attitudes toward pregnancy. *Health Care Women Int.* 14:193–200, 1993.

39. Pertl, B., Kopp, S., Kroisel, P. M., Tului, L., Brambati, B., and Adinolfi, M. Rapid detection of chromosomal aneuploidies by quantitative fluorescence PCR: first application on 247 chorionic villus samples. *J. Med. Genetics* 36:300–303, 1999.

40. D'Alton, M. E. Prenatal diagnostic procedures. *Semin. Perinatol.* 18:140–162, 1994.

41. Donnenfeld, A. E., Librizzi, R. J., Dunn, L. K., Craparo, F., Godmilow, L., and Weiner, S. Chorionic villus sampling followed by amniocentesis in the same pregnancy. *Am. J. Med. Genetics* 45:361–364, 1993.

42. Smidt-Jensen, S., and Sundberg, K. Early amniocentesis. *Curr. Opinion Obstet. Gynecol.* 7:117–121, 1995.

43. Johnson, J. M., Wilson, R. D., Singer, J., et. al. Technical factors in early amniocentesis predict adverse outcome. Results of the Canadian Early (EA) versus Mid-trimester (MA) Amniocentesis Trial. *Prenat. Diagn.* 19:732–738, 1999.

44. Saltvedt, S., and Almstrom, H. Fetal loss rate after second trimester amniocentesis at different gestational age. *Acta Obstet. Gynecol. Scand.* 78:10–14, 1999.

45. Brumfield, C. G., Lin, S., Conner, W., Cosper, P., Davis, R. O., and Owen, J. Pregnancy outcome following genetic amniocentesis at 11–14 versus 16–19 weeks' gestation. *Obstet. Gynecol.* 88:114–118, 1996.

46. Stringer, M., Librizzi, R., and Weiner, S. Establishing a prenatal genetic diagnosis: the nurse's role. *MCN* 16:152–156, 1991.

47. Economides, D. L., and Nicolaides, K. H. Cordocentesis in the investigation of fetal oxygenation and metabolism. In Chervenak, F. A., Isaacson, G. C., and Campbell, S. (Eds.) *Ultrasound in Obstetrics and Gynecology*, Vol 1. Boston, MA: Little, Brown, 1993, pp. 433–446.

48. Antepartum Fetal Surveillance. *ACOG Practice Bulletin* 9 (October) 1999.

49. Neldam, S. Fetal movements as an indicator of fetal well-being. *Lancet* 1:1222–1234, 1980.

50. Christensen, F. C., Rayburn, W. F. Fetal movement counts. *Obstet. Gynecol. Clin. North Am.* 26(4):607–621 (December) 1999.

51. Sadovsky, E., and Yaffe, H. Daily fetal movement recording and fetal prognosis. *Obstet. Gynecol.* 41:845–850, 1973.

52. Manning, F. A., Snijders, R., Harman, C. R., Nicolaides, K., Menticoglou, S., and Morrison, I. Fetal biophysical profile score. VI. Correlation with antepartum umbilical venous fetal pH. *Am. J. Obstet. Gynecol.* 169:755–763, 1993.

53. Pearson, J. F., and Weaver, J. B. Fetal activity and well-being. *Br. Med. J.* 1:1305, 1976.

54. Moore, T., and Piacquadio, K. A prospective evaluation of fetal movement screening to reduce the incidence of antepartum fetal death. *Am. J. Obstet. Gynecol.* 160:1075–1080, 1989.

55. Davis, L. Daily fetal movement counting: a valuable assessment tool. *J. Nurse-Midwifery* 32(1):11–19, 1987.

56. Kelly, J., Matthews, K. A., and O'Connor, M. Smoking in pregnancy: effects on mother and fetus. *Br. J. Obstet. Gynecol.* 91:111–117, 1984.

57. Grace, L. M., Cardoso, C. G., Clode, N., and Calhaz-Jorge, C. Acute effects of maternal cigarette smoking on fetal heart rate and fetal body movements felt by the mother. *J. Perinatol. Med.* 19:385–390, 1991.

58. Johnson, T. R. B., Besinger, R. E., and Thomas, R. L. New clues to fetal behavior and well-being. *Contemp. OB/GYN* 30:91–123 (May) 1988.

59. Sherer, D.M., Spong, C.Y., Minior, V. K., and Salafia, C. M. Decreased amniotic fluid volume at <32 weeks gestation is associated with decreased fetal movements. *Am. J. Perinatol.* 13(8):479–482, 1996.

60. Grant, A., and Hepburn, M. Merits of an individualized approach to fetal movement counting compared with fixed-time and fixed-number methods. *Br. J. Obstet. Gynecol.* 91:1087–1090, 1984.

61. Gegor, C. L., Paine, L. L., and Johnson, T. R. B. Antepartum fetal assessment: a nurse-midwifery perspective. *J. Nurse-Midwifery* 36(3):153–167, 1991.

62. Harrington, K., Thompson, O., Jordan, L., Page, J., Carpenter, R. G., and Campbell, S. Obstetric outcome in women who present with a reduction in fetal movements in the third trimester of pregnancy. *J. Perinatol. Med.* 26:77–82, 1998.

63. Sparrow, M. M. Eavesdropping on the womb: the advent of fetal auscultation. *The Pharos* 31–36 (Winter) 2000.

64. Feinstein, N. F. Fetal heart rate auscultation: Current and future practice. *JOGNN* 29(3):306–315 (May/June) 2000.

65. Paine, L. L., Barger, M. K., Rorie, J. L., Zanardi, L.R., and Johnson, T.R.B. *A comparison of the 6-minute and 10-minute auscultated acceleration test for fetal well-being.* Oral presentation. International Confederation of Midwives. May 1999.

66. Engstrom, J. L., McFarlin, B. L., and Sampson, M. B. Fundal height measurement: Part 4. Accuracy of clinicians' identification of the uterine fundus during pregnancy. *J. Nurse-Midwifery* 38:318–323, 1993.

67. Paine, L. L., Payton, R. G., and Johnson, T. R. B. Auscultated fetal heart rate accelerations: Part I. Accuracy and documentation. *J. Nurse-Midwifery* 31(2):68–72, 1986.

68. Paine, L. L., Johnson, T. R., Turner, M. H., et al. Auscultated fetal heart rate accelerations: Part II. An alternative to the nonstress test. *J. Nurse-Midwifery* 31(2):73–77, 1986.

69. Paine, L. L., Benedict, M. I., Strobino, D. M., Gegor, C. L., and Larson, E. L. A comparison of the auscultated acceleration test and the nonstress test as predictors of perinatal outcomes. *Nurs. Res.* 41(2):8791, 1992.

70. Daniels, S. M., and Boehm, N. Auscultated fetal heart rate accelerations: an alternative to the non-stress test. *J. Nurse-Midwifery* 36:88–94, 1991.

71. Devoe, L. D. Nonstress testing and contraction stress testing. *Obstet. Gynecol. Clin. North Am.* 26(4):535–555, 1999.

72. Druzin, M. L., Fox, A., Kogut, E., and Carlson, C. The relationship of the nonstress test to gestational age. *Am. J. Obstet. Gynecol.* 152(4):386–389, 1985.

73. Pillai, M., and James, D. The development of fetal heart rate patterns during normal pregnancy. *Obstet. Gynecol.* 76:812–816, 1990.

74. Schifrin, B. S., and Clement, D. Why fetal monitoring remains a good idea. *Contemp. OB/GYN* 35:70–86 (February) 1990.

75. Manning, F. A., Baskett, T. F., Morrison, I., et al. Fetal biophysical profile scoring: A prospective study in 1,184 high-risk patients. *Am. J. Obstet. Gynecol.* 140:289, 1981.

76. Manning, F. A., Morrison, I., Lange, I. R., Harman, C. R., and Chamberlain, P. F. Fetal assessment based on fetal biophysical profile scoring: experience in 12,260 referred high-risk patients: I. Perinatal mortality by frequency and etiology. *Am. J. Obstet. Gynecol.* 151(3):343–350, 1985.

77. van Geijn, H. P., Jongsma, H. W., de Haan, J., Eskes, K. A. B., and Prechtl, H. F. R. Heart rate as an indicator of the behavioral state. *Am. J. Obstet. Gynecol.* 136:1061–1065, 1980.

78. Meis, P. J., Ureda, J. R., Swain, M., Kelly, R. T., Penry, M., and Sharp, P. Variable decelerations during nonstress tests are not a sign of fetal compromise. *Am. J. Obstet. Gynecol.* 154:586–590, 1986.

79. Naef, R. W., Morrison, J. C., Washburne, J. F., McLaughlin, B. N., Perry, K. G., and Roberts, W. E. Assessment of fetal well-being using the nonstress test in the home setting. *Obstet. Gynecol.* 4:424–426, 1994.

80. Shaw, K. J., and Paul, R. H. Fetal responses to external stimuli. *Obstet. Gynecol. Clin. North Am.* 17(1):235–248, 1990.

81. Richardson, B., Briggs, M. L., Toomey, C., et al. The effect of maternal glucose administration on the specificity of the nonstress test. *Am. J. Obstet. Gynecol.* 145:141, 1983.

82. Abitol, M. M., Udom-Rice, I., Martin, A. K., Toledo, R. B., and Karimi, A. Fetal sound stimulation using maternal voice. *J. Mat. Fetal Invest.* 2:233–239, 1992.

83. McCarthy, K. E., and Narrigan, D. Is there scientific support for the use of juice to facilitate the nonstress test? *JOGNN* 24(4):303–306, 1995.

84. Nathan, E. B., Haberman, S., Burgess, T., and Minkoff, H. The relationship of maternal position to the results of brief nonstress tests: A randomized clinical trial. *Am. J. Obstet. Gynecol.* 183:1070–1072, 2000.

85. Clark, S., Sabey, P., and Jolley, K. Nonstress testing with acoustic stimulation and amniotic fluid volume assessment: 5973 tests without unexpected fetal death. *Am. J. Obstet. Gynecol.* 160:694–697, 1989.

86. Devoe, L. D., Murray, C., Faircloth, D., and Ramos, E. Vibroacoustic stimulation and fetal behavioral state in normal term human pregnancy. *Am. J. Obstet. Gynecol.* 163:1156–1161, 1990.

87. Arulkumaran, S., Anandakumar, C., Wong, Y. C., and Ratnam, S. S. Evaluation of maternal perception of sound-provoked fetal movement as a test of antenatal fetal health. *Obstet. Gynecol.* 73:182–186, 1989.

88. Smith, C. V., Phelan, J. P., Platt, L. D., et al. Fetal acoustic stimulation: a randomized clinical comparison with the nonstress test. *Am. J. Obstet. Gynecol.* 155:131–134, 1986.

89. Porter T. F., and Clark, S. L. Vibroacoustic and scalp stimulation. *Obstet. Gynecol. Clin. North Am.* 26(4):657–669 (December) 1999.

90. Visser, G. H. A. Fetal health assessment. *Curr. Opinion Obstet. Gynecol.* 3:242–247, 1991.

91. Newnham, J. P., Burns, S. E., and Roberman, B. D. Effect of vibratory acoustic stimulation on the duration of fetal heart rate monitoring tests. *Am. J. Perinatol.* 7(3):232, 1990.

92. Manning, F. A. Fetal biophysical profile. *Obstet. Gynecol. Clin. North Am.* 26(4):557–577, 1999.

93. Manning, F. A. Antepartum fetal surveillance. *Curr. Opinion Obstet. Gynecol.* 7:146–149, 1995.

94. Tsang, H. H., and Manning, F. A. Fetal biophysical profile scoring. In Druzin, M. L. (Ed.) *Antepartum Fetal Assessment*. Boston, MA: Blackwell Scientific, 1992, pp. 29–44.

95. Manning, F. A., Snijders, R., Harman, C. R., Nicolaides, K., Menticiglou, S., and Morrison, I. Fetal biophysical profile score. VI. Correlation with antepartum umbilical venous fetal pH. *Am. J. Obstet. Gynecol.* 169:755–763, 1993.

96. Martinez-Frias, M. L., Bermejo, E., Rodriguez-Pinilla, E., and Frias, J. L. Maternal and fetal factors related to abnormal amniotic fluid. *J. Perinatol.* 19(7):514–520, 1999.

97. McCurdy, C. M., and Seeds, J. W., Oligohydramnios: Problems and treatment. *Sem. Perinatol.* 17:183–209, 1993.

98. Chamberlain, P. F., Manning, F. A., Morrison, I., et al. Ultrasound evaluation of amniotic fluid volume: I. The relationship of marginal and decreased amniotic fluid volume to perinatal outcome. *Am. J. Obstet. Gynecol.* 150:245–249, 1984.

99. Boylan, P., and McParland, P. Fetal assessment in postterm pregnancy. *Curr. Opinion Obstet. Gynecol.* 3:41–44, 1991.

100. Phelan, J. P., Platt, L. D., Yeh, S. Y., Broussard, P., and Paul, R. H. The role of ultrasound assessment of amniotic fluid volume in the man-

agement of the postdate pregnancy. *Am. J. Obstet. Gynecol.* 151:304–308, 1985.

101. Phelan, J. P., Smith, C. V., Broussard, P., and Small, M. Amniotic fluid volume assessment with the four-quadrant technique at 36–42 weeks gestation. *J. Reprod. Med.* 32:540–542, 1987.

102. Moore, T. R., and Cayle, J. E. The amniotic fluid index in normal human pregnancy. *Am. J. Obstet. Gynecol.* 162:1168–1173, 1990.

103. Moore, T. R. Superiority of the four-quadrant sum over the single-deepest-pocket technique in ultrasonographic identification of abnormal amniotic fluid volumes. *Am. J. Obstet. Gynecol.* 163:762–767, 1990.

104. Magann, E. F., Nolan, T. E., Hess, L. W., et al. Measurement of amniotic fluid volume: accuracy of ultrasonography techniques. *Am. J. Obstet. Gynecol.* 167:1533–1537 (December) 1992.

105. Magann, E. F., Sanderson, M., Martin, J.N., and Chauhan, S. The amniotic fluid index, single deepest pocket, and two-diameter pocket in normal human pregnancy. *Am. J. Obstet. Gynecol.* 182(6):1581–1588, 2000.

106. Larmon, J. E., and Ross, B. S. Clinical utility of amniotic fluid volume assessment. *Obstet. Gynecol. Clin. North Am.* 25(3):639 (September) 1998.

107. Magann, E. F., Isler, C. M., Chauhan, S. P., and Martin, J. N. Amniotic fluid volume estimation and the biophysical profile: a confusion of criteria. *Obstet. Gynecol.* 96(4):640–642 (October) 2000.

108. Magann, E. F. , Kinsella, M. J., Chauhan S. P., McNamara, M. F., Gehring, B. W., and Morrison, J. C. Does an amniotic fluid index of ≤ 5 cm necessitate delivery in high-risk pregnancies? A case-controlled study. *Am. J. Obstet. Gynecol.* 180:1354–1359, 1999.

109. Magann, E. F., Chauhan, S. P., Kinsella, M. J., McNamara, M. F., Whitworth, N. S., and Morrison, J.C. Antenatal testing among 1001 patients at high risk: the role of ultrasonographic estimate of amniotic fluid volume. *Am. J. Obstet. Gynecol.* 180(6, pt. 1):1330–1336, 1999.

110. Chervenak, F. A., and Gabbe, S. G. Obstetric ultrasound: assessment of fetal growth and anatomy. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. (Eds.) *Obstetrics: Normal and Problem Pregnancies*, 2nd ed. New York: Churchill Livingstone, 1991, p. 340.

111. Phelan, J. P., Ahn, M. O., Smith, C. V., et al. Amniotic fluid index measurements during pregnancy. *J. Reprod. Med.* 32:8, 601–604, 1987.

112. Horsager, R., Nathan, L., and Leveno, K. J. Correlation of measured amniotic fluid volume and sonographic predictions of oligohydramnios. *Obstet. Gynecol.* 83:955–958, 1994.

113. Deren, O., Karaer, C., Onderoglu, L., Durukan, T., and Bahado-Singh, R. The effect of steroids on the biophysical profile of the healthy preterm fetus and its relationship with time. *Am. J. Obstet. Gynecol.* 182(1, pt. 2):S108 (January) 2000.

114. Nageotte, M. P., Towers, C. V., Asrat, T., and Freeman, R. K. Perinatal outcome with the modified biophysical profile. *Am. J. Obstet. Gynecol.* 170:1672–1676, 1994.

115. Rutherford, S. B., Phelan, J. P., Smith, C. V., and Jacobs, N. The four-quadrant assessment of amniotic fluid volume: an adjunct to antepartum fetal heart rate testing. *Obstet. Gynecol.* 70:353–356, 1987.

116. Miller, D. A., Rabello, Y. A., and Paul, R. H. The modified biophysical profile: antepartum testing in the 1990s. *Am. J. Obstet. Gynecol.* 174:812–817, 1996.

117. Harrington, K. F. Making best and appropriate use of fetal biophysical and Doppler ultrasound data in the management of the growth restricted fetus. *Ultrasound Obstet. Gynecol.* 16:399–401, 2000.

118. Schulman, H., Ducey, J., Farmakides, G., et al. Uterine artery Doppler velocimetry: the significance of divergent systolic/diastolic ratios. *Am. J. Obstet. Gynecol.* 157:1539–1542, 1987.

119. Marsal, K. Role of Doppler sonography in fetal/maternal medicine. *Curr. Opinion Obstet. Gynecol.* 6:36–44, 1994.

120. Baschat, A., and Harman, C. R. Antenatal assessment of the growth restricted fetus. *Curr. Opinion Obstet. Gynecol.* 13(2):161–168, 2001.

121. Baschat, A. A., Gembruch, U., Reiss, I., Gortner, L., Weiner, C. P., and Harman, C. R. Relationship between arterial and venous Doppler and perinatal outcome in fetal growth restriction. *Ultrasound Obstet. Gynecol.* 16(5):407–413, 2001.

122. Baschat, A. A., Gembruch, U., Gortner, L., Reiss, I., Weiner, C. P., and Harman, C. R., Coronary artery blood flow visualization signifies hemodynamic deterioration in growth-restricted fetuses. *Ultrasound Obstet. Gynecol.* 16(5):425–431 (October) 2000.

123. Baschat, A. A., and Weiner, C. P. Umbilical artery Doppler screening for detection of the small fetus in need of antepartum surveillance. *Am. J. Obstet. Gynecol.* 182(1, pt. 1):154–158 (January) 2000.

124. Kurjak, A., Kupesic, S., and Zudenigo, D. Doppler ultrasound in all three trimesters of pregnancy. *Curr. Opinion Obstet. Gynecol.* 6:472–478, 1994.

125. Alfirevic, Z., and Neilson, J. P. Doppler ultrasonography in high-risk pregnancies: systematic review with meta-analysis. *Am. J. Obstet. Gynecol.* 172:1379–1387, 1995.

126. Intrauterine growth restriction. *ACOG Practice Bulletin* 12 (January) 2000.

127. National Institutes of Health. *Diagnostic Ultrasound Imaging in Pregnancy: Report of a Consensus Development Conference Sponsored by the National Institute of Child Health and Human Development* (DHHS publication NIH 86-667). Washington, DC: NIH, 1984, pp. 3–13.

128. Ultrasound in pregnancy. *ACOG Technical Bulletin* No. 187, 1993.

129. American Institute of Ultrasound in Medicine. *Standards and Guidelines for the Performance of the Antepartum Obstetrical Examination*. Bethesda, MD: AIUM, 1993.

130. American College of Obstetricians and Gynecologists. *Ultrasound Imaging in Pregnancy*. ACOG Committee Opinion 96, 1991.

131. Gegor, C. L., Paine, L. L., Costigan, K., and Johnson, T. R. B. Interpretation of biophysical profiles by nurses and physicians. *JOGNN* 23(5):405–410 (June) 1994.

132. Gegor, C. L. Third trimester ultrasound for nurse-midwives. *J. Nurse-Midwifery* 38(suppl. 2):1–13, 1993.

133. Association of Women's Health, Obstetric, and Neonatal Nurses. *Nursing Practice Competencies and Educational Guidelines for Limited Ultrasound Examinations in Obstetric and Gynecologic Infertility Settings*. Washington, DC: AWHONN, 1993.

134. American College of Nurse-Midwives. *Limited Obstetrical Ultrasound in the Third Trimester*. Clinical bulletin. Washington, DC: ACNM, 1996.

135. American College of Nurse-Midwives. Guidelines for the incorporation of new procedures into nurse-midwifery practice. In *Standards for the Practice of Nurse-Midwifery*. Washington, DC: ACNM, 1992.

136. Reece, E. A., Assimakopoulos, E., Zheng, X. Z., et al. The safety of obstetric ultrasonography: concern for the fetus. *Obstet. Gynecol.* 76(1):139, 1990.

137. American Institute of Ultrasound Medicine. *Medical Ultrasound Safety*. Laurel, MD: AIUM, 1997.

138. American Institute of Ultrasound in Medicine. Mechanical bioeffects from diagnostic ultrasound: AIUM consensus statements. *J. Ultrasound Med.* (February) 2000.

139. Saari-Kemppainen, A., Karjalainen, O., Ylostalo, P., and Heinonen, O. P. Ultrasound screening and perinatal mortality: controlled trial of systematic one-stage screening in pregnancy. The Helsinki Ultrasound Trial. *Lancet* 336:387–391, 1990.

140. Eik-Nes, S. H., Okland, O., Aure, J. C., and Ulstein, M. Ultrasound screening in pregnancy: a randomised controlled trial. *Lancet* 1:1347, 1984.

141. Ewigman, B. G., Crane, J. P., Frigoletto, F. D., LeFevre, M. L., Bain, R. P., and McNellis, D. Effect of prenatal ultrasound screening on perinatal outcome. *N. Eng. J. Med.* 329(12):821–827, 1993.

142. LeFevre, M. L., Bain, R. P., Ewigman, B. G., et al. A randomized trial of prenatal ultrasonographic screening: impact on maternal management and outcome. RADIUS (Routine Antenatal Diagnostic Imaging with Ultrasound) Study Group. *Am. J. Obstet. Gynecol.* 169:483–489, 1993.

143. Levi, S., and Hyjazi, Y. Sensitivity of routine ultrasonographic screening for congenital anomalies during the last 5 years. *J. Ultrasound Med.* 11:188, 1992.

144. Bucher, H. C., and Schmidt, J. G. Does routine ultrasound scanning improve outcome in pregnancy? Meta-analysis of various outcome measures. *Br. Med. J.* 307(3):13–17, 1993.

145. Eik-Nes, S. H. An overview of routine versus selective use of ultrasound. In Chervenak, F. A., Isaacson, G. C., and Campbell, S. (Eds.) *Ultrasound in Obstetrics and Gynecology*. Boston, MA: Little, Brown, 1993, pp. 229–238.

146. Berkowitz, R. Should every pregnant woman undergo ultrasonography? *N. Eng. J. Med.* 329(12):874–875, 1993.

147. Crane, J. P., Lefevre, M. L., Winborn, R. C., et al. A randomized trial of prenatal ultrasonographic screening: impact on the detection, management, and outcome of anomalous fetuses. *Am. J. Obstet. Gynecol.* 171:392–399, 1994.

148. Skupski, D. W., Chervenak, F. A., and McCullough, L. B. A clinical and ethical evaluation of routine obstetric ultrasound. *Curr. Opinion Obstet. Gynecol.* 6:435–439, 1994.

149. Gomez, K. J., and Copel, J. A. Routine ultrasound screening. *Curr. Opinion Obstet. Gynecol.* 6:426–429, 1994.

150. DeVore, G. R. The routine antenatal diagnostic imaging with ultrasound study: another perspective. *Obstet. Gynecol.* 84:622–626, 1994.

151. Levi, S., and Chervenak, F. A. Ultrasound screening for fetal anomalies: is it worth it? *Annals of the New York Academy of Sciences*, vol. 847:86–98, 1998.

152. Cox, D. N., Wittman, B. K., Hess, M., et al. The psychological impact of diagnostic ultrasound. *Obstet. Gynecol.* 70(5):673–676, 1987.

153. Villeneuve, C., Laroche, C., Lippman, A., and Marrache, M. Psychological aspects of ultrasound imaging during pregnancy. *Can. J. Psychiatry* 33:530–536, 1988.

154. Lumley, J. Through a glass darkly: ultrasound and prenatal bonding. *Birth* 17:214–217, 1990.

155. Waldenstrom, V., Axelsson, O., Nilsson, S., et al. Effects of routine one-stage ultrasound screening in pregnancy. *Lancet* 2:585–588, 1988.

• • • Additional References

American College of Nurse-Midwives. *The Appropriate Use of Technology in Childbirth*: Position Statement. Washington, DC: ACNM, 1991.

American College of Obstetricians and Gynecologists. *Down Syndrome Screening*. ACOG Committee Opinion 141, 1994.

American Institute of Ultrasound Medicine. *Educational Guidelines for Diagnostic Sonography*. Bethesda, MD: AIUM, 2001.

American Registry of Diagnostic Medical Sonographers. Registry prerequisite requirements. In *Examination Application and Informational Booklet*. Cincinnati, OH: ARDMS, 2001.

Dawes, G. S., Lobb, M. O., Mandruzzato, G., et al. Large fetal heart rate decelerations at term associated with changes in fetal heart rate variation. *Am. J. Obstet. Gynecol.* 168:105–111, 1993.

Edelman, S. K., *Understanding Ultrasound Physics: Fundamentals and Exam Review*, 2nd ed. Houston, TX: D. Armstrong, 1994.

Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 3rd ed. New York: Churchill Livingstone, 1996.

Gonen, R., Perez, R., Dar, H., Merksamer, R., and Sharf, M. The association between unexplained second-trimester maternal serum hCG elevation and pregnancy complications. *Obstet. Gynecol.* 80(1):83–86, 1992.

Kilpatrick, S. J., and Safford, K. L. Maternal hydration increases amniotic fluid index in women with normal amniotic fluid. *Obstet. Gynecol.* 81:49–52, 1993.

Kilpatrick, S. J., Safford, K. L., Pomeroy, T., Hoedt, L., Scheerer, L., and Laros, R. Maternal hydration increases amniotic fluid index. *Obstet. Gynecol.* 78:1098–1102, 1991.

Levi, S., and Chervenak, F. A. Ultrasound screening for fetal anomalies: is it worth it? *Annals of the New York Academy of Sciences*, vol. 847:86–98, 1998.

Lin, C. C., Adamczyk, C. J., Sheikh, A., and Mittendorf, R. Fetal congenital malformations; biophysical profile evaluation. *J. Reprod. Med.* 43:521–527, 1998.

Magann, E. F., and Martin, J. N., Amniotic fluid volume assessment in singleton and twin pregnancies. *Obstet. Gynecol. Clin. North Am.* 26(4):579–593 (December) 1999.

Murray, M. *Antepartal and Intrapartal Fetal Monitoring*. Albuquerque, NM: Learning Resources International. 1997.

Nageotte, M. P., Towers, C. V., Asrat, T., Freeman, R. K., and Dorchester, W. The value of a negative antepartum test: contraction stress test and modified biophysical profile. *Obstet. Gynecol.* 84(2):231–234, 1994.

Newnham, J. P., Evans, S. F., Michael, C. A., Stanley, F. J., and Landau, L. I. Effects of frequent ultrasound during pregnancy: a randomised controlled trial. *Lancet* 342:887–891, 1993.

O'Brien, J. M., Mercer, B. M., Freidman, S. A., and Sibai, B. M. Amniotic fluid index in hospitalized hypertensive patients managed expectantly. *Obstet. Gynecol.* 82(2):247–250, 1993.

Roberts, D., Nwosu, E. C., and Walkinshaw, S. A. The fetal outcome in pregnancies with isolated reduced amniotic fluid volume in the third trimester. *J. Perinatol. Med.* 26:390–395, 1998.

Sparling, J. W., Seeds, J. W., and Farran, D. C. The relationship of obstetric ultrasound to parent and infant behavior. *Obstet. Gynecol.* 72:902–907, 1988.

Thorpe, K., Harker, L., Pike, A., and Marlow, N. Women's views of ultrasonography. *Soc. Sci. Med.* 36:311–315, 1993.

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CHAPTER

24

Screening for and Collaborative Management of Antepartal Complications

This chapter discusses antepartal complications from the viewpoint of screening and collaborative management. The signs and symptoms, midwifery management, and collaborative management of common complications are presented. Complications rarely seen in practice—e.g., genital tract developmental abnormalities, choriocarcinoma, hypofibrinogenemia and fibrinogenopenia, disseminated intravascular coagulation, urinary calculi, and gastrointestinal diseases such as gastric ulcers, gallbladder disease, liver diseases, pancreatitis, intestinal obstruction—are not included. Common medical diseases that have specific implications during pregnancy are discussed or identified for physician referral. Midwives interested in the study of these and other complications are encouraged to consult standard medical and obstetrical textbooks and journals.

The midwife is an expert on normal childbearing and detection of complications. In order to detect abnormality, a thorough knowledge of the range of normal is essential. Knowledge of the signs and symptoms of the more common complications enables the midwife to identify possible complications and initiate the process of differential diagnosis and physician consultation at the earliest indication of a problem.

There are some commonly occurring, minor complications that midwives manage independently within their scope of practice. These include isolated urinary tract infections, iron deficiency anemia, gestational diabetes, and mild hypertensive disorders. Other conditions/complications that are diagnosed and treated by the midwife include vaginal infections, sexually transmitted diseases, and the common discomforts of pregnancy (see Chapters 8, 15, and 22).

The conditions and complications in this chapter are those the midwife will either manage, consult the physician about, contribute to the management of care in collaboration with the physician, or refer to the physician for medical management. The midwife assumes any one of these roles either initially, after diagnostic laboratory work, or in the event of increasing severity of the problem. The scope of midwifery care will depend on the practice setting, the experience and education of the midwife, the collaborative relationship with medical consultants and the clinical practice agreement in place.

The ACNM has issued this statement about clinical practice:

> Practice occurs within a health care system that provides for consultation, collaborative management or referral as indicated by the health status of the client. . . . Collaboration is the process whereby health care professionals jointly manage care. The goal of collaboration is to share authority while providing quality care within each individual's professional scope of practice. Successful collaboration is a way of thinking and relating that requires knowledge, open communication, mutual respect,

> a commitment to providing quality care, trust and the ability to share responsibility. [1]

For midwives with a strong interest in high-risk obstetrics, in general, or a specific complication, it is very appropriate to extend their knowledge and care for a broader range of women. This chapter describes a scope of knowledge and care with which all midwives should be comfortable. The involvement of midwives with women with complicated pregnancies is limited only by the knowledge base, patient population, and setting in which the care is provided. As long as there is a system developed with availability to consultation and referral, and the midwife works within agreed upon guidelines established collaboratively with the medical consultants, midwifery care may be offered. Often midwives are part of a multidisciplinary team providing a range of services. Women of all risk and complication levels can benefit from the individualized care, education, and support of midwifery. Throughout our profession, there are midwives who care for women in specialty cites such as clinics for pregnant women with HIV, twins (or more), substance abuse, diabetes, hypertension, lupus, infertility, and more. So, this chapter is not a limitation but a starting gate from which each midwife may determine their scope of practice and circle of safety.

First Trimester Bleeding

While normal pregnancy is associated with amenorrhea and a complete lack of vaginal bleeding, many women experience episodes of vaginal bleeding in the first trimester. The bleeding may be fresh (bright red) or old (dark brown). It may be slight and persist for several days or have a sudden heavy onset. Only one-third of women who have painless vaginal bleeding during the first half of pregnancy are having symptoms of impending abortion. Other possible causes of bleeding include ectopic pregnancy, severe cervicitis, cervical lesions, cervical polyp, postcoital bleeding, spotting during implantation, or bleeding that comes from a subchorionic bleed. Demise of a twin may also cause vaginal bleeding without any expulsion of products of conception. Rarely, the bleeding may be a symptom of hydatidiform mole.

Regardless of the cause, bleeding during pregnancy must be investigated to rule out causes that threaten the integrity of the pregnancy or the health of the mother. The following is a review of the symptomatology, diagnostic steps, and management approaches for causes of first trimester vaginal bleeding.

Database for First Trimester Vaginal Bleeding

If the woman calls the midwife during the first trimester with complaint of vaginal bleeding, a thorough history is required. If the woman has never been seen by the midwife or in the same practice, due to the risk of an ectopic pregnancy, it may be necessary to have her seen for an emergency office visit, or refer her to an emergency room for thorough evaluation. If the woman is known to the practice, then some of the following data may already have been collected and disposition may be possible without an emergent visit. This will be at the midwife's discretion after she has asked some questions and gotten information about the pregnancy and the current symptoms.

The history includes the following:

1. LMP, regularity of menses, use of contraception prior to pregnancy, confirmation of dates by exam and or sonogram, is there an established EDC?
2. Pregnancy test results: by urine or blood sample and when positive?
3. Previous pregnancy history: any previous spontaneous abortions (SAB) or ectopic pregnancy?
4. Contraceptive history, specifically for current use of an IUD.
5. History of bleeding? When did it start? How much bleeding is present? Is it dark or bright red? Do you need to change a pad? How frequently?
6. Is there pain or cramping? When did it start? Where is the pain (lower front, midline, right or left side, back, rectal, shoulder, painful with breathing)? What is its nature (mild, intense, sharp, dull)?
7. Has there been fever or urinary tract symptoms?
8. Has there been a urinary tract infection or sexually transmitted disease recently or during this pregnancy?
9. Has there been any change in pregnancy symptoms (worsening nausea, suddenly improved nausea, improved breast tenderness)?
10. Has there been recent intercourse? When? Was there any impact on the pain or bleeding either during or after sexual contact?

If the woman is known to the practice, reports that bleeding is slight and she has no low abdomi-

nal or back pain, the midwife may ask the woman to make an appointment to be seen in the office the next day. In the meantime, she should advise the woman to follow the instructions given to her for minor first trimester bleeding (see Table 24-1).

If a woman reports moderate or heavy bleeding, lower abdominal, back, or generalized pelvic pain or if the woman is febrile or reports symptoms of hypotension, the midwife should recommend immediate physician evaluation. This arrangement should be made in the method best used in the clinical setting, such as emergent appointment for evaluation by the midwife with physician consultation, immediate appointment with a physician, or referral to the local emergency room.

During office evaluation of first trimester bleeding, the midwife should take the following steps:

1. Review or update the history from the previous phone conversation (above).
2. Evaluate the woman's blood pressure, temperature, pulse, and respirations.
3. Confirm a pregnancy test if indicated (this could be delayed menses).
4. Perform an abdominal exam including
   a. palpation for tenderness/pain
   b. palpation for fundal height or other masses
   c. assessment for rebound tenderness
   d. auscultation for bowel sounds (diminished in appendicitis)
   e. palpation for CVA tenderness (pyelonephritis can present with referred pelvic pain)
5. Perform a gentle speculum examination of the vagina and cervix.
   a. Screen for vaginitis and cervicitis with cultures and a wet prep if indicated.
   b. Observe the cervical os for dilation, presence of fluid, blood, clots, pus, or fetal parts or membranes.
6. Perform a gentle bimanual examination for
   a. size of uterus
   b. cervical effacement, dilatation, and status of membranes
   c. adnexal masses or pain
   d. cervical motion pain
7. Attempt to auscultated for the FHT if the pregnancy is deemed to be greater than 10 weeks gestation.
8. Obtain a hemoglobin and hematocrit if indicated.
9. Order a sonogram if indicated (see discussion below).
10. Serial serum quantitative beta human chorionic gonadotropin (B-hCG) or progesterone measurement may be indicated (see discussion below).

TABLE 24-1 Instructions for Minor First Trimester Bleeding

1. *Rest:* Do not change your activity level but be very aware of symptoms as they occur. If bleeding, and/or cramping escalate, try to be in an environment where you can rest, be watchful of any bleeding, and have supportive person/s with you. Bedrest has been shown to have no effect on outcome of the pregnancy, and it can be disruptive to family functioning.
2. *Pelvic rest:* Do not have sexual intercourse; do not douche or insert tampons or anything else into your vagina (except for progesterone suppositories if you have been using them prior to the bleeding).
3. Do not engage in non-vaginal sexual activity that leads to orgasm; orgasm causes contraction of the uterus.
4. Notify the midwife immediately of the following:
   An increase in vaginal bleeding
   Lower abdominal cramps or back pain
   Pelvic pain other than cramping
   A gush of fluid from the vagina (indicative of rupture of the membranes)
   A fever of more than 100.4° F

If the woman has not been seen for a new prenatal appointment during this pregnancy, routine laboratory tests may be performed at this visit. If the lab results are available from an earlier visit, they may be useful at that time to determine presence of vaginal infection, urinary tract infection, anemia and blood type and Rh.

Based on the data collected at this visit, a differential diagnosis may be formulated. A review of causes of first trimester bleeding, their specific symptoms, and the data necessary to formulate a diagnosis follow. Management by the midwife and need for consultation and referral are also identified.

B-hCG quantification can be useful in determining normal hormonal progression, identifying ectopic pregnancy and identifying appropriate timing for ultrasound. B-hCG is produced by the trophoblastic tissue and increases rapidly in the first trimester (see Chapters 21 and 23). Single values are of minimal value unless they are in the single digit range. Therefore, serial samples must be gathered at 2-day intervals. Intrauterine pregnancies will demonstrate an increase of at least twofold in a 48-hour period. Decreasing values are consistent with a nonviable pregnancy. Values that increase at a slower than anticipated rate may indicate an ectopic

pregnancy. By the time the B-hCG is 1500 mIUs/ml, a gestational sac should be visible by transvaginal ultrasound examination. Transabdominal ultrasound may not be able to visualize a gestational sac until after the B-hCG reaches 6000 mIUs/ml [2–4].

Progesterone is produced by the corpus luteum in the first trimester of pregnancy. If the serum progesterone value is ≥ 25ng/ml, ectopic pregnancy can be ruled out in more than 97 percent of pregnancies. Similarly, a value of ≥ 25 ng/ml is virtually 100 percent indicative of a viable intrauterine pregnancy. For women with no major risk factors for ectopic pregnancy, this value alleviates the need for further investigation for an ectopic pregnancy. If the serum progesterone level is < 5 ng/ml, then the pregnancy is nonviable; however, this does not rule out an ectopic pregnancy. Further documentation with ultrasound may be necessary. When the value of serum progesterone is between 5 and 25 ng/ml, then further evaluation of the pregnancy is indicated [3, 4]. A potential problem with the use of progesterone is that some labs take several days to return results, decreasing the use of this as a diagnostic tool.

First trimester ultrasound exams can be very useful in evaluating a woman with bleeding early in pregnancy. The scan can be performed by transvaginal and/or transabdominal routes. Findings of sonography in the first trimester include identifying intrauterine versus extrauterine pregnancy, gestational age (accurate within 5 days), number of fetuses, viability with cardiac activity, adnexal masses (ectopic pregnancy, ovarian cyst, dermoid cyst), uterine fibroids, and presence of fluid in the cul-de-sac. Subchorionic bleeding within the uterus can be detected as a potential reason for bleeding without termination of the pregnancy. Incomplete abortion with retention of products of conception can also be evaluated. Ultrasound examination is diagnostic of a molar pregnancy. Evaluation of fetal anatomy is limited in the first trimester. Measurement of nuchal translucency for genetic evaluation is discussed in Chapter 23.

Cardiac activity can usually be identified by 6 weeks' menstrual age. Once cardiac activity has been identified at a normal FHR, the incidence of spontaneous pregnancy loss drops to 3 percent [2]. This can be a very reassuring exam.

Cervical/Vaginal Causes of Bleeding

During early pregnancy, the cervix is very vascular. Any situation that would cause inflammation of the cervix and vaginal tissue may cause bleeding. On speculum examination, observe for any blood (dark or bright) in the vagina. If possible, try to determine the source as coming through the cervix and therefore from within the uterus, or from a cervical or vaginal source outside of the uterus.

If blood is flowing from within the uterus, then an ultrasound examination and serum B-hCG and progesterone are indicated. Completion of the bimanual exam may also provide data regarding the etiology of the bleeding.

However, if the bleeding is caused by superficial cervical bleeding (wipe the cervix with a large cotton swab and observe for bleeding) then an infectious process may be to blame. Gonorrhea, chlamydia, trichomonads, or cervical dysplasia are all associated with cervical friability and bleeding. A herpes lesion may be present on the cervix or other site in the vagina. Vaginal yeast infections and bacterial vaginosis are very common in early pregnancy and may also be responsible for cervical inflammation and bleeding. (See Chapter 15 for evaluation and treatment recommendations.) Another possible cause is a cervical polyp. In the absence of a specific infectious process, simple increased vascularity of the cervix may be implicated. Agitation of the cervix and vagina by sexual intercourse may stimulate or worsen the bleeding.

Bleeding from the cervix or vagina is of concern to the woman and requires evaluation and treatment, but it is rarely associated with pregnancy loss. In most cases, the woman may be reassured that the pregnancy is not in jeopardy. However, if risk factors for ectopic pregnancy, a history of pregnancy losses, or any findings on the bimanual exam are of concern, then an ultrasound examination may be indicated for complete evaluation.

Spontaneous Abortion

Abortion is the termination of pregnancy by expulsion of the products of conception prior to the ability of the fetus to survive if born. This is generally accepted to be up to 20 weeks' gestation or 500 grams in weight. Spontaneous abortion (SAB)—also commonly known as "miscarriage"—occurs naturally, without having been induced. Approximately 10 to 15 percent of all clinically diagnosed pregnancies are lost [2]. The primary reason for early pregnancy loss is genetic abnormality, accounting for 75 to 90 percent of all losses [2]. Other reasons for an SAB include abnormal progesterone levels, thyroid abnormalities, uncontrolled diabetes, uterine anomalies, infection, and autoimmune dis-

eases. Within the diagnosis of spontaneous abortion are its varied expressions, which include threatened abortion, inevitable abortion, missed abortion, and incomplete abortion. The signs, symptoms and potential management of each follow. Elective termination of pregnancy is discussed in Chapter 22.

Threatened Abortion

The pregnancy is considered threatened at any time when there is vaginal bleeding during the first half of pregnancy. A threatened abortion may or may not be accompanied by lower abdominal cramping pain or low backache. The prognosis for continuation of a pregnancy is poor when a woman experiences a combination of bleeding and pain. Evaluation of the pregnancy with physical examination, serum B-hCG and progesterone, and ultrasound are indicated in order to determine a source of bleeding and initiate treatment if necessary.

Inevitable Abortion

When a spontaneous abortion is almost certain to occur and cannot be stopped, it is classified as inevitable. This happens when there is cervical dilatation and/or rupture of the membranes in addition to vaginal bleeding and lower abdominal or back pain.

If the woman is in the first trimester, does not have excessive bleeding or pain, has normal vital signs, is not severely emotionally distressed, and has a previous hematocrit of at least 30 percent, you may offer her two choices. One choice is for the consulting physician to assist the abortion by terminating the pregnancy with a suction D&C. The other choice is for the woman to return home to await the inevitable spontaneous evacuation of the products of conception. Apprise your consulting physician of the situation and the woman's decision either way.

If the woman chooses to remain at home during the abortion, instruct her to take her temperature every 4 hours (unless she is asleep) or more often if she has chills and to call you if she soaks through a regular sanitary napkin in an hour or less, passes clots larger than 3 centimeters (the size of a 50-cent piece), or has a fever of 100.4°F (38°C) or above. She should also call when she aborts. If she has had two or more consecutive spontaneous abortions, ask her to save, if possible, the products of conception in a container for genetic studies. The products of conception may also be sent to the lab for verification of placental villi to confirm a complete abortion and verify that the pregnancy had been intrauterine.

If any of the assessment data are outside the limits given in the aforesaid situation, then arrange for your consulting physician to evaluate the woman. Completion of the SAB may then be done by D&C.

Incomplete Abortion

Incomplete abortion occurs when the placenta is not expelled with the fetus at the time of the abortion. The retained placenta (all or part) will eventually be the cause of bleeding, which may be profuse, or infection, especially if the abortion occurred during the second trimester. The midwife involves the consulting physician regarding the management of care in the event of an infection and to complete evacuation of the uterus.

Missed Abortion

In missed abortion the fetus dies but the products of conception are retained for a prolonged period of time (2 or more weeks). Signs and symptoms of a missed abortion include the following:

1. Normal early pregnancy without accompanying presumptive and probable signs of pregnancy
2. Vaginal spotting or bleeding or lower abdominal or back pain at the time of death of the fetus (may or may not occur)
3. Fundal height not only ceases to increase but after a while the uterus becomes smaller (due to maceration of the fetus and absorption of the amniotic fluid)
4. Regression of mammary changes of pregnancy
5. The woman often loses a few pounds in weight
6. Persistent amenorrhea
7. No fetal heart tones when anticipated by dates

When a woman presents with these signs and symptoms, order an ultrasound examination for confirmation of fetal death. If fetal death has occurred, there is an increased risk of abnormal clotting mechanisms and potential development of disseminated intravascular coagulopathy (DIC). The woman should be referred for medical management. The following baseline coagulation studies may be requested:

1. Prothrombin
2. Partial prothrombin
3. Fibrinogen
4. Platelets

Habitual Abortion

Habitual abortion is the term applied when spontaneous abortion has terminated the course of three or more consecutive pregnancies. Genetic counseling and an endocrinologic workup should be considered if the woman has experienced repeated abortions. Developmental abnormalities of the genital tract (e.g., bicornuate uterus, vaginal septum) should be ruled out in any woman having multiple spontaneous abortions or second trimester losses.

Follow-up care of the woman by the physician/midwife team includes support through the grieving process, counseling regarding contraception and resumption of sexual intercourse within 2 to 4 weeks, and future pregnancy counseling.

Regardless of the category of spontaneous abortion, all postabortal Rh-negative mothers with negative antibody titers should receive Rh immune globulin (e.g., RhoGAM) within 72 hours of the abortion.

Ectopic Pregnancy

Ectopic pregnancy occurs whenever the blastocyst implants anywhere except in the endometrium lining the uterine cavity. Possible sites for ectopic pregnancy include the cervix, fallopian tubes, ovaries, and abdomen. Predisposing factors to ectopic pregnancy include pelvic infections, intrauterine contraceptive devices, previous ectopic pregnancy, and prior tubal surgery. Early symptoms of an ectopic pregnancy are usually vaginal bleeding and spotting, and occasionally pelvic pain. Because the levels of B-hCG are lower and more slowly rising, a woman may have fewer presumptive signs of pregnancy. She may or may not be certain of a diagnosis of pregnancy.

Uterine changes are not diagnostic because the uterus grows to the same size and consistency as a pregnant uterus for the first trimester due to the influence of the placental hormones. However, the uterus may be displaced to one side by the tubal pregnancy.

Early diagnosis of ectopic pregnancy in recent years has greatly improved the outcome of tubal patency and diminished the numbers of catastrophic tubal rupture. Consideration of ectopic pregnancy in the differential of all early pregnancy vaginal bleeding and pelvic pain as well as the use of serial B-hCG, serum progesterone, and ultrasound have increased the likelihood of early diagnosis. There is an old adage, "You only have one chance to miss an ectopic." It is imperative that midwives always proceed in this manner.

Medical management of ectopic pregnancy with methotrexate has diminished the need for surgical intervention and has also improved the potential of preserving tubal function and therefore a woman's fertility. However, medical management is reliant on early diagnosis prior to significant distortion of the fallopian tube and rupture of the pregnancy into the abdomen.

Tubal Pregnancy

Tubal pregnancy accounts for 95 percent or more of ectopic pregnancies [2]. Signs and symptoms are those of tubal rupture or abortion and may vary widely from woman to woman. The classic case of tubal rupture involves a woman who may or may not realize she is pregnant because slight vaginal bleeding or spotting has substituted for menstrual periods. Without warning, she suddenly experiences a sharp, stabbing, tearing, severe lower abdominal pain. Hypotension and other signs of shock may or may not develop quickly. Her abdomen is tender, and vaginal examination is quite painful. Movement of the cervix elicits exquisite pain. A tender, boggy mass may be felt to one side of the uterus. The cul-de-sac may be full of blood, thereby causing the posterior vaginal fornix to bulge. Pain in the neck or shoulder, especially on inspiration, may be present as a result of diaphragmatic irritation from blood in the peritoneal cavity.

Data collection should be the same for history and physical examination as noted above for evaluation of first trimester bleeding. Specific signs and symptoms that may presage the full-blown classic case described above include the following:

1. Pelvic examination may be quite painful, especially with movement of the cervix—or may not be painful at all.
2. A soft, pliable pelvic mass may be palpated posterior or lateral to the uterus. The mass may be firm if distended with blood.
3. The entire decidual lining of the uterus (decidual cast) may be expelled.
4. Neck or shoulder pain may occur as a result of diaphragmatic irritation from intraperitoneal blood.
5. The woman experiences acute abdominal pain in the upper or lower abdomen; pain may be unilateral, bilateral, or generalized.
6. Diarrhea and rectal pressure may occur as a result of irritation from blood in the abdomen.

7. The woman may have had negative urine pregnancy tests due to very low chorionic gonadotropin levels.
8. The white blood cell count may be normal or may range up to 30,000 due to presence of an inflammatory process.

The ambiguity of the symptoms obviously makes diagnosis difficult. This problem is compounded if the presenting symptom is pelvic or abdominal pain because the midwife also must consider a differential diagnosis of salpingitis, threatened or incomplete abortion, appendicitis, a twisted ovarian cyst, or a ruptured corpus luteum or follicular cyst.

For any woman who the midwife suspects of having an ectopic pregnancy or when an intrauterine pregnancy cannot be confirmed and the woman is symptomatic for an ectopic pregnancy, medical management is indicated. Screening with history, physical assessment, and laboratory evaluation, including ultrasound scanning, is within the scope of midwifery care. If ectopic pregnancy cannot be ruled out, the midwife should consult with the physician.

Ovarian Pregnancy

Ovarian pregnancy is rare. Vaginal bleeding or spotting may be the presenting complaint. Symptoms relate to rupture into the peritoneal cavity and are similar to those of tubal rupture. On examination, the midwife may palpate an enlarged ovary or ovarian mass which may or may not be painful. The uterus may be slightly enlarged from the endometrial response to progesterone and hCG. Diagnosis will be made with slowly rising B-hCG levels and ultrasound exam. Referral for medical management is always indicated.

Abdominal Pregnancy

Abdominal pregnancy is almost always the result of an early tubal pregnancy rupture or abortion into the peritoneal cavity. In a few exceedingly rare cases, the fertilized ovum makes the abdomen the site of its primary implantation. Pregnancy may in fact proceed even to term. In addition to the signs and symptoms of a ruptured tubal pregnancy, the following may exist:

1. Gastrointestinal disturbances (diarrhea, constipation, flatulence, abdominal pain, nausea, and vomiting)
2. A transverse lie (very common)
3. Marked pain from fetal movements late in pregnancy
4. Ease in palpating small parts
5. Readily audible fetal heart tones
6. Inability to stimulate contraction of the musculature surrounding the fetus
7. Ability to palpate the uterus on vaginal examination and small parts outside of it
8. Cervical displacement
9. Dilatation (up to 2 centimeters) but no effacement of the cervix as a result of spurious labor

Ultrasound examination may or may not make the diagnosis, especially later in pregnancy. Delivery must be by abdominal route, clearly requiring medical management.

Cervical Pregnancy

Cervical pregnancy is rare. Signs and symptoms include painless bleeding soon after the time of implantation and palpation of a cervical mass with distention and thinning of the cervical wall, partial dilatation of the external cervical os, and a slightly enlarged uterine fundus. Diagnosis will be made with slowly rising B-hCG levels and ultrasound exam. Referral for medical management is always indicated.

Hydatidiform Mole

Hydatidiform mole is a genetically abnormal pregnancy that manifests itself as a developmental anomaly of the placenta. In complete hydatidiform mole (CHM), the pregnancy is genetically entirely from the father, usually diploid 46, XX, with no fetal tissue apparent. A partial hydatidiform (PHM) mole is usually triploid (e.g., 69, XXY), with both villus changes and fetal tissues [5]. The placental villi become a mass of clear, cystlike vesicles hanging in clusters from thin pedicles, resembling a bunch of grapes. A CHM is all vesicles, whereas a PHM mole also has a nonviable fetus or amniotic sac. On rare occasion, there may be a twin pregnancy, with one normal fetus and placenta and one mole.

A hydatidiform mole is usually a benign neoplasm, but it has the potential for becoming malignant and often precedes the extremely malignant but fortunately rare trophoblastic neoplasm known as choriocarcinoma. With current chemotherapeutic drugs, the cure rate of choriocarcinoma is nearly 100 percent [5].

The overall incidence of hydatidiform mole is approximately 1.5 in 1000 pregnancies. Risk is increased in women of Asian ethnicity. The incidence is ten times higher in women over 45, indicating that hydatidiform mole is much more common in pregnancies at the end of the child-bearing cycle. Women with a previous molar pregnancy also have an increased recurrence rate [5].

Rapid growth of the abnormal placental tissue is responsible for many symptoms as the B-hCG values are very high. Signs and symptoms include the following:

1. Persistent, often severe, nausea and vomiting.
2. Uterine bleeding evident by the twelfth week of pregnancy; spotting or profuse bleeding is possible but usually the woman evidences just a bloody discharge, more brown than red, occurring intermittently or continuously over time.
3. A large-for-dates uterus clearly out of proportion to presumed gestational age (occurs in about one-third of cases).
4. Shortness of breath.
5. Often enlarged, tender ovaries (theca lutein cysts).
6. No fetal heart tones.
7. No fetal activity.
8. Fetal parts not evident with palpation.
9. Pregnancy-induced hypertension, preeclampsia, or eclampsia before 24 weeks' gestation.

These findings indicate that the midwife should obtain a specimen for a serum chorionic gonadotropin titer and a sonogram. Hydatidiform mole has a characteristic pattern on ultrasonography. A persistently high, or even rising, level of chorionic gonadotropin after 100 days from the first day of the last menstrual period is indicative of abnormal trophoblastic growth or a multiple gestation. The woman is referred to the consulting physician.

Hyperemesis Gravidarum

Hyperemesis gravidarum is excessive nausea and vomiting during pregnancy. This pernicious vomiting is differentiated from the more common and more normal morning sickness by the fact that it is of greater intensity and extends beyond the first trimester. Associated with ketonemia, weight loss, and dehydration, hyperemesis gravidarum may occur in any trimester, usually beginning in the first and persisting at varying degrees throughout gestation. The etiology is unknown but is probably a combination of hormonal changes and psychological factors [6]. It is important to rule out diseases such as cholecystitis, pancreatitis, hepatitis, and thyroid disease. Ptyalism, an apparent excessive production of saliva, is associated with severe nausea and vomiting of pregnancy. Women are unable to swallow the saliva and go through pregnancy spitting 1 to 2 liters a day. The etiology is unknown.

The following are signs, symptoms, and effects:

1. Pernicious vomiting
2. Poor appetite
3. Poor nutritional intake
4. Weight loss
5. Dehydration
6. Electrolyte imbalance
7. Extreme response to underlying psychosocial problems
8. Vomiting not controlled by treatment measures for morning sickness (see Chapter 22)
9. Acidosis due to starvation
10. Alkalosis resulting from loss of hydrochloric acid in the vomitus
11. Hypokalemia

When a woman presents with a complaint of nausea and vomiting, the following history should be obtained to assist in distinguishing between the benign form of nausea and vomiting associated with pregnancy and this pathologic situation.

History

1. Frequency of vomiting episodes
2. Relationship of vomiting to food intake (amount and type)
3. Dietary history (what foods and fluids, amounts, timing, reaction)
4. Medication history (medication reactions)
5. Elimination (frequency, amount, constipation, diarrhea)
6. Blood in vomitus (peptic ulcer or esophagitis from repeated vomiting)
7. Fever or chills
8. Exposure to viral infection
9. Exposure to contaminated food
10. Abdominal pain
11. History of eating disorders
12. History of diabetes
13. Previous abdominal surgery
14. Amount of rest she is getting
15. Family support
16. Anxieties regarding the pregnancy

Physical Examination

1. Weight (and relationship to previous weights)
2. Temperature, pulse, respirations
3. Skin turgor
4. Moistness of mucous membranes
5. Condition of tongue (swollen, dry, cracked)
6. Abdominal palpation for: organomegaly, tenderness, distention
7. Bowel sounds
8. Sweet odor to breath
9. Assessment of fetal growth

Laboratory

1. Urine dipstick for ketones
2. Urinalysis
3. BUN and electrolytes
4. Liver function tests (rule out hepatitis, pancreatitis, and cholestasis)
5. TSH and T4 (rule out thyroid disease)

Assessment

Poor tissue turgor, dry tongue and mucus membranes, increased pulse and respirations, decreased urinary output, and increased urine specific gravity are all symptoms indicating that the woman is dehydrated. If the urine dip is positive for ketones, the breath has a sweet odor, or she has lost weight, the woman has had too few calories and is acidotic due to burning fat for energy. If there are no symptoms of dehydration or acidosis, the woman may not truly have hyperemesis. The immediate, initial treatment is as follows:

1. Administration of IV fluids using a solution with 5% dextrose. (If the woman is diabetic, physician consultation is required before any treatment is initiated.) A rapid flow of 200 ml/hour for the first liter can be used to assist in replacement of fluids.
2. NPO or minimal sips of clear fluid and ice chips for several hours to let her stomach rest.
3. The following antiemetics are frequently used:
   a. promethazine (Phenergan) 25 mg into the IV or by rectal suppository.
   b. chlorpromazine (Thorazine) rectal suppository 25–50 mg q 6–8 hours or 25–50mg IM q 3–4 hours.
   c. prochlorperazine (Compazine) 10 mg IM or $2\,^1/_2$–10 mg IV q 3–4 hours or 25 mg rectal suppository bid.
   d. metoclopramide (Reglan) 10 mg po qid (do not combine with the above phenothiazines due to possible extrapyramidal effects [6]).
   e. methylprednisolone 16 mg tid for 3 days, then tapered over 2 weeks (for recalcitrant hyperemesis).
4. After a few hours, offer oral fluids very gradually. If nausea or vomiting resume, revert to NPO. If the fluids are tolerated, increase gradually.
5. Dip all urine samples for the presence of ketones.
6. Once the ketones have "cleared," assess maternal status for maintenance.

Some women will be able to stop the IV fluids, continue with oral fluids and the food, and progress without a problem. More commonly, the nausea and vomiting will persist. If the woman is not able to tolerate oral fluids or food after an initial course of IV fluids, antiemetics, and then progressive introduction of oral fluids, the physician should be consulted for further evaluation and management. Medical treatment will consist of aggressive use of sedatives and antiemetics. The woman will then be maintained on antiemetics as long as necessary to allow her to consume adequate nutrition. In severe cases, it may be necessary to progress to IV total parenteral nutrition (TPN).

Nonphysiologic influences must be considered. If the woman has a history of depression, if this is a very stressful pregnancy, if she has a history of eating disorder, or if she is not responsive to initial medical management, psychologic or sociologic counseling may be appropriate. It is important to recognize that hyperemesis can be chronic through the pregnancy, and may cause significant distress to the family. This can interfere with parenting and other home responsibilities, and it may be a financial burden if the woman is unable to work. Supportive care for the woman and the family is needed.

Incompetent Internal Cervical Os

Incompetent internal cervical os, more commonly referred to as an incompetent cervix, is diagnosed when the cervix effaces and dilates without pain in the second or early third trimester. The typical scenario is of a woman presenting to the office or L&D with a complaint of vaginal bleeding, pelvic pressure, or ruptured membranes and is found on examination to have a cervix with advanced dilation. For women with an incompetent cervix, this sequence of events is repeated in subsequent consecutive pregnancies, regardless of the pregnancy interval.

Traditionally, the diagnosis has been retrospective, following at least two midtrimester losses with painless onset of labor and birth. More recently, a history of a previous loss or any other risk factor for preterm loss may heighten investigation into cervical changes during pregnancy. See Chapter 29 for a full discussion of preterm labor and ultrasound evaluation of the cervix.

The risk factors for internal cervical os incompetence include the following:

1. History of fetal loss at 14 weeks' gestation or more
2. History of cervical laceration following vaginal or cesarean birth
3. Overdistension of the cervix with prolonged second stage in a previous pregnancy [7]
4. Multiple first or second trimester elective abortions [8]
5. DES exposure
6. Previous cervical conization with a large amount of tissue removed [9]

Women who present with a history of previous second or early third trimester pregnancy loss may benefit from a thorough history which should include the following:

1. Description of signs and symptoms surrounding previous loss (e.g., bleeding, abdominal cramping/contractions, suprapubic pain, low back pain, vaginal or lower abdominal pressure, vaginal discharge without signs or symptoms of vaginal infection, ruptured membranes) and when they occurred in relation to delivery
2. Gestational age at time of each consecutive loss
3. Congenital abnormalities of previously aborted fetuses
4. Family history of early fetal loss
5. Previous first trimester suction abortions (three or more) or one or more second trimester abortions
6. History of cervical trauma with previous delivery
7. History of any other cervical trauma or surgery on the cervix

Pelvic examination for any woman with a suspicious history or current symptoms for incompetent cervix should include the following:

1. Speculum exam—visualization for
   a. cervical discharge
   b. cervical length
   c. evidence of previous cervical laceration
2. Bimanual exam—digital examination for
   a. consistency and length of the cervix
   b. dilatation of the internal and external cervical os
   c. palpable membranes
   d. position and station of the presenting part

If a woman has a history of previous second or early third trimester pregnancy loss, consultation with the physician is required. Depending on the current and historical circumstances, she may be a candidate for weekly or biweekly vaginal ultrasound to measure cervical length and perform cervical cerclage if indicated.

If a woman presents with cervical effacement, dilatation, pelvic pressure, or vaginal bleeding of unknown source, she requires immediate medical management. If the membranes are still intact and the cervix is amenable, the common treatment is use of a cervical cerclage. Several types of cerclage are used, which are selected by the clinical situation, cervical length and dilatation, and physician experience. Further discussion of cervical cerclage is included in Chapter 29, p. 858.

Emotional support is especially important for women with repeated losses. These women walk a fine line between hope, fear of another loss, and the potential for disappointment. Cultural attitudes toward the ability to bear children may strongly affect the psyches of such women.

Infections

Infections are caused by microorganisms, primarily those in the following categories: viruses, bacteria, fungi, rickettsias, protozoans, and animal parasites. The danger of these microorganisms in pregnancy is twofold. One is the direct effect that microorganisms can have on the mother (e.g., maternal dehydration, poor nutritional intake, and electrolyte imbalance) and the subsequent indirect effect of these on the fetus. Colds and influenza with the possible sequela of pneumonia are examples of diseases with this type of effect. The other danger is the direct effect microorganisms can have on the fetus, as certain microorganisms are known to cause congenital malformations.

Tuberculosis

Since 1993, tuberculosis (TB) case rates have been declining, suggesting that the nation is recovering

from the resurgence of TB that occurred in the mid-1980s and is back on track toward TB elimination [10]. However, TB cases, including drug-resistant cases, continue to be reported in every state.

Tuberculosis is an infection caused by *Mycobacterium tuberculosis*. Inoculation with the tubercle bacillus occurs through droplet inhalation. Once inoculation has occurred, an initial lesion develops in the lung with formation of a localized inflammatory exudate combined with necrosis of the surrounding lung tissue. The infection spreads to the lymphatic nodes and can then be disseminated throughout the body. Because of this dissemination, tuberculosis can be extrapulmonary (e.g., genital, skeletal). In the majority of individuals infected, the primary (pulmonary) lesion is arrested by encapsulation, fibrosis, and calcification. These individuals may never suffer from active tuberculosis. A chest x-ray examination of such individuals will reveal evidence of calcification of the primary lesion. Usually this calcification represents host resistance at the time of the initial infection and indicates that the local and systemic progression of the disease has been arrested.

Persons who are infected but who do not have TB disease are asymptomatic and not infectious; such persons usually have a positive reaction to the tuberculin skin test. About 10 percent of infected persons will develop TB disease at some time in life, but the risk is considerably higher for persons who are immunosuppressed, especially those with HIV infection [10].

The incidence of tuberculosis appears to be affected by geographical location and the socioeconomic status of a given population. Tuberculosis remains one of the more common infectious diseases among women of childbearing age. It is endemic in certain countries, such as those in Southeast Asia. Factors contributing to the spread of TB include substance abuse, AIDS, poverty, homelessness, and an influx of immigrants from countries where tuberculosis is endemic. Communal living environments can be a source of infection when one or members of the group have active TB. This pertains to institutional living such as long-term care facilities or homeless shelters. TB has become more difficult to treat and eventually eliminate as strains of tuberculosis have become drug resistant when courses of therapy have not been completed. The diagnosis of active tuberculosis is made through history, physical examination, sputum culture, and chest x-ray, as follows:

History

1. Previous history of tuberculosis evidenced either by symptoms or by a positive chest x-ray.
2. Exposure to other individuals with tuberculosis.
3. Fever—one of the earliest symptoms; initially minimal to moderate temperature elevation occurs daily in the late afternoon or evening, usually accompanied by a feeling of euphoria and well-being; temperature elevations reach 103°F (39.5°C) or higher as disease progresses.
4. Night sweats—the daily rise in body temperature is reversed at nighttime with accompanying diaphoresis.
5. Weight loss—minor weight loss with anorexia early in the disease; increased weight loss, fatigue, and irritability as the disease progresses.
6. Persistent colds and a chronic cough, which is worse in the morning.
7. Chronic, productive cough with large amounts of purulent, greenish-yellow sputum; may be accompanied by hemoptysis.
8. Pleurisy with effusion—in young childbearing women, the findings indicative of pleurisy should lead you to suspect active tuberculosis, as pleurisy in this age group is uncommon.
9. Spontaneous atelectasis, especially in a young person, may be a sign of active tuberculosis.

Physical examination is considered to be positive if crepitant rales are present on auscultation, heard best after the woman coughs.

Diagnostic Tests

1. Sputum culture (looking for acid-fast organisms)
2. Chest x-ray

If you suspect that a woman has active tuberculosis, obtain a chest x-ray and sputum for culture (for acid-fast organisms) and discuss with your consulting physician whether the woman should be referred for care of the tuberculosis. Do not give PPD to someone with signs or symptoms of active tuberculosis; a chest x-ray and sputum culture are diagnostic for such an individual.

Screening Test

The purpose of screening for tuberculosis is to detect those individuals who have active or inactive disease who would benefit from treatment. Screening for TB infection should be done in well-defined high-risk groups that can be divided into two categories: (1) persons at higher risk for TB exposure or infection and (2) persons at higher risk for TB disease once infected (see Table 24-2). Groups that are not at high risk for TB should not be tested routinely in order to

TABLE 24-2 High-Risk Groups That Should Be Tested for Tuberculosis Infection

Persons at Higher Risk for TB Exposure or Infection

- Close contacts of persons known or suspected to have TB (i.e., those sharing the same household or other enclosed environments)
- Foreign-born persons, including children, from areas that have a high TB incidence or prevalence (e.g., Asia, Africa, Latin America, Eastern Europe, Russia)
- Residents and employees of high-risk congregate settings (e.g., correctional institutions, nursing homes, mental institutions, other long-term residential facilities, and shelters for the homeless)
- Health care workers who serve high-risk clients
- Some medically underserved, low-income populations as defined locally
- High-risk racial or ethnic minority populations, defined locally as having an increased prevalence of TB (e.g., Asians and Pacific Islanders, Hispanics, African Americans, Native Americans, migrant farm workers, or homeless persons)
- Infants, children, and adolescents exposed to adults in high-risk categories
- Persons who inject illicit drugs; any other locally identified high-risk substance users (e.g., crack cocaine users)

Persons at Higher Risk for TB Disease Once Infected

- Persons with HIV infection
- Persons who were recently infected with *M. tuberculosis* (within the past 2 years), particularly infants and very young children
- Persons who have medical conditions known to increase the risk for disease if infection occurs—e.g., diabetes, end-stage renal disease
- Persons who inject illicit drugs; other groups of high-risk substance users (e.g., crack cocaine users)
- Persons with a history of inadequately treated TB

Source: National Center for HIV, STD, and TB Prevention. *Core Curriculum on Tuberculosis: What the clinician should know*. www. cdc.gov/nchstp/tb/pubs/corecurr.

avoid a high occurrence of false positives and to conserve resources [10].

Screening tests will detect hypersensitivity to the tuberculin protein. The Mantoux test, commonly known as a PPD (purified protein derivative) is the only test recommended by the CDC for screening [10]. The multiple puncture tests (MPTs), which were widely used in the past, have been found to be unreliable. The Mantoux test is safe throughout pregnancy.

The Mantoux test consists of 0.1 milliliters of purified protein derivative (PPD) tuberculin containing 5 tuberculin units, administered intradermally in the forearm. The reaction to the PPD should be read 48 to 72 hours after injection. If a patient's reaction is not read until after 72 hours and it is negative, the test should be repeated. A positive reaction may be measurable up to 1 week after testing. Reaction is the diameter of a palpable swelling (induration), measured in millimeters. Erythema is not included in the measurement.

Many individuals from countries outside the United States (e.g., England, Caribbean Islands, some African countries) receive bacille Calmette-Guerin (BCG) vaccine in childhood to prevent tuberculosis infection. Previous BCG vaccination is not a contraindication to skin testing, but it is a major cause of false-positive test results. Care should be taken as PPD can cause serious cellulitis and localized damage to the forearm. If the woman reports a previous positive PPD, avoid another injection and have a chest x-ray performed. Individuals who have received BCG, have had a positive PPD, and remain asymptomatic may be screened with a chest x-ray every two years.

A tuberculin reaction of ≥ 15 millimeters of induration is classified as positive in persons with no known risk factors for TB. However, targeted skin-testing programs should be conducted only among high-risk groups. In general, these guidelines for interpreting skin test reactions should also be applied to persons who may have occupational exposure to TB (e.g., health care workers or the staff in nursing homes, drug treatment centers, or correctional facilities). Thus the appropriate cutoff for defining a positive reaction depends on the employee's individual risk factors for TB, including recent TB exposure, and the prevalence of TB in the facility. In facilities where the risk of exposure is very low, ≥ 15 millimeters may be an appropriate cutoff for employees with no other risk factors. In facilities where TB patients receive care, ≥ 10 millimeters may be an appropriate cutoff for employees with no other risk factors (see Tables 24-3 and 24-4).

TABLE 24-3 Classification of the Tuberculin Reaction, Based on Risk Factors

A tuberculin reaction of ≥ 5 mm of induration is classified as positive in the following groups:

- HIV-positive persons
- Recent contacts of TB case
- Persons with fibrotic changes on chest radiograph consistent with old healed TB
- Patients with organ transplants and other immunosuppressed patients (receiving the equivalent of ≥ 15 mg/day of prednisone for ≥ 1 month)

A tuberculin reaction of ≥ 10 mm of induration is classified as positive in persons who do not meet the preceding criteria but who have other risk factors for TB. These include the following:

- Recent arrivals (< 5 years) from high-prevalence countries
- Injection drug users
- Residents and employees of high-risk congregate settings: prisons and jails, nursing homes and other long-term facilities for the elderly, hospitals and other health care facilities, residential facilities for AIDS patients, and homeless shelters
- Mycobacteriology laboratory personnel
- Persons with clinical conditions that place them at high risk
- Children < 4 years of age, or children and adolescents exposed to adults in high-risk categories.

A tuberculin reaction of ≥ 15 mm of induration is classified as positive in persons with no known risk factors for TB. However, targeted skin testing programs should only be conducted among high-risk groups. In general, these guidelines for interpreting skin test reactions should also be applied to persons who may have occupational exposure to TB (e.g., health care workers or the staff in nursing homes, drug treatment centers, or correctional facilities). Thus the appropriate cutoff for defining a positive reaction depends on the employee's individual risk factors for TB, including recent TB exposure, and the prevalence of TB in the facility. In facilities where the risk of exposure is very low, ≥ 15 mm may be an appropriate cutoff for employees with no other risk factors. In facilities where TB patients receive care, ≥ 10 mm may be an appropriate cutoff for employees with no other risk factors.

Source: National Center for HIV, STD, and TB Prevention. *Core Curriculum on Tuberculosis: What the clinician should know*, 4th ed. November 2001. http://www. cdc.gov/nchstp/ tb/pubs/corecurr.

TABLE 24-4 Classification System for Tuberculosis [10]

Class	Type	Description
0	No TB exposure Not infected	No history of exposure Negative reaction to tuberculin skin test
1	TB exposure No evidence of infection	History of exposure Negative reaction to tuberculin skin test
2	TB infection No disease	Positive reaction to tuberculin skin test Negative bacteriologic studies (if done) No clinical, bacteriological, or radiographic evidence of active TB
3	TB, clinically active	*M. tuberculosis* cultured (if done) Clinical, bacteriological, or radiographic evidence of current disease
4	TB Not clinically active	History of episode(s) of TB *or* Abnormal but stable radiographic findings Positive reaction to the tuberculin skin test Negative bacteriologic studies (if done) *and* No clinical or radiographic evidence of current disease
5	TB suspected	Diagnosis pending

Health care providers should comply with state and local laws and regulations requiring the reporting of TB. All persons with class 3 or class 5 TB should be reported promptly to the state and local health department.

Source: National Center for HIV, STD, and TB Prevention. *Core Curriculum on Tuberculosis: What the clinician should know*, 4th ed. November 2001. http://www. cdc.gov/nchstp/ tb/pubs/corecurr.

Anergy is a condition in which the tuberculin reaction (a delayed-type hypersensitivity response) may decrease or disappear in immunosuppressed persons. Anergy is caused by HIV infection, overwhelming miliary or pulmonary tuberculosis, severe or febrile illness, measles or other viral infections, Hodgkin's disease, sarcoidosis, live-virus vaccination, and the administration of corticosteroids or immunosuppressive drugs [10]. Persons with anergy may be infected with tuberculosis, but their immune systems cannot produce a positive reaction to the PPD [10]. For persons with any of the conditions listed above that may cause anergy, the diagnosis of tuberculosis should not be ruled out solely on the basis of a negative Mantoux test. Anergy is ascertained by injecting two other delayed-type hypersensitivity antigens—such as *Candida*, mumps, or tetanus toxoid—intradermally on the other forearm to serve as controls. These are antigens to which at least 90 percent of the population has been exposed. Any induration equal to or greater than 3 millimeters is proof that the immune system is capable of responding to skin tests, and a negative PPD is thus truly negative. If all the controls are negative, however, this means the immune system is incapable of reaction and tuberculin skin testing is rendered invalid [10, 11].

Pregnancy

Pregnant women should be screened for tuberculosis according to risk factors as noted in Table 24-3. All pregnant women with a positive skin reaction should have a chest x-ray. The woman's abdomen should be shielded during the x-ray procedure. A positive radiologic finding should be followed by a series of three sputum cultures for AFB. Positive AFB cultures and/or positive x-ray findings must be referred to physician care for treatment.

Pregnant women must be given adequate therapy as soon as TB is suspected. The preferred initial treatment regimen is isoniazid, rifampin, and ethambutol (ethambutol may be excluded if primary isoniazid resistance is unlikely). Streptomycin should not be used because it has been shown to have harmful effects on the fetus. In addition, pyrazinamide should not be used routinely because its effect on the fetus is unknown. Because the 6-month treatment regimen cannot be used, a minimum of 9 months of therapy should be given. To prevent peripheral neuropathy, it is advisable to give pyridoxine (vitamin B_6) to pregnant women who are taking isoniazid [10].

Breastfeeding during the course of TB therapy is not contraindicated. Women are encouraged to breastfeed their infants. The trace amounts of medication transferred to the infant via breast milk cannot be construed as treatment of the newborn.

You should inform your consulting physician about all women with a positive PPD and women in whom you suspect active disease. The families of women with a positive PPD and of women in whom you suspect active tuberculosis should be evaluated for active disease and, if tuberculosis is not evident, they should be screened with PPD.

Tuberculosis is a reportable disease. Midwives need to know their state reporting regulations, which may include penalties for late reporting or nonreporting, and be in compliance with them.

Hepatitis

Hepatitis can present as an active infection or be identified as a chronic infection through lab studies during routine prenatal care. However this is manifested, there are specific things the midwife must know related to hepatitis in pregnancy. Refer to Chapter 8 for a full discussion of identification, treatment, and prevention of hepatitis.

Rubella

The virus that causes rubella, or German measles, is particularly virulent during pregnancy. The most important consequences of rubella are the miscarriages, stillbirths, fetal anomalies, and therapeutic abortions that result when rubella infection occurs during early pregnancy, especially during the first trimester [12]. If a woman contracts rubella during the first trimester, there is approximately a 52 percent chance that her baby will be born with congenital rubella syndrome (CRS). This figure is as high as 85 percent if the woman contracts the virus during the first eight weeks of pregnancy [22]. The most common malformations associated with CRS are cataracts, cardiac defects, and deafness. There may also be glaucoma, microcephaly, and other defects involving the eyes, ears, heart, brain, and central nervous system. Infants with CRS frequently exhibit both intrauterine and postnatal growth retardation [12]. Infection after the twentieth week of gestation rarely causes defects.

The occurrence of rubella infection, once common, is now rare in the United States. Implementation of mandatory childhood immunization and enhanced surveillance for immunity in at-risk populations had led to record low numbers of cases of CRS. At this time, it is critical that surveillance remain high, as this is a disease that has its greatest impact on the developing fetus. Although immunization is nearly universal in the United States, it is uncommon in most areas of the world, making eradication unlikely. Attention to high-risk populations, and continued offering of vaccine for children, adolescents, and those known to be nonimmune will keep protection high.

Most rubella cases in the United States occur among young Hispanic adults born outside the United States [13], and most infants with CRS are born to foreign-born mothers. Ensuring immunity in women of childbearing age, especially those at highest risk for exposure, will help to prevent CRS.

Ascertainment of rubella-immune status of women of childbearing age and the availability of rubella vaccination should be components of the health care program in places where the risks for disease exposure and transmission are substantial (e.g., day care facilities, schools, colleges, jails, and communal living situations).

The ACIP has recommended that MMR vaccine be offered to all women of childbearing age (i.e., adolescent girls and premenopausal women) who do not have acceptable evidence of rubella immunity. Efforts should be made to ensure that all susceptible women of childbearing age, especially those who grew up outside the 50 states in areas where routine rubella vaccination may not occur, are vaccinated with MMR vaccine or have other acceptable evidence of immunity [14].

Screening in Pregnancy

A rubella antibody titer for immunity (hemagglutination inhibition) should be done routinely as part of the initial antepartal examination. An antibody titer of 1:10 or above is generally accepted as indicative of immunity. Below 1:10 indicates lack of immunity, and the midwife should include a note in the woman's record to offer rubella immunization postpartally. High antibody titers of 1:64 or above may indicate present disease, since there is a prompt antibody response with infection. Such a situation requires searching for signs and symptoms of the disease, ordering a series of antibody titers, and consulting with the physician.

Rubella vaccination during pregnancy of women who are not immune is not recommended because the vaccine is an attenuated live virus that could theoretically cause malformations. Women who do not know they are pregnant and who receive a rubella vaccine can be reassured, as no evidence of teratogenicity from the vaccine has been demonstrated [14].

To avoid risk, it is prudent to offer rubella vaccine to the nonimmune woman immediately postpartum. If not postpartum, women should be asked if they are pregnant, informed of potential risk, and advised to avoid pregnancy for 1 month after receiving the vaccine [14]. Breastfeeding is not a contraindication to vaccination.

Diagnosis

Clinical signs and symptoms of rubella, when they are present, include the following:

1. Low-grade fever
2. Drowsiness
3. Sore throat
4. Rash—pale or bright red on the first or second day, spreading rapidly from the face over the entire body, and fading rapidly
5. Swollen neck glands
6. Duration of 3 to 5 days

Diagnosing rubella may be difficult because the disease may be subclinical, thereby infecting the fetus but not exhibiting itself clinically in the mother. If the mother knows she has been exposed to rubella and has an antibody titer below 1:10 (not immune), a blood specimen should be obtained for serologic testing (IgG and IgM) and the physician consulted. Authorities differ on the administration of hyperimmune gamma globulin in such a situation.

Prevention

The primary objective of the rubella immunization program is the prevention of CRS. The major components of the rubella and CRS elimination strategy are achieving and maintaining high immunization levels for children and adults, especially women of childbearing age; conducting accurate surveillance for rubella and CRS; and undertaking control measures promptly when a rubella outbreak occurs. Since the late 1970s, this strategy has effectively prevented major epidemics of rubella and CRS in the United States [15].

Vaccination of susceptible women of childbearing age should be part of routine general medical

and gynecologic outpatient care, take place in all family-planning settings, and be provided routinely before discharge from any hospital, birthing center, or other medical facility [15].

An additional concern is for women or their families when traveling outside of the continental United States. As rubella vaccine is not routine in many countries, travelers should be advised to be certain of immunity prior to travel. For women who have been documented as nonimmune during pregnancy, travel to high-risk countries should be avoided until after the pregnancy [16].

Cytomegalovirus

Cytomegalovirus (CMV) is a member of the herpesvirus group, which includes herpes simplex virus types 1 and 2, varicella-zoster virus (which causes chickenpox), and Epstein-Barr virus (which causes infectious mononucleosis) [17]. CMV infects between 50 and 85 percent of adults in the United States by 40 years of age, most with few symptoms and no long-term sequelae. Occasionally, mononucleosis-like symptomatology or mild hepatitis will occur. As with other viruses, once it infects an individual, the virus remains for the duration of that person's life, and may be reactivated at any time. Usually, these subsequent infections are mild or the person is completely asymptomatic. Severe stress or circumstances with immunosuppression may create the potential for a clinical infection. However, CMV is the virus most frequently transmitted to a developing child before birth [18].

Generally, CMV is not highly contagious. Infection requires close, intimate contact with a person excreting the virus in their urine, saliva, blood, tears, semen, and breast milk. The most significant spread among essentially healthy individuals occurs within households and among young children in day care centers and the classroom.

This is important for women cared for by midwives as they are often in situations to care for small children as mothers, teachers, nurses, or other child care workers. When women are planning a pregnancy or are currently pregnant, they should be advised to maintain excellent hand-washing technique in order to diminish the likelihood of infection (see Table 24-5).

Most transmission is through infected bodily fluids that come in contact with hands and then are absorbed through the nose or mouth of a susceptible person. Therefore, care should be taken when handling children, soiled tissues, drinking cups, and items like diapers. Simple hand washing with soap and water is effective in removing the virus from the hands.

The incidence of primary CMV infection in pregnant women in the United States varies from 1 to 3 percent [17]. The greatest risk of congenital CMV infection is in women who have never had a previous infection and who become infected for the first time during pregnancy. As with other adults, most women have minimal if any symptoms and are unaware of the infection. The fetus, however, is at risk if this is a primary infection. Infection is usually not recognized until birth. Of those infants, only 30 percent will become infected in utero, and less than 15 percent of these infants will have symp-

TABLE 24-5 CDC Recommendations for CMV During Pregnancy

1. Throughout her pregnancy, a pregnant woman should practice good personal hygiene, especially hand washing with soap and water, after contact with diapers or oral secretions (particularly with a child who is in day care).
2. Pregnant women working with infants and children should be informed of the risk of acquiring CMV infection and the possible effects on the unborn child.
3. Women who develop a mononucleosis-like illness during pregnancy should be evaluated for CMV infection and counseled about the possible risks to the unborn child.
4. Routine laboratory screening is not recommended; however, laboratory testing for antibody to CMV can be performed to determine if a women has already had CMV infection.
5. Recovery of CMV from the cervix or urine of women at or before the time of delivery does not warrant a cesarean section.
6. The demonstrated benefits of breastfeeding outweigh the minimal risk of acquiring CMV from the breastfeeding mother.
7. There is no need to either screen for CMV or exclude CMV-excreting children from schools or institutions because the virus is frequently found in many healthy children and adults.

Source: Centers for Disease Control and Prevention. National Center for Infectious Diseases. Cytomegalovirus (CMV) Infection, 2002. http://www.cdc.gov/ncidod/diseases/cmv.htm.

toms at the time of birth [18]. The complications that can occur include the following:

1. Generalized infection with symptoms ranging from moderate enlargement of the liver and spleen (with jaundice) to fatal illness.
2. Most infants with CMV disease survive, but 80 to 90 percent will have complications that may include hearing loss, vision impairment, and varying degrees of mental retardation.
3. Approximately 5 to 10 percent of infants who are infected but without symptoms at birth will subsequently have varying degrees of hearing and mental or coordination problems.

The virus can also be transmitted to the infant at delivery from contact with genital secretions or later in infancy through breast milk. However, these infections usually result in little or no clinical illness in the infant.

Diagnosis

Although CMV is a common viral infection, it is not frequently diagnosed because of the minimal presence of symptoms. The following clinical situations should lead to suspicion of CMV infection:

1. Symptoms of infectious mononucleosis with negative test results for mononucleosis and Epstein-Barr virus
2. Signs of hepatitis with negative test results for hepatitis A, B, and C.

Laboratory Testing

The enzyme-linked immunosorbent assay (or ELISA) can be used to determine if acute infection, prior infection, or passively acquired maternal antibody in an infant is present. If serologic tests detect a positive or high titer of IgG, this result should not automatically be interpreted to mean that active CMV infection is present. However, if antibody tests of paired serum samples, taken at 2 week intervals, show a fourfold rise in IgG antibody and a significant level of IgM antibody (equal to at least 30 percent of the IgG value), or virus is cultured from a urine or throat specimen, the findings indicate that an active CMV infection is present [17].

Treatment

There is no treatment for CMV infection in healthy persons. Immunocompromised patients and those with severe mononucleosis or hepatitis symptoms may be treated symptomatically or with appropriate antiviral therapies.

Toxoplasmosis

Toxoplasmosis is a protozoal infection caused by the intracellular parasite *Toxoplasma gondii*. It is the third most common cause of food-related death in the United States [19]. Approximately 1 in 1000 pregnant women are infected each year. If contracted, toxoplasmosis can cause severe congenital malformations when the mother acquires the infection while pregnant, because it crosses the placenta to the fetus. The potential for infection of the fetus is only 5 percent if contracted prior to 8 weeks, and increases to 80 percent as gestation continues. However, the most severe cases tend to be those when transmission occurs late in the first trimester [20]. Many infants do not demonstrate symptoms at the time of birth, instead developing seizures, motor and cognitive deficits, and mental retardation throughout childhood. The most severely affected will have neurologic anomalies such as anencephaly, hydrocephalus, microcephaly, and intracranial calcifications [20].

Toxoplasma gondii has three life phases, with the first two causing infection within their host—the animals or humans who consume them. The third phase, which allows for sexual replication of the protozoan, occurs only in cats. Cats become infected by eating infected mammals such as mice or rats and then pass the oocytes, which become infectious three days after excretion when they can be contracted by direct or aerosolized exposure. Oocytes from cat feces in the soil can remain infectious for up to a year. Therefore, humans are exposed to toxoplasmosis through exposure to cat feces, infected soil, or ingestion of infected raw or under-cooked meat. It has been shown that about 50 percent of human exposure to toxoplasmosis is through infected meat, pork being the most frequent.

For the midwife, the most important aspects of dealing with toxoplasmosis will be through careful history taking and prevention through education of women planning for a pregnancy and who are already pregnant. Table 24-6 presents recommendations from the CDC for prevention of toxoplasmosis.

Most persons infected with toxoplasmosis are asymptomatic. The signs and symptoms of toxoplasmosis in the pregnant woman are vague, similar to mononucleosis, but when present include the following:

1. Fatigue and malaise
2. Muscle pain
3. Fever

TABLE 24-6 CDC Recommendations for Prevention of Toxoplasmosis

1. To prevent toxoplasmosis and other foodborne illnesses, food should be cooked to safe temperatures. A food thermometer should be used to measure the internal temperature of cooked meat to ensure that meat is cooked all the way through. Beef, lamb, veal roasts, and steaks should be cooked to at least 145°F, and pork, ground meat, and wild game should be cooked to 160°F before eating. Whole poultry should be cooked to 180°F in the thigh to ensure doneness.
2. Fruits and vegetables should be peeled or thoroughly washed before eating.
3. Cutting boards, dishes, counters, utensils, and hands should always be washed with hot soapy water after they have contacted raw meat, poultry, seafood, or unwashed fruits or vegetables.
4. Pregnant women should wear gloves when gardening and during any contact with soil or sand because cat waste might be in soil or sand. After gardening or contact with soil or sand, they should wash their hands thoroughly.
5. Pregnant women should avoid changing cat litter if possible. If no one else is available to change the cat litter, use gloves, then wash hands thoroughly. Change the litter box daily because *Toxoplasma* oocysts require several days to become infectious. Pregnant women should be encouraged to keep their cats inside and not adopt or handle stray cats. Cats should be fed only canned or dried commercial food or well-cooked table food, not raw or undercooked meats.
6. Health education for women of childbearing age should include information about meat-related and soilborne toxoplasmosis prevention. Health care providers should educate pregnant women at their first prenatal visit about food hygiene and prevention of exposure to cat feces.

Source: Centers for Disease Control and Prevention. Preventing congenital toxoplasmosis. *MMWR* 49(RR02); 57–75. March 31, 2000.

4. Sore throat
5. Enlarged posterior cervical lymph nodes

If the woman is seronegative for mononucleosis, then toxoplasmosis screening should be done.

Serum testing is done for IgM and IgG with repeated testing in three weeks. Recent infection will be characterized with a high or increasing IgM with seroconversion from negative to positive IgG. It is important that this testing be performed in a well-recognized reference laboratory. Health care providers who are in contact with pregnant women should be educated about two potential problems associated with *Toxoplasma* serology tests. First, no assay exists that can determine precisely when initial *Toxoplasma* infection occurred. Second, in populations with a low incidence of *Toxoplasma* infection, such as in the United States, a substantial proportion of the positive IgM test results will probably be false positive [19].

For any woman with a high suspicion of toxoplasmosis during pregnancy, immediate referral for ultrasound examination and medical management are indicated. Ultrasound can be useful in identifying any fetal anomaly, hepatomegaly, ascites, or intracranial abnormalities. Amniotic fluid and fetal blood can be sampled to confirm fetal infection [21].

Treatment of most adults is not required, but for pregnant women, treatment can reduce the potential harmful effects to the fetus. This includes use of sulfonamides, pyrimethadine, and spiramycin by the physician.

Varicella

Varicella (chickenpox) is a highly contagious viral infection caused by a form of herpesvirus. Varicella may remain dormant in the dorsal ganglia of the nerves and become reactivated years later as herpes zoster (shingles). Herpes zoster is rare in pregnancy and has no known adverse effect on mother or fetus.

Varicella during pregnancy has serious effects on both the mother and the fetus or infant. Between 25 and 40 percent of fetuses exposed to varicella in utero will be affected and demonstrate congenital varicella syndrome [22]. The earlier in pregnancy the mother has varicella, the greater the risk of congenital varicella syndrome. The greatest risk occurs in the first 20 weeks of pregnancy. Congenital varicella syndrome is associated with cataracts, chorioretinitis, limb hypoplasia, hydronephrosis, microcephaly, mental retardation, dermatome lesions, and cutaneous scars (see Table 24-7).

Maternal varicella infection that occurs from 6 days before through 2 days after delivery can be passed to the newborn; in such a situation there will not be sufficient time for the mother to develop immunity and pass it on to the baby. Without the passive immunity from the mother, the infant can become seriously ill; approximately 5 percent of infants who contract varicella this way will die.

Varicella infection in adults can be grave, with approximately 10 to 30 percent of cases developing varicella pneumonia. Varicella pneumonia leads to

TABLE 24-7 Management of Care of Woman with Varicella Based on Patient Exposure or Route of Infection

Exposure/Infection Route	Management of Care
Household member exposed to varicella (e.g., child in day care)	**1.** Determine history of varicella in exposed household member. **2.** Conduct serologic test for immunity in woman. **3.** Have woman avoid contact with exposed household member until incubation period ends without evidence of infection.
Direct exposure to varicella (child with varicella infection)	**1.** Conduct serologic test for immunity. **2.** Administer VZIG within 96 hr of exposure if woman's immunity is negative or unknown.
Varicella infection in mother in first 20 weeks of pregnancy	**1.** Provide symptomatic relief with mild analgesics and antipyretics. **2.** If woman is experiencing fulminant disease with high fever, extensive rash, and/or pulmonary symptoms, refer to physician for intravenous acyclovir. **3.** Consult MD for ultrasound and possible fetal blood sampling (identify fetal infection).
Varicella infection in mother after 20 weeks but no later than 10 days before delivery	**1.** Provide symptomatic relief with mild analgesics and antipyretics. **2.** If woman is experiencing fulminant disease with high fever, extensive rash, and/or pulmonary symptoms, refer to physician for intravenous acyclovir. **3.** Infant will receive passive immunity from mother.
Varicella in mother beginning in the period 6 days before delivery	**1.** Give VZIG to mother. **2.** Prepare for the possibility of tocolysis. **3.** Give VZIG to infant at birth. **4.** May need to isolate infant from mother, even if no maternal rash. **5.** Possibly pump breast milk for infant, to minimize infant's contact with any maternal lesions.
Varicella in mother beginning within first 72 hr postpartum	**1.** Treat infant with VZIG. **2.** Treat mother with VZIG if rash has not appeared (may reduce risk of serious infection). **3.** Isolate mother and baby together. **4.** Pump breast milk for infant, to minimize infant's contact with any maternal lesions.
Exposure of mother/baby to varicella after 72 hr postpartum	**1.** Determine serologic status of mother (immune mother passes antibodies to fetus/newborn). **2.** Treat infant of nonimmune mother with VZIG or notify infant health care provider. **3.** Avoid mother/baby contact with infected individual.

Source: Centers for Disease Control and Prevention. National Immunization Program. Varicella. In *Epidemiology and Prevention of Vaccine—Preventable Diseases*, 7th ed. CDC. Atlanta, GA: April 2002.

maternal death in almost 40 percent of cases in pregnant women unless treated with acyclovir [21]. Up to 95 percent of adults have a history of childhood varicella, which confers lifetime immunity. Of those adults who do not report a history of varicella, immunity can be demonstrated in 75 to 80 percent by serologic testing.

Varicella is transmitted by direct contact and respiratory transmission of the virus. The incubation period from exposure until the first symptoms is from 10 to 21 days. The disease is communicable beginning 2 days before lesions appear and ending when all lesions are crusted over, about 7 to 10 days later. Crusted lesions do not release communicable virus.

Clinical signs and symptoms of varicella infection include fever, chills, myalgia, and arthralgia, followed in a few days by the eruption of characteristic vesicles. Vesicles are extremely pruritic and follow a typical pattern: they begin on the head and neck and spread to the trunk and extremities, break open, and crust over. In women who develop varicella pneumonia, symptoms appear between 1 and 6 days after the appearance of vesicles. Symptoms of varicella pneumonia include a nonproductive cough with pleuritic chest pain, persistent fever, and dyspnea.

Evaluation of a woman with suspected varicella includes the following:

1. History
   a. childhood history of varicella exposure or infection (considered adequate evidence of immunity)

- **b.** evidence of significant exposure
  - **(1)** date of exposure
  - **(2)** nature of exposure (risk for acquiring disease increases with likelihood of droplet transmission)
  - **(3)** duration of exposure (close proximity contact of at least 1 hour increases risk of disease transmission)
  - **(4)** stage of disease when exposure occurred (exposure when all lesions are crusted carries less risk than when lesions are fresh)

2. Physical
- **a.** temperature
- **b.** respiratory rate
- **c.** auscultation of lungs for evidence of pneumonia
- **d.** skin examination for lesions (note pattern of lesions on the body and whether lesions are fresh or crusted to assist in establishing the date of exposure)

3. Laboratory
- **a.** serologic test for varicella antibodies
- **b.** chest x-ray if evidence of pneumonia

Management of varicella in pregnancy is based on the extent of the exposure, when in gestation the infection occurs, and the severity of the illness in the woman. Table 24-7 summarizes the management of varicella in pregnancy. Once exposure occurs, varicella-zoster immune globulin (VZIG) given to the mother within 96 hours of exposure, may offer some protection from more serious infection, including varicella pneumonia. The cost (approximately $400 to $500) may prohibit use on a routine basis for all pregnant women who think they may have been exposed to varicella but are not sure if they ever had it. Of these women, 80 percent will demonstrate evidence of prior infection upon serologic testing and not need VZIG, but results of the test most likely will not be known within 96 hours. Thus, some clinicians limit the use of VZIG to those women who are directly exposed to varicella within the first 20 weeks of gestation and who do not know if they have ever had the disease [22].

VZIG provides no known benefit to the fetus. However, the infant of a woman who develops varicella infection 6 days before through 2 days after delivery should receive VZIG because of the high associated neonatal mortality.

Because of the high communicability of varicella, women who have been exposed or infected should be seen before or after regular office hours to avoid exposure of other patients; staff with known immunity to varicella should evaluate and care for them. Women exposed to or infected with varicella should be counseled to avoid exposure of others.

With the availability of a reliable vaccine, it is possible to prevent the majority of cases of varicella. Encouragement of childhood immunization decreases the incidence of varicella and the potential exposure of adults, including pregnant women. During preconception counseling, serologic testing for varicella antibodies can be offered to women without a history of infection. Vaccination can be offered prior to pregnancy. It is reasonable to add serologic screening for varicella to the initial laboratory evaluation of pregnant women who do not have a history of infection. If serologic testing confirms a lack of immunity, varicella vaccine can be offered postpartum and/or interconceptionally. Varicella vaccine is an attenuated live vaccine and therefore is contraindicated in pregnancy. Women receiving the vaccine need to be counseled to avoid pregnancy for 1 month afterward. In the event that a woman is vaccinated and then finds that she is pregnant, she should be advised that the risk to the fetus is theoretical, as no known anomalies or cases of CVS have been documented after vaccination. The case should also be reported to the Varicella Vaccination in Pregnancy Registry (maintained by the vaccine manufacturer and the CDC) at (800) 986-8999 [22].

Parvovirus B19 (Fifth Disease, Erythema Infectiosum)

The most common presentation of parvovirus B19, is a flushed red face, with a characteristic "slapped cheek" pattern. Prior to onset of the rash, symptoms often include mild fever, malaise, myalgias, and headache. A symmetric, maculopapular, lacelike, pruritic rash may then appear on the trunk and move peripherally to the arms, buttocks, and thighs. In rare cases, adult women may experience arthralgia and arthritis. The virus may rarely cause transient red-cell hypoplasia or aplastic crisis [23].

The virus is transmitted primarily through contact with respiratory secretions, but it can also be transmitted by percutaneous exposure to blood or blood products, and by vertical transmission from mother to fetus. The virus is common in elementary and middle school children, with a high incidence of spread among family members.

The period of greatest contagion is prior to the onset of symptoms, and transmission is rare after onset of the rash. Therefore, once symptoms are present, there is no need for isolation of children or of pregnant women. The incubation period from exposure to onset of symptoms is 4 to 21 days. Rash and joint symptoms may not appear for 2 to 3 weeks after exposure.

Diagnosis is done by parvovirus B19-specific immunoglobulin antibody (IgM). When positive, IgM indicates infection within the past 2 to 4 months. The presence of serum IgG antibody is indicative of previous infection and immunity.

When parvovirus infection occurs during pregnancy, there is a 20 to 30 percent placental transfer rate. For those fetuses that are affected, some will experience aplastic anemia, nonimmune hydrops, and rarely death. Fetal hydrops is present in 18 percent and fetal death occurs in 3 to 9 percent, with the most severely affected when the infection occurs in the first half of pregnancy [24]. Congenital anomalies are not associated with parvovirus.

For women who have been exposed to parvovirus B19, serum IgM and IgG should be obtained. If immunity is present (with positive IgG), no further testing is required. Nonimmunity (negative IgG) testing should be repeated in 3 to 4 weeks. If seroconversion occurs, the fetus should be monitored weekly by ultrasound examination for fetal hydrops, placentomegaly, and fetal growth restriction. Physician consultation should be sought.

Urinary Tract Infections

Urinary tract infections, especially asymptomatic bacteriuria and cystitis, are a common complication of pregnancy. Pyelonephritis, while less common, carries significant maternal morbidity and potential poor pregnancy outcomes. Due to the hydronephrosis that normally occurs during pregnancy, urinary stasis can result, a condition that makes an excellent medium for bacterial growth. Identification and treatment of urinary tract infections during pregnancy are critical, as they are associated with preterm labor, low birth weight, hypertension, preeclampsia, and maternal anemia [25]. In addition, minor bladder infections, left untreated have a high incidence of developing into pyelonephritis.

Women with a history of urinary tract infections, sickle cell trait, sickle cell anemia, and diabetes are at increased risk. However, due to the potential hazards, frequent lack of symptoms, ease of screening, and effectiveness of treatment, the screening of all women with a urine culture at the first prenatal visit is recommended [25, 26].

Both asymptomatic bacteriuria and cystitis are infections of the lower urinary tract. The causative organisms are the same. Bacteria frequently ascend from the closely placed vagina and rectum, but as many as 35 percent of urinary tract infections arise from the kidneys [25].

The presence of bacteria in the urine (bacteriuria) is considered significant when the urine is a clean catch specimen and contains 100,000 bacteria of the same species per milliliter. This most often indicates an infection that should be treated.

Escherichia coli is the most common pathogen found in urinary tract infections [27]. This bacteria is normative and nonpathogenic in the intestinal tract, but highly pathogenic outside it. Similarly, *Proteus*, which is normally found in the intestinal tract is pathogenic in the urinary tract. *Klebsiella*, a common respiratory infectious agent, may also cause urinary tract infections, as can *Pseudomonas aeruginosa*, which is pathogenic in humans, including causing urinary tract infections. Another common urinary tract bacteria is *Beta-hemolytic streptococcus*. The term *Enterococcus* refers to any species of streptococcus normally inhabiting the intestinal tract and pathogenic in the urinary tract.

Not all bacteria are pathogens to the urinary tract, but they are identified in urine culture samples. These bacteria are, instead, contaminants. *Alpha-hemolytic streptococcus* is a common flora of the skin and mucous membranes. *Staphylococcus epidermidis* is also common on the mucous membranes and skin, including the genital area, and it is a major source of urine specimen contamination. *Lactobacillus* is normal in the mouth, intestinal tract, and vagina, and it is considered to be a urinary contaminant. When more than one type of bacteria is identified, the specimen should also be considered to be contaminated. When a culture report identifies a contaminated specimen, the recommendation is to repeat the specimen at the next prenatal visit.

Asymptomatic Bacteriuria

As the name states, there are no symptoms associated with this infection, which occurs in up to 11 percent of pregnancies. There is not an increase in asymptomatic bacteriuria during pregnancy. However, the dramatically increased rate of pyelonephritis and as-

sociated complications makes this a true concern during pregnancy. It has been reported that as many as 40 percent of untreated lower urinary tract infections will progress to pyelonephritis [25].

Cystitis

Cystitis, by definition, is inflammation of the bladder. Usually the inflammation is due to a bacterial infection. Signs and symptoms of cystitis include the following:

1. Urinary urgency
2. Urinary frequency
3. Dysuria
4. Nocturia
5. Lower abdominal (suprapubic) pain
6. Hematuria (possible)

When women report symptomatology, it is prudent to obtain a dipstick urine assessment and a urinalysis. If the dipstick is positive for WBCs, nitrates, or protein above trace, or if the urinalysis is positive for WBCs, RBCs, and/or bacteria, a culture is indicated. Sometimes symptoms are difficult to assess as they are the same or similar to normal pregnancy symptomatology (e.g., frequency, nocturia, lower abdominal pressure). Whenever a question arises of normal symptoms versus urinary tract symptoms, it is prudent for the midwife to obtain a dipstick and or urinalysis. Laboratory findings from microscopic urinalysis include the following:

1. Bacteriuria
2. Abnormally increased number of white blood cells
3. Red blood cells
4. Nitrites

Treatment is ideally based on targeting culture specific organisms. However, when the woman is symptomatic and the urine dipstick or U/A is positive, then empiric antibiotic therapy should be initiated and then changed if necessary when the culture results are available. Antibiotic therapy has been shown to decrease the risks of pyelonephritis as well as the accompanying preterm labor and low birth weight infants [27]. (See Table 24-8.)

The treatment of asymptomatic bacteriuria is best based on a report of the antimicrobial agents to which the microorganisms present are sensitive. Most, however, are sensitive to sulfa drugs (e.g., Bactrim), nitrofurantoin (e.g., Macrodantin), the cephalosporins, and ampicillin or amoxicillin. The sulfa drugs are contraindicated after 36 weeks and may be a factor in kernicterus of the newborn; the nitrofurantoin drugs are contraindicated in women with glucose-6-phosphate dehydrogenase (G6PD) deficiency, since drug-induced hemolysis may occur and cause hemolytic anemia. When Group B Streptococcus is identified as a urinary pathogen, the woman should be treated antepartally and on labor [29].

TABLE 24-8 Antibiotic Treatment of Lower Urinary Tract Infections

Medication	Dosage	Frequency
Amoxicillin	500 mg po	tid
Ampicillin	250 mg po	qid
Cephalosporin (Keflex)	250 mg po	qid
Nitrofurantoin (Macrodantin)	100 mg qid	qid
Sustained release nitrofurantoin (Macrobid)	100 mg po	bid

Notes:

Trimethoprim/sulfamethoxazole (TMP/SMX) (Bactrim DS) 160 mg/800 mg po bid are contraindicated after 36 weeks, and with G6PD. During pregnancy, treatment should be given for 3 to 7 days.

Repeat urine culture should be done 1 to 2 weeks after completion of antibiotic therapy as a test of cure.

When Group B Streptococcus is identified, the woman should be treated antepartally and in labor.

Source: Adapted from Samuels, P., and Colombo, D. F. Renal disease. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*. New York: Churchill Livingstone, 2002, ch. 31.

A follow-up urine culture should be performed within 2 weeks of treatment as a test of the effectiveness of the prescribed therapy. If the test of cure shows continuing infection, obtain a careful history of compliance with the treatment regimen, prescribe another course of treatment with a different drug (based on sensitivity testing), and schedule another test of cure urine culture 1 to 2 weeks after completion of this course of antibiotics.

Suppressive therapy is used when two courses of treatment have been completed without cure of asymptomatic bacteriuria or cystitis. A continuing dose of an antimicrobial agent will suppress the offending organism as long as the drug is taken but, as has already been demonstrated, will not effect a cure. Nitrofurantoin (Macrodantin) 100 mg once daily at bedtime, or cephalexin (Keflex) 250 mg once daily at bedtime, is usually used for suppressive therapy throughout the rest of pregnancy [28]. Effectiveness is monitored by monthly urine cultures. By suppressing the occurrence of asymptomatic bacteriuria, the midwife reduces the incidence of pyelonephritis, preterm delivery, and low birth weight babies.

Acute Pyelonephritis

Pyelonephritis, by definition, is inflammation of one or both kidneys. The infectious agent is bacterial. Incidence of pyelonephritis in pregnancy, including the puerperium, is approximately 2 percent [25]. The complications of pyelonephritis—preterm labor and delivery, adult respiratory distress syndrome, hemolysis resulting in anemia, and septic shock—can be life threatening for mother and fetus. It is the primary nonobstetric indication for hospitalization of pregnant women [28]. Pyelonephritis results in part from a number of naturally occurring physiological and anatomical events associated with pregnancy, including the following:

1. Compression of the ureters at the pelvic brim by the uterus
2. Dilatation and decreased tone of the ureters due to hormonal effects (probably progesterone)
3. Urinary stasis favorable to microorganisms, caused by 1 and 2 above
4. Dilatation of the renal pelves and calyces allows greater virulence by microorganisms
5. Decreased bladder tone and urine stasis in the immediate puerperium

Pyelonephritis is a symptomatic disease. Signs and symptoms of acute pyelonephritis are as follows:

1. Fever—temperature usually 100.4°F or above
2. Shaking chills
3. Hematuria
4. Myalgia
5. History of loss of appetite, nausea, and vomiting
6. History of asymptomatic bacteriuria or cystitis
7. Urinary urgency due to associated cystitis
8. Urinary frequency due to associated cystitis
9. Dysuria due to associated cystitis
10. Low back (lumbar) pain
11. CVA tenderness (if infection is unilateral, it will most often involve the right side)
12. Lower abdominal (suprapubic) pain

Laboratory testing includes urinalysis, culture, and sensitivity, and CBC with differential. Findings from microscopic urinalysis and urine culture and sensitivity include the following:

1. Bacteriuria
2. Pyuria (with WBCs equal to or greater than 10 per high power field)
3. Hematuria
4. Proteinuria (value depending on the extent of renal damage)

The blood testing will usually demonstrate an increased WBC and a left shift in the differential.

The midwife should consult with the physician for management of pyelonephritis. Management of pyelonephritis requires hospitalization for intravenous therapy to correct dehydration and electrolyte imbalance, and for intravenous antibiotic therapy. Many clinicians maintain women on suppression therapy with antibiotics or nitrofurantoin until delivery. A urine culture should be done 6 to 8 weeks postpartum to assess for asymptomatic infection [25, 26, 28].

Anemias and Hemoglobinopathies

There are large numbers of anemias and hemoglobinopathies that may complicate or be complicated by pregnancy. If the woman's history or laboratory studies indicate an abnormality, the midwife evaluates the woman to determine the etiology of the anemia and then develops an appropriate management plan. This section will address the obstetric implications of common anemia and hemoglobinopathies. Refer to Chapter 7 for more general information.

Naturally occurring physiological changes in pregnancy affect normal blood count results in pregnant women. The increase in maternal blood volume results primarily from an increase in plasma rather than from an increase in red blood cells. Although there is an increase in the number of erythrocytes in circulation, it is not proportionate to the increase in plasma volume. The disproportion of erythrocytes to plasma exhibits itself in a lowered hemoglobin level. The increase in the number of erythrocytes is also one of the factors in the increased need for iron during pregnancy, along with fetal demand. This disproportion between erythrocytes and plasma is greatest during the second trimester, because the increase in plasma volume ceases toward the end of pregnancy while increased erythrocyte production continues.

Anemia is defined as either a decrease in the number of red blood cells or a decrease in the concentration of the hemoglobin in the circulating blood. The working definition of anemia is generally accepted to be a hemoglobin level of less than 12.0 grams per 100 milliliters (12 grams/deciliter) blood in nonpregnant women and less than 10.0 grams per 100 milliliters (10 grams/deciliter) blood in pregnant women. Iron deficiency anemia constitutes approximately 95 percent of anemias related

to pregnancy [31].

Although often asymptomatic, anemia may cause the following signs and symptoms:

1. Fatigue, drowsiness, malaise
2. Dizziness, weakness
3. Headaches
4. Sore tongue
5. Skin pallor
6. Pale mucous membranes, e.g., conjunctivae
7. Pale fingernail beds
8. Loss of appetite, nausea, and vomiting

History related to potential hematologic abnormalities include the following:

1. History of iron deficiency anemia
2. Sickle cell disease
3. Self or family history of thalassemia
4. Idiopathic thrombocytopenic purpura (ITP)
5. Bleeding disorders
6. Medication history
7. Previous pregnancy with increased bleeding (from episiotomy, cesarean incision, need for previous blood therapy, or bruising from IV sites)
8. If any previous infant had bleeding problems, e.g., after circumcision
9. History of HELLP syndrome
10. HIV infection (highly associated with anemias and an ITP-like syndrome)
11. Dietary history
    a. High iron source foods
    b. Pica—i.e., excessive craving for and ingestion of food substances, or such things as clay or dirt, starch, ice

Anemia is a sign of underlying illness rather than a disease entity itself [30]. In determining the etiology of an anemia, it is helpful to think of how the diagnosis is made by laboratory tests in order to categorize the possibilities and start the process of differential diagnosis. Initial laboratory evaluation for anemia determines the red cell size: microcytic, normocytic, or macrocytic. Further laboratory evaluation may be necessary to determine the specific anemia within a category (e.g., folate deficiency or B_{12} deficiency in macrocytic anemia). The following is a list of anemia etiologies by cell size category [30]:

Microcytic Anemias (Decreased Red Cell Size)

1. Iron deficiency anemia
2. Thalassemias
3. Hemoglobin E disorders (genetic hemoglobin variant common in Southeast Asia)
4. Lead toxicity
5. Chronic disease (infection, neoplasm)

Normocytic Anemias (Normal Red Cell Size)

1. Increased red blood cell loss or destruction
    a. acute blood loss
2. Hemolytic disorders
    a. hemoglobin SS disease (sickle cell disease)
    b. hemoglobin C disorders
    c. spherocytosis (common in Northern Europeans)
    d. glucose-6-phosphate dehydrogenase (G6PD) deficiency
    e. acquired hemolytic anemias (medication side effect)
    f. autoimmune hemolytic anemias
3. Decreased red blood cell production
    a. aplastic anemia (life-threatening bone marrow failure)
    b. chronic disease (liver disease, renal failure, infection, neoplasm)
4. Overexpansion of plasma volume pregnancy, overhydration

Macrocytic Anemias (Increased Red Cell Size)

1. Vitamin B_{12} deficiency
2. Folic acid deficiency
3. Hypothyroidism
4. Alcoholism
5. Chronic liver or renal disease

Iron Deficiency Anemia

Iron deficiency anemia is microcytic, and it is the primary cause of anemia in pregnancy. The cause may be dietary or due to chronic blood loss, with the vast majority of cases in pregnancy caused by dietary deficiency.

Women with a hemoglobin below 10 g/dL blood should be started on iron, folic acid (400 mcg, which is exceeded in prenatal vitamins), and vitamin supplements if they are not already taking all of these. Most midwives will supplement all women with iron and vitamins via prenatal vitamins. Controversy exists in the need for additional iron supplementation without evidence of iron deficiency. However, except for women with a medical contraindication such as hemochromatosis, supplementation has minimal if any side effects. (Refer to Chapter 22, p. 601 for further discussion.)

Dietary counseling is very important as iron is more readily absorbed from foodstuffs than from oral iron medication (see Table 24-9). High-iron foods include green leafy vegetables, collard greens,

TABLE 24-9 Tips to Increase Absorption of Iron

1. Take iron supplements between meals or 30 minutes before meals.
2. Avoid calcium ingestion with iron (milk, antacid, prenatal supplements).
3. Take with vitamin C (orange juice, vitamin C supplement).
4. Cook foods in a minimal amount of water, for the shortest possible time.
5. Eat meat, poultry, and fish—foods in which iron is absorbed and utilized more readily than the iron in other foods.
6. Eat a wide variety of foods.

red meat, egg yolks, raisins, prunes, liver, oysters, and some fortified cereals. Heme iron is contained in meat, fish, and poultry, and it is more completely absorbed than iron in other foods. Plant and dairy foods contain nonheme iron. Absorption of this form of the nutrient is affected by various components in food. Vitamin C and various compounds in meats, for instance, enhance the absorption of nonheme iron, while phytic acid (found in grains and soy proteins), coffee, and calcium phosphate hinder the body's ability to use the mineral [32]. In addition, iron from all food sources is better absorbed from meals that contain heme iron sources. Meals or food sources with vitamins A and C will also enhance absorption. Calcium sources, however, from foods or from medication will diminish the absorption of iron. The midwife should take a careful dietary history and analyze it. Attention should be paid to high iron content foods. Included in this history should be a thorough investigation into the possibility of pica, excessive craving and ingestion either of food substances or of clay or dirt, starch, ice, and other nonfoods. Such nonnutritive substances are filling; thus nutritive foodstuffs are neglected, resulting in malnutrition and its sequelae.

When the CBC demonstrates a low hemoglobin and hematocrit, below 10 mg/dL and 30 percent, respectively, iron supplementation should be initiated [30]. Iron is best absorbed when taken on an empty stomach, and it must be available to the body at several times during the day for best results. Table 24-10 shows the amount of elemental iron available in frequently prescribed iron preparations. These supplements can be provided in tablet, capsule, or liquid preparations.

If hemoglobin levels do not stabilize or continue to drop, a careful history should be taken to ascertain whether the woman is taking her iron supplement and following her dietary instructions. Ask about the color of her stools, as iron pills turn stools black and tarry. A stool specimen for occult blood should be taken. The possibility of pica should be reinvestigated. Iron replacement therapy has side effects such as nausea, dyspepsia, and constipation that may be uncomfortable or intolerable to women. Discussing these symptoms openly and offering dietary or medication changes may help the woman be compliant with iron use.

TABLE 24-10 Oral Iron Preparations

Preparation	Typical Dose	Elemental Iron/Dose
Ferrous sulfate	325 mg tid	65 mg
Ferrous sulfate, exsiccated (Feosol)	200 mg tid	65 mg
Ferrous gluconate	325 mg tid	36 mg
Ferrous fumarate (Hemocyte)	325 mg bid	106 mg

In addition to beginning iron replacement therapy, when the hemoglobin falls below 10 g/dL blood, the midwife should initiate the following laboratory tests directed at determining cell size and screening for the most common etiologies for anemia [33]:

1. Complete blood count (CBC) with differential
2. Reticulocyte count
3. Serum iron
4. Serum ferritin
5. Total iron-binding capacity (TIBC)
6. Platelet count
7. Hemoglobin electrophoresis

If these studies confirm iron deficiency anemia, continue iron replacement and monitor for improvement. If other than iron deficiency alone is suspected, evaluate the lab results according to Table 24-11. Physician consultation is recommended when iron deficiency anemia is recalcitrant, or if another etiology is identified or suspected.

Sickle Cell Disease (Hemoglobin S Disease) and Sickle-C Disease (Hemoglobin C Disease)

All African American women should be screened for the sickle cell trait at the initial prenatal visit. Those women with this trait should have genetic counseling along with the baby's father in order to rule out the presence of sickle cell disease in the fetus. In addition, these women have an increased risk of urinary tract infections during pregnancy and should be screened appropriately.

TABLE 24-11 Laboratory Diagnosis, Evaluation, and Management of Anemia

			Management	
Laboratory Test	*Result*	*Interpretation*	*Additional Data Needed*	*Treatment*
Hemoglobin	<10.0 g/dL	True anemia (hypochromic)	Management based on other indices	
Reticulocyte count	Elevated above 2.5%	Increased marrow activity due to blood loss or hemolysis	Review history for blood loss, hemolysis Order stool for ova and parasites	
	Absent to low (<0.5%)	Marrow failure due to iron or folate deficiency or effect of medications	Review medications for risk of marrow depression side effect	Change medication Supplement with iron and folic acid
Mean corpuscular hemoglobin (MCH)	Decreased	Iron deficiency (hypochromic)		Supplement with iron
Mean corpuscular volume (MCV)	Low value MCV <80 fl	Iron deficiency (microcytic) Confirms iron deficiency if serum ferritin is also low		Supplement with iron
	High value MCV >95 fl	Folate or vitamin B_{12} deficiency (macrocytic)	Order serum folate	If serum folate is low, supplement with folic acid If serum folate is high or normal, consider vitamin B_{12} deficiency Consult with physician for further evaluation
Serum iron	Elevated slightly	Mobilization of iron stores		Supplement with iron
	Low	Depleted iron stores		Supplement with iron
Serum ferritin	Elevated	Iron overload, inflammatory diseases, alcoholism, inflammatory liver diseases		Consult physician for further evaluation
	Normal or elevated	Chronic disease, thalassemia		Consult MD for further evaluation
	Low	Iron stores depleted		Supplement with iron
Total iron-binding capacity (TIBC)	Elevated	Response to fall in serum iron		Supplement with iron
Platelets	Mild decrease (100,000–149,000/mm^3)	Thrombocytopenia Gestational most likely	Antiplatelet antibody screen, peripheral smear Recheck platelet counts each trimester, 36 weeks, and in labor	No treatment needed Consult physician for further evaluation
	Moderate decrease (50,000–99,000/mm^3)	Thrombocytopenia Gestational most likely	As above	No treatment needed Consult physician for further evaluation and collaborative management
	Profound decrease (<50,000/mm^3)	Thrombocytopenia Gestational, ITP, HELLP	As above Preeclampsia labs	Medical management

TABLE 24-11 Laboratory Diagnosis, Evaluation, and Management of Anemia (*continued*)

			Management	
Laboratory Test	*Result*	*Interpretation*	*Additional Data Needed*	*Treatment*
Hemoglobin electrophoresis	AA	Normal		Inform woman
	AS	Sickle cell trait		Inform woman
		Carrier		Genetic counseling
				Monitor for urinary tract infections
	SS	Sickle cell disease		Inform woman
				Consult physician for further evaluation and collaborative management

Pregnancy increases the frequency and intensity of sickle cell crises in the woman with SS and SC hemoglobin. The midwife works collaboratively with a physician knowledgeable in the management of the complex hematologic problems when caring for a woman with sickle cell disease (see Chapter 7).

G6PD Deficiency

Glucose-6-phosphate dehydrogenase (G6PD) deficiency is an X-linked genetic disease that affects an enzyme (G6PD) associated with red blood cells. G6PD deficiency is common in those of Mediterranean descent and in African Americans. Hemolysis occurs when the individual has an infection, undergoes surgery, or receives oxidant drugs. Oxidant drugs commonly used in pregnancy and women's health care that must not be given to individuals with G6PD deficiency include sulfa and sulfa derivatives, nitrofurantoin (Macrodantin), toluidine blue, and methylene blue. If a particular woman's care requires the use of any of these drugs and you do not know her G6PD status, you should obtain a G6PD screen. The woman should be informed of the results and genetic counseling should be offered, if indicated. In women with the Mediterranean variant of G6PD deficiency, fava beans will trigger hemolysis.

Management of care of women with G6PD deficiency includes avoidance of drugs (and fava beans, for Mediterraneans) that may cause hemolysis. Prompt diagnosis and treatment of infections such as urinary tract infections will minimize the risk of hemolysis from infection. Surgery can precipitate an episode of hemolysis. Therefore, the midwife should remind the woman to notify her surgeon and surgical team prior to any elective or required surgery. Genetic counseling and prenatal diagnostic testing should be offered to all women with G6PD deficiency. When caring for a pregnant woman with G6PD deficiency, the midwife should notify the consulting physician so that appropriate care can be provided in the event an operative delivery is needed or the woman requests postpartum surgical sterilization.

Thalassemia

In pregnancy, it is important to accurately diagnose anemia and not just to decide that all anemia is realted to iron deficiency. In the case of thalassemias, folic acid supplementation may be useful, but iron supplementation is not indicated and may cause hemosiderosis, an overaccumulation of iron. In addition, genetic counseling is indicated as this is a genetically inherited condition. (See Chapter 7 for discussion of thalassemia.)

Gestational Idiopathic Thrombocytopenic Purpura

A decrease in the platelet count below the lower limits of normal is considered to be thrombocytopenia. An increase in plasma volume during pregnancy will result in a slight dilutional effect in platelet levels, but they should not drop below normal (generally considered to be 150,000/millimeters^3. The most common cause of decreased platelets in pregnancy is gestational thrombocytopenia [30]. It is usually mild (platelets between 100,000 to 150,000/millimeters^3), and has no serious complications for mother or fetus. Immune thrombocytopenic purpura (ITP), thrombotic thrombocytopenic purpura (TTP), and hemolytic uremic syndrome (HUS) are uncommon chronic hematologic diseases that may be encountered during pregnancy and must be ruled out when platelets are abnormally low.

Any woman who has an abnormally low platelet count, or a history of any bleeding problems during previous pregnancies, should have laboratory evaluation that includes antiplatelet antibody screening and a peripheral smear. Coagulation studies may also be requested. Consultation with a physician is required for making a management plan. In the majority of cases, no treatment will be necessary. If the mother's platelets are low, in rare instances, fetal platelets may also be depressed. In order to avoid problems for the fetus, internal scalp electrodes are not to be used unless considered of greater benefit than risk. Fetal scalp blood sampling and operative vaginal birth should be avoided if at all possible [30]. Vacuum assisted vaginal birth is contraindicated.

Von Willebrand's Disease

This genetic disease is responsible for an increased risk of bleeding in women (see Chapter 7 for discussion of the disorder). During pregnancy, there is increased risk for postpartum hemorrhage [30].

Heart Disease

The New York Heart Association (NYHA) [34] classification of cardiac status is the standard method used to classify heart disease. The purpose of the NYHA system is to provide a tool for communicating functional status in heart disease. The NYHA classification is shown in Table 24-12.

The normal physiologic changes of pregnancy increase cardiac output up to 40 percent above cardiac output during the nonpregnant resting state. This increase occurs early in pregnancy and peaks by 20 to 24 weeks. There is also marked fluctuation in cardiac output during pregnancy with changes in body position. Cardiac output increases further in labor, with an almost 50 percent increase during contractions. Cardiac output is highest immediately postpartum. During pregnancy, labor, and delivery, the increase in cardiac output places the woman with a history of heart disease at increased risk of cardiac decompensation [35]. A woman may enter pregnancy with Class I heart disease and become Class II or III with the physiological stress of pregnancy and delivery. Therefore, careful consideration must be made when there is any concern for cardiac status in pregnancy.

The most common cardiac abnormality in young women and therefore during pregnancy is mitral valve prolapse (MVP). This may be suspected on auscultation with the classic systolic click. Diagnosis is made by echocardiogram. The severity is based on whether there is evidence of valvular leaflet thickening or regurgitation. When no regurgitation is present, this is an innocuous problem during pregnancy, only requiring consideration of the need for antibiotic prophylaxis [36] (see Figure 24-1).

The American Heart Association's guidelines recommend that women with MVP without mitral regurgitation or thickened leaflets, do not require antibiotic prophylaxis for cesarean section or vaginal birth [36]. If a woman has additional cardiac complications, or if she develops chorioamnionitis or postpartum infection, she should be treated with an antibiotic appropriate for eradication of entero-

TABLE 24-12 The New York Heart Association (NYHA) Classification of Cardiac Status

Class	Summary	Characteristics
I	Uncompromised	Physical activity is not limited No symptoms of cardiac insufficiency No anginal pain
II	Slightly compromised	Slight limitation of physical activity Comfortable at rest Ordinary physical activity results in excessive fatigue, palpitation, dyspnea, or anginal pain
III	Markedly compromised	Marked limitation of physical activity Comfortable at rest Less than ordinary activity results in excessive fatigue, palpitation, dyspnea, or anginal pain
IV	Severely compromised	Inability to perform any physical activity without discomfort Symptoms of cardiac insufficiency or angina may develop at rest Any activity increases discomfort

Source: Varney, H., Kriebs, J. M., Gegor, C. L. Antepartal complications. In *Varney's Pocket Midwife*. Sudbury, MA: Jones and Bartlett, 1998.

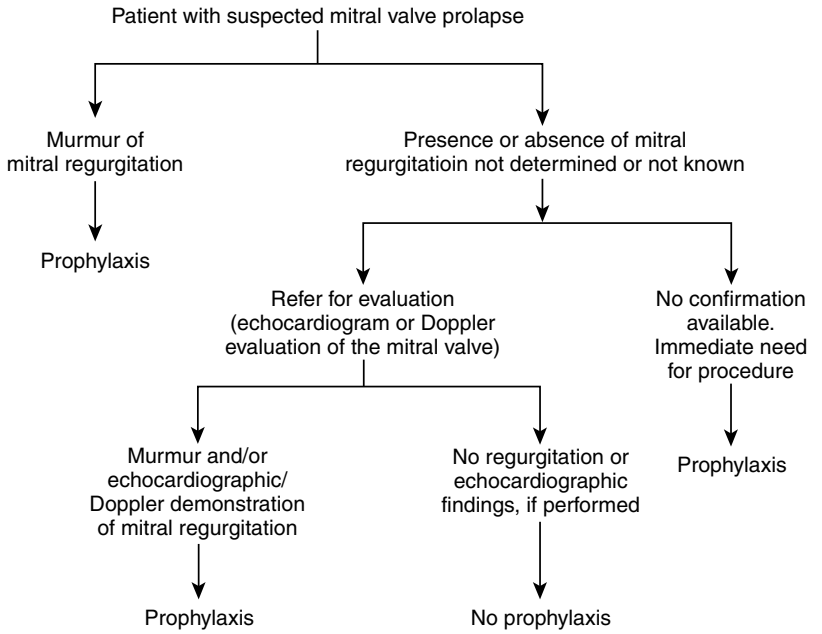

FIGURE 24-1 Clinical approach to determination of the need for prophylaxis with suspected mitral valve prolapse.

Source: Dajani, A. S., Taubert, K. A., Wilson, W., et al. Prevention of bacterial endocarditis: Recommendations by the American Heart Association. JAMA 227(22):1794–1801 (June 11) 1997. Reprinted by permission of the American Medical Association.

cocci. If a woman requires antibiotic prophylaxis due to mitral valve regurgitation with mitral valve prolapse or another risk category, refer to Table 24-13 for the drug of choice.

Thyroid Disorders

During pregnancy, there is an increased demand for thyroid hormone secretion. When the thyroid gland is normal, this will not present a problem. However, if the woman is hypothyroid, or has a subtle, unrecognized degree of hypothyroidism, she may become symptomatic, resulting in concern for both herself and the fetus. Hyperthyroidism may also become symptomatic and has implications for both mother and fetus (see Table 24-14).

At the current time, there is not considered to be an adequate cost-benefit ratio to screening all women for thyroid disorders [37]. However, when indications exist (see Table 24-15), a serum TSH should be drawn and evaluated according to Figure 24-2. If the TSH is abnormal, then a free thyroxine 4 index (FT4I) should be drawn [38]. Consultation is required for abnormal testing results and need for medication. (Chapter 7 has further discussion of signs, symptoms, and management of thyroid disease.)

TABLE 24-13 Recommended Prophylaxis for Genitourinary Procedures

Risk Status	Medication/Dosage
High	Initial dose within 30 min of starting procedure: Ampicillin 2 gm IM or IV; and Gentamicin 1.5 mg/kg (not to exceed 120 mg) IM or IV 6 hr later: Ampicillin (only) 1 gm IM or IV
Moderate	2 hr before the procedure: Amoxicillin 2 gm orally or Within 30 min of procedure: Ampicillin 2 gm IM or IV
	If Penicillin Allergic
High	To be completed 30 min before procedure: Vancomycin 1 gm IV over 1–2 hr and Gentamicin 1.5 mg/kg (not to exceed 120 mg) IM or IV
Moderate	To be completed 30 min before procedure: Vancomycin 1 gm IV over 1–2 hr

Source: Dajani, A. S., Taubert, K. A., Wilson, W., et al. Prevention of bacterial endocarditis: Recommendations by the American Heart Association. JAMA 227(22):1798 (June 11) 1997. Reprinted by permission of the American Medical Association.

TABLE 24-14 Effects of Abnormal Thyroid Levels in Pregnancy

Hyperthyroid	
Maternal	*Fetal*
Miscarriage	Neonatal hyperthyroidism
Preterm labor/delivery	IUGR
Congestive heart failure	SGA
Thyroid storm	Prematurity
PIH	Stillbirth
Abruptio placentae	
Infection	
Hypothyroid	
Maternal	*Fetal*
Hyperemesis-like syndrome	Congenital malformation
PIH	Low birth weight
Abruptio placentae	Fetal anemia (<26%)
Postpartum hemorrhage	Stillbirth
Postpartum depression-like syndrome	

TABLE 24-15 Indications for Thyroid Testing in Pregnancy

Family History
Autoimmune thyroid disease (Hashimoto's disease)
Current Medical Diagnosis
Hypothyroidism with thyroid supplementation
Hyperthyroidism with thyroid suppression
Presence of goiter
Presence of thyroid nodule
Type I diabetes mellitus
Previous History
High-dose neck radiation
Graves' disease (hyperthyroid)
Thyroid cancer
Postpartum thyroid dysfunction
Infant with thyroid disease

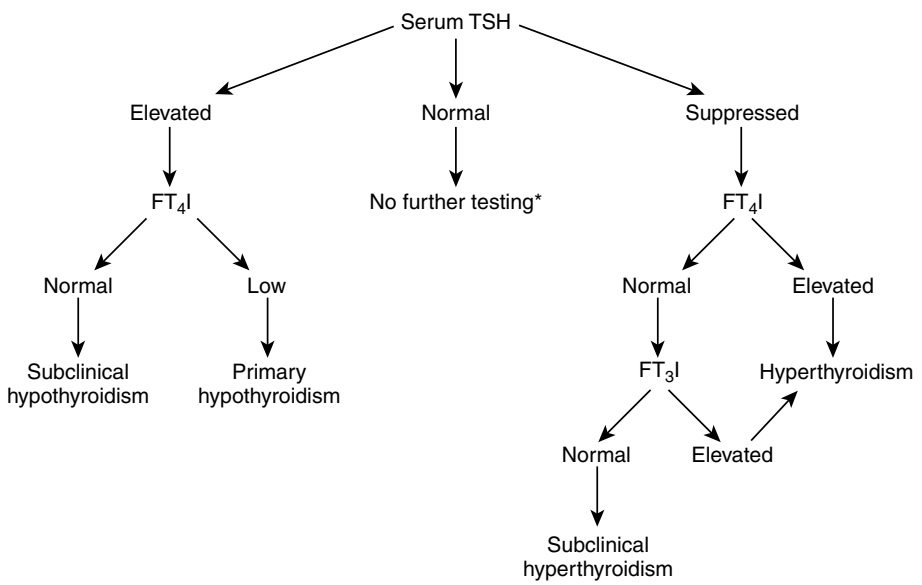

FIGURE 24-2 Algorithm for the diagnosis of thyroid disease.

Source: From Mestman, J. H. Endocrine diseases in pregnancy. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 33, p. 1142. Reprinted by permission.

Asthma

It is estimated that 1 to 4 percent of pregnant women have asthma. During pregnancy, the clinical course of asthma cannot be predicted. There is evidence that women with severe asthma before pregnancy will continue to experience severe problems and may get worse during pregnancy. In women with a history of asthma without recent acute episodes and women with occasional episodes, the pattern may continue, improve, or worsen. The experience of asthma in previous pregnancies may offer an indication of the course of asthma during the current pregnancy. Women generally return to

their prepregnant level of severity of asthma by 3 months postpartum. (Asthma as a medical disorder and in pregnancy is also discussed in Chapter 7.)

Asthma is associated with increased perinatal mortality, hyperemesis gravidarum, preterm delivery, chronic hypertension, preeclampsia, low birth weight infants, and vaginal hemorrhage. The incidence and severity of these adverse effects of asthma on pregnancy may be mitigated by good asthma control.

Medications commonly used to manage asthma are safe and effective during pregnancy. These include inhaled bronchodilators such as albuterol (Proventil), metaproterenol (Alupent), and terbutaline sulfate inhalation aerosol (Brethaire). Oral theophylline (Theo-Dur, Slo-Bid) may also be used. Anti-inflammatory agents that may be used include beclomethasone (Vanceril, Beclovent), flunisolide (Aerobid), and prednisone. The need for anti-inflammatory agents indicates severe asthma [39].

During labor and delivery, the woman should continue to take her regular medication. Care should be taken to ensure that she remains hydrated and that her pain is managed appropriately. These measures will help prevent bronchospasm. Medications to be avoided during labor and delivery include morphine and meperidine (Demerol), which can produce bronchospasm. If a prostaglandin is needed to manage fourth-stage postpartum hemorrhage, then prostaglandin E2 (PGE2), marketed as dinoprostone, should be used. The more common prostaglandin, 15-methyl prostaglandin F_2 alpha (PG F2α), marketed as Hemabate, Carboprost, or Prostin/15M, may trigger bronchospasm in women with a history of asthma.

Multiple Pregnancy

It is essential that a multiple pregnancy be identified as early as possible. A number of complications are associated with the pregnancy, labor and delivery, and puerperium of a woman pregnant with more than one fetus. No woman receiving antepartal care should enter labor with an undiagnosed multiple gestation. This statement, however, is not meant to advocate routine ultrasound screening. Rather, it emphasizes the importance of clinical skill and judgment.

The following are signs and symptoms indicative of a possible multiple pregnancy:

1. Large-for-dates uterine size, fundal height, and abdominal girth, associated with rapid uterine growth during the second trimester
2. Severe nausea and vomiting (associated with rapidly increasing hCG levels)
3. Familial history of twins (in and of itself not indicative)
4. History of recent use of ovulation-inducing drugs such as clomiphene citrate (Clomid) or menotropins (Pergonal)
5. Abdominal palpation of three or more large parts and/or multiple small parts, especially in the third trimester when these are more readily felt
6. Auscultation of more than one clearly distinct fetal heart tone (differing by more than 10 beats per minute and separate from the maternal pulse)

When there is discrepancy between the estimated gestational age and the uterine size at the initial prenatal visit, ultrasound evaluation is indicated to accurately date the pregnancy and to rule out the possibility of a twin (or greater) gestation. With multiple pregnancy, it is common for a woman to register in the first trimester and have that physical exam be consistent with the dates. Then, when she returns for a subsequent visit, the uterus will seem to have grown more than expected. This may be dramatic or it may only be slightly ahead of dates. The decision of when to do an ultrasound exam is based on clinical judgment. The midwife may wish to wait until the next visit if the uterine size is not dramatically larger, or may decide to reconfirm dating and rule out multiple pregnancy as soon as there is any suspicion of size greater than dates. Diagnosis is made on the basis of clinical findings and confirmed with ultrasound.

Midwifery management of multiple pregnancy depends on the setting. Twin gestations are considered to be at risk for the following [40]:

1. Fetal anomalies
2. Early pregnancy loss
3. Stillbirth
4. IUGR
5. Placenta previa
6. Preterm labor and birth
7. Gestational diabetes
8. Preeclampsia
9. Malpresentation
10. Dysfunctional labor

Therefore, if midwives plan to participate in management of twin gestations, they should have immediate access to consultative physician care and

anticipate birth in the hospital. Higher order multiples (triplets and greater) require medical management. For midwives who plan to care for women with multiple pregnancy, this chapter is not considered to be adequate instruction. Consider referring to a medical obstetric text for further information about the physiology and potential problems that may be encountered. It is important to develop a management plan with the consultant physician at the time of diagnosis of twins and at agreed upon times during the pregnancy.

Ultrasound diagnosis will be focused on fetal number, fetal anatomy, and placentation. In twins, the placenta is evaluated not only for position, but also for chorionicity of the twinning. In many cases, it is possible to determine if the twins are monozygotic or dizygotic. In addition, they will attempt to identify whether the twins are mono- or di-amniotic. These distinctions are necessary to help predict risks for complications. Figure 24-3 illustrates the possible combinations of chorionicity and amnionicity.

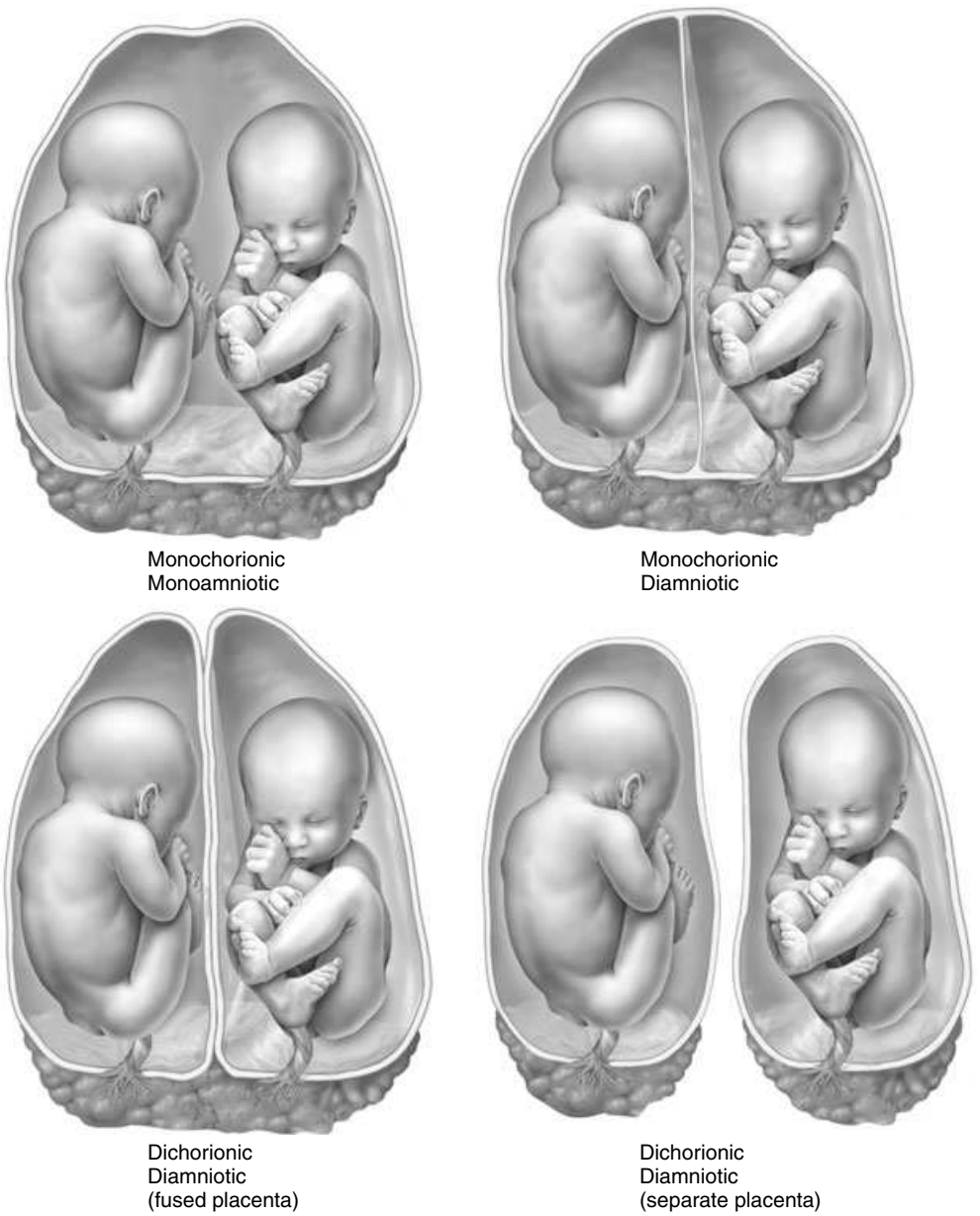

FIGURE 24-3 Placentation in twin pregnancies.

Once the diagnosis of twin pregnancy is made, the couple should be advised of this diagnosis and have a discussion about the changes in management of the pregnancy that will be necessary. This will include more frequent prenatal visits, increased surveillance for complications, at least monthly sonograms, physician consultation, and earlier changes in home and work responsibilities.

The first concern is that of fetal growth. Maternal nutrition is critical to the development of the fetuses. As explained in Chapter 22, protein and calories should be added to the diet for each fetus. Women should be evaluated carefully for the duration of their pregnancy for weight gain and fetal growth. Weight gain is essential for the woman to have the nutritional stores necessary for adequate fetal growth. After 24 weeks, the woman should be seen every 2 weeks until 36 weeks, and then weekly, unless there is a concern that indicates more frequent visits.

Fetal growth should be monitored by ultrasound as fundal height cannot give information about the individual fetus. It is generally accepted that ultrasound exams will be done every 3 to 4 weeks from 20 weeks until term for assessment of fetal growth. Of importance is not only the continued growth of each fetus but also consistency in size. If one of the twins becomes discordant, or if both twins are found to be lagging in growth, there will be heightened concern for intrauterine growth restriction (IUGR). Poor fetal growth may occur because of the tremendous demands of the mother for nutritional support or because of uteroplacental insufficiency. The large size of the placenta can stress the capability of uterine blood flow, especially when there is underlying pathology such as maternal hypertension, diabetes, or collagen vascular disease. If one or both fetuses have poor growth patterns, consultation is required as this then becomes a high risk pregnancy.

Due to the larger placental mass, the placental hormones are greater, which makes the risk for development of gestational diabetes higher. Glucose screening should be done at 24 to 26 weeks. The normative values for interpretation and the limits for glycemic control of the mother are the same as with a singleton pregnancy.

Increased surveillance of the woman with twins is indicated for evaluation of risks for preterm labor. Preterm labor symptoms should be carefully reviewed with the woman at each visit. In addition, ultrasound measurement of the cervix should be done with each scan for fetal growth [39]. Cervical examination should be performed as described in Chapter 29 for all women with an increased risk of preterm labor.

Preeclampsia has a higher incidence in women with multiple gestation, most likely related to increased placental mass and hormone production. Therefore, the woman and her family should be apprised of the symptomatology. Close observation of blood pressure measurement, weight gain, proteinuria, and edema in addition to development of headaches and scotomata must be carried out. The diagnosis and management of preeclampsia are discussed later in this chapter.

In multiple gestation, the physical discomforts of pregnancy are more extreme, body image may be even more distorted, preparations for baby care are multiplied, and finances may be more strapped. All of these factors pose additional stress, which requires the midwife to spend additional time in counseling and patient education. Midwifery management of multiple gestation can be very effective despite the increased risk for complications. Close rapport with the woman and her family, increased dietary counseling, and education regarding preterm labor and preeclampsia are critical to quality care of the multiple pregnancy.

Management also includes limiting activity and increasing rest periods throughout pregnancy. Bedrest has not been found to be an effective means to prevent preterm labor in multiple gestation. However, rest periods will become increasingly necessary and women should avoid exhaustion and long hours standing. Instruction regarding sexual activity should be based on cervical findings, previous obstetrical history, and strength of Braxton Hicks contractions. Advice may include the use of condoms because the prostaglandins in the semen can cause uterine irritability, or may extend to complete pelvic rest including avoidance of orgasm, based on individual findings.

Plans should be made for the physician to attend the birth. The midwife may have a key role in the vaginal birth of twins when the progress is normal. However, with twins, circumstances can change rapidly and the staff must be prepared to respond. In the event that the first twin is vertex, many physicians will proceed with a vaginal birth. Regardless of the second twin's position at the time of labor, once twin A is born, twin B can move freely in the vacated space and change position easily. Based on the resultant position of twin B, the physician's experience and preference, the baby may be delivered vaginally or by cesarean. If twin B

is vertex, a vaginal birth can be anticipated if the cervix remains dilated and allows the birth to proceed. If twin B is breech, some clinicians will allow the woman to give birth vaginally, either as a complete breech, or they may cause the fetus to become a double footling and guide the baby through a breech extraction. Other physicians will prefer to have a breech second twin, or a second twin who does not deliver quickly, to be born by cesarean. The decision-making is complex and must be in the hands of the physician.

Polyhydramnios (Hydramnios)

Polyhydramnios (hydramnios) is an excessive amount of amniotic fluid. Most polyhydramnios is of unknown etiology. The following conditions are likely to result in a higher incidence of polyhydramnios [41]:

1. Multiple pregnancy (especially with monozygotic twins)
2. Diabetes
3. Erythroblastosis
4. Fetal malformations (especially of the gastrointestinal tract—e.g., tracheoesophageal fistula—or central nervous system—e.g., anencephaly, meningomyelocele)

Polyhydramnios may produce the following additional complications [42]:

1. Preterm labor (due to overdistention of the uterus)
2. Maternal dyspnea and shortness of breath
3. Fetal malpresentations
4. Abruptio placentae
5. Cord prolapse
6. Uterine dysfunction during labor (due to overdistention of the uterus)
7. Immediate postpartum hemorrhage as a result of uterine atony from overdistention

The signs and symptoms of polyhydramnios include the following:

1. Uterine enlargement, abdominal girth, and fundal height far beyond that expected for gestational age
2. Tenseness of the uterine wall, making it difficult or impossible to auscultate fetal heart tones and to palpate the fetal outline and large and small parts
3. Elicitation of a uterine fluid thrill
4. Mechanical problems, if polyhydramnios is severe, such as dyspnea, lower extremity and vulvar edema; pressure pains in the back, abdomen, and thighs; heartburn, nausea, and vomiting
5. Frequent change in lie (unstable lie)

If the midwife suspects that a woman has polyhydramnios, the following workup should be done:

1. Obtain an ultrasound to confirm the diagnosis and identify any coexisting fetal or placental conditions or complications (see Chapter 23).
2. Screen for diabetes.
3. Screen for Rh alloimmunization.

When polyhydramnios is diagnosed, consultation with a consulting physician is indicated. The woman especially needs emotional support if congenital anomalies are present. Women with severe polyhydramnios have a number of mechanical difficulties and discomforts (listed above) for which the midwife can provide relief measures.

Oligohydramnios

Oligohydramnios is an abnormally small amount of amniotic fluid. The condition is frequently caused by uteroplacental insufficiency, which thereby means that a decreased fluid volume may be associated with a marked increase in perinatal mortality. The following conditions have a higher incidence of oligohydramnios [43]:

1. Congenital anomalies (e.g., renal agenesis, Potter's syndrome)
2. Viral diseases
3. Intrauterine growth restriction (IUGR)
4. Uteroplacental insufficiency
5. Early rupture of the fetal membranes (24 to 26 weeks)
6. Response to indocin as a tocolytic
7. Fetal hypoxia
8. Meconium-stained fluid and meconium aspiration
9. Postmaturity syndrome

The clinical signs and symptoms of oligohydramnios include the following:

1. "Molding" of the uterus around the fetus
2. A fetus that is easily outlined
3. A fetus that is not ballotable
4. Lagging fundal height

These clinical signs and symptoms are based on the fact that the amniotic fluid volume is below what is normally found for that particular gestational age. The amount of amniotic fluid is variable among women with normal pregnancies and may also fluctuate during the course of pregnancy. Generally speaking, amniotic fluid increases throughout pregnancy until it reaches around 1000 milliliters by the start of the third trimester, and then it gradually decreases, starting around 34 weeks' gestation, to about 800 milliliters by term. Amniotic fluid volume is measured by ultrasound and is a standard component of complete ultrasound examinations and the biophysical profile (see Chapter 23).

Oligohydramnios can be associated with multiple variable decelerations in the fetal heart rate, as reflected on a nonstress test [44]. The decelerations probably occur because less fluid "cushions" the cord, and fetal movement or uterine contractions may cause transient cord compression. Amnioinfusion has been shown to reduce the incidence of variable decelerations during labor.

Oligohydramnios is a significant finding suggestive of postmaturity syndrome in a postdate pregnancy. The combination of oligohydramnios and a fetus that has suffered intrauterine growth retardation increases the risk that the fetus will tolerate labor poorly and that operative delivery may be necessary.

Discussion with the consulting physician should include identification of the underlying etiology of the oligohydramnios and consideration of different management strategies based on etiology and gestational age. Conservative management includes bedrest, hydration, good nutrition, monitoring of fetal well-being (fetal movement counts, NSTs, biophysical profile, Doppler velocimetry), regular ultrasound measurement of amniotic fluid volume, amnioinfusion, and induction and delivery. (See Chapter 23 for detailed discussion of antepartum fetal assessment.)

Diabetes Mellitus

Diabetes is an increasing problem in the United States. The incidence continues to rise each year across ethnic and socioeconomic groups [45], although the incidence varies greatly by demographic groups. The CDC identified a 70 percent increase in the prevalence of diabetes in women between ages 30 and 39 and a 27 percent increased prevalence in women under the age of 45 between 1989 and 1996 [45]. Overweight, weight gain, and lack of physical activity are major risk factors for developing diabetes [45]. Clearly, these are considerations for all midwives when encouraging women to select healthy lifestyles. It is also a growing problem in women of childbearing age, and it must be screened for with all pregnant women.

Gestational diabetes mellitus (GDM) is defined as the presence of carbohydrate intolerance of varying degrees of severity with an onset or first recognition during pregnancy [46, 47]. The diagnosis of gestational diabetes is made regardless of the need for insulin or diet control or whether there is likelihood that the diabetes existed, but was yet undiagnosed, prior to pregnancy. Gestational diabetes is associated with an increased risk of both maternal and fetal complications both during pregnancy and potentially throughout life. The incidence of GDM in the United States varies between ethnic populations, but averages about 7 percent [47]. The prevalence of gestational diabetes is increased in women of Hispanic, African, Native American, South or Eastern Asian or Pacific Island ethnicity [46].

A pregnant woman with diabetes is classified according to when she was diagnosed with diabetes. If the diabetes antedated the pregnancy, the classification is *pregestational diabetes*; if she was first diagnosed with diabetes while pregnant, she has *gestational diabetes*. Pregestational diabetics, like all nonpregnant diabetics, are classified as either Type I or Type II. Type I diabetes is true insulin-dependent diabetes mellitus, typically develops prior to adolescence, and is therefore usually diagnosed prior to pregnancy. The White classification for pregnant women of Class B, C, D, F, and above is associated with pregestational diabetes [46]. All women who are pregestational diabetics, whether Type I or Type II, will require insulin during pregnancy and should have medical management. Pregnant women who have pregestational diabetes and who are on oral hypoglycemic agents will need to be placed on insulin. Oral hypoglycemic agents such as Tolbutamide (Diabenase) are possibly teratogenic and are associated with prolonged neonatal hypoglycemia. Research has shown some value in using glyburide orally during pregnancy but requires further research to extend this to general populations [46].

Type II diabetes is not necessarily insulin-dependent and usually begins when the individual is over age 40. Women with Type II diabetes are generally overweight and do not have the immune

markers of Type I diabetes. Because of its later onset, Type II diabetes is less common in pregnancy. Blood glucose levels in Type II diabetes mellitus can usually be controlled with diet, exercise, and oral hypoglycemic agents when women are not pregnant.

Physiology

Diabetes is caused by the absence or inadequate production of insulin, a hormone that is secreted by the beta cells in the islets of Langerhans within the pancreas. Insulin is responsible for transport of glucose into the cells. Cellular survival is dependent on this incoming glucose, which is then transformed into energy. In diabetes, there is no shortage of glucose in the blood, but it cannot be transported to the cellular level without an adequate supply of insulin, which results in hyperglycemia.

In classic Type I diabetes, there is an absence of insulin, thereby requiring the cells to metabolize fats and proteins for energy. Their breakdown forms ketones that are acidic, requiring mobilization of buffers for neutralization. Eventually, the acidosis overcomes the body, causing coma and eventually death.

In Type II diabetes, insulin is produced, but the cells are resistant to the insulin, requiring increasing amounts to be secreted. Eventually, the pancreas is not able to meet the increasing demand, and hyperglycemia results. Overwhelming ketosis is an uncommon problem with Type II diabetes.

Gestational diabetes is similar to Type II diabetes, in that there is insulin available. However, hormonal changes of pregnancy alter the body's receptivity to insulin. In early pregnancy (prior to 20 weeks) the cells are more responsive to insulin and circulating glucose levels may be lower than usual. This may be a reason for some women to experience nausea and vomiting when they have gone without food for a long period of time, such as through the night.

As the placenta grows, the production of pregnancy hormones, specifically human placental lactogen (HPL) increases. HPL increases cellular resistance to insulin, causing a diabetogenic state [46]. In most women, the pancreas is able to increase the supply of insulin to meet this increased demand. But when the pancreas is unable to produce adequate insulin, hyperglycemia results. The peak effect of HPL occurs around 26 to 28 weeks of pregnancy, the suggested timing for screening.

Hyperglycemia is responsible for many adverse effects during pregnancy. For Type I or Type II pregestational diabetics, in poor glycemic control during organogenesis, elevated glucose and ketone levels have been found to have teratogenic properties resulting in congenital anomalies such as cardiac defects, central nervous system defects, and caudal regression syndrome. Spontaneous abortion and stillbirth are also increased. The vasculopathy of Type I diabetes may cause decreased blood flow to the uterus and placenta, thereby increasing the incidence of uteroplacental insufficiency resulting in IUGR and its related complexities. Hypertension and preeclampsia are also found in greater numbers of diabetic women.

For gestational diabetics, whose early pregnancy blood sugars were most likely not elevated, the risk of congenital anomalies is the same as the general population. Instead, as the demand for insulin increases, hyperglycemia also increases. Insulin is a hormone very similar to human growth hormone (HGH). As maternal blood sugar elevates, it crosses the placenta to the fetus. The fetus does not have diabetes, but must increase its own production of insulin in order to metabolize the glucose. This response to elevated glucose and insulin levels causes a dramatic growth profile in the fetus resulting in a macrosomic infant [46]. Macrosomia is caused by hyperplasia, an increased number of cells, and hypertrophy, an enlargement of the infant's cells. Thus, this is a lifelong change for the fetus that has been shown to increase the likelihood of childhood and adult obesity as well as an increase in the risk for diabetes later in life [48]. Macrosomia is a known complication of the intrapartum period, placing the mother and fetus at increased risk for protracted labor, shoulder dystocia, and operative delivery.

For gestational diabetic mothers, there is an increased incidence of hypertension and preeclampsia complicating the intrapartum course. There is also an increased risk of Type II diabetes developing later in life.

Screening

Every pregnant woman should be screened for diabetes. The guidelines used here are from the American Diabetes Association [47], and the Fourth International Workshop-Conference on Gestational Diabetes [47]. Each midwife must be aware of the screening guidelines and the laboratory assessments that are used in their own clinical site. With all methods, the initial screening for gestational diabetes begins with the first visit and history taking.

For the subset of women who have no identifiable risk factors, the ADA suggests that no laboratory screening is indicated. This includes women who meet *all* of the following criteria:

1. Age <25 years
2. Weight normal before pregnancy
3. Member of an ethnic group of low prevalence of GDM (white American or Western European)
4. No known diabetes in first-degree relatives
5. No history of abnormal glucose tolerance
6. No history of poor obstetric outcome [47]

Conversely, if a fasting glucose is found to be >126 mg/dL or a nonfasting glucose sample is found to be > 200 mg/dL, then the diagnosis of gestational diabetes can be made without further screening tests [47]. For all other women, a stepwise screening process applies.

When high risk symptoms or historical factors exist at the initial prenatal visit, or become evident in a subsequent visit, a laboratory screening test should be performed at that time. The criteria for early screening are as follows:

1. Marked obesity
2. History of GDM in a prior pregnancy
3. Strong family history of diabetes (parents, siblings, grandparents)
4. Previous infant >4000 grams
5. History of previous unexplained stillbirth
6. Poor obstetrical history (e.g., spontaneous abortions, congenital anomalies)
7. Recurrent glycosuria (two positive tests) in clean-catch specimens, not explained by dietary intake. Glycosuria secondary to dietary intake illustrates the lowered renal threshold for glucose, which is a normal physiologic change during pregnancy.

The midwife should screen all pregnant women for whom there are no initial risk factors for diabetes mellitus between 26 and 28 weeks' gestation. In addition, all women who had risk factors and normal screening results early in pregnancy, should be rescreened between 26 and 28 weeks. If the screening test is normal, no further testing is needed unless new risk factors develop.

If secondary risk factors such as preeclampsia, polyhydramnios, or a large-for-gestational-age fetus are identified, rescreening when these risk factors are first noted should be considered.

Screening has become virtually standardized with the use of a glucose challenge test (GCT). The GCT is a random, nonfasting, oral 50-gram glucose load followed in one hour by a blood glucose draw. A glucose threshold of >140 mg/dL will successfully lead to diagnosis of 80 percent of women with carbohydrate intolerance consistent with gestational diabetes. A cut-off of >130 mg/dL will increase the yield to 90 percent. For those women who have a screening test result over the stated norm (>140 or >130 mg/dL), a 3-hour oral glucose tolerance test (OGTT) is the diagnostic study that must be done. The exception to this is that, if the screening GCT glucose value is > 200 mg/dL, then the diagnosis of GDM is made without further testing.

Procedure for an OGTT

1. Three days prior to the test, the daily intake of carbohydrate must exceed 150 grams, and physical activity should be unrestricted.
2. Perform the test in the morning after an 8 to 14-hour fast (except water).
3. Administer the glucose mixture—to be ingested within 10 min.
4. There should be no eating or drinking (other than water) and no moderate or vigorous exercise or smoking for the duration of the test.

Most laboratories have established their laboratory values on the basis of using 100 grams of the glucose solution for diagnosis in pregnancy. The criteria for normal values are based on work by O'Sullivan and Mahan, which has been modified by Carpenter and Coustan [47]. The upper limits of normal are listed in Table 24-16.

Management

The goal of management of GDM is to maintain a normal fasting blood sugar. Most women with gestational diabetes can control this condition with a combination of diet and exercise. The following is a summary of the American Diabetes Association's Clinical Practice Recommendations for Gestational Diabetes [47].

Every woman with GDM should have a visit with a nutritionist or a nurse or midwife with detailed knowledge of medical nutritional therapy (MNT). This visit must include careful explanation of the exchange food list and the caloric intake necessary to meet the maternal and fetal nutritional needs, but avoid fasting and postprandial hyperglycemia, as well as ketonemia [49, 51]. Controversy exists in the literature and between organizational guidelines regarding the ideal division of calories between carbohydrate, fat, and protein sources as well as the required overall daily caloric intake. The ADA suggests that nutrition requirements during preg-

TABLE 24-16 Diagnostic Criteria for Gestational Diabetes

3-hr, 100 g OGTT

Abnormal, or diagnostic for GDM: two or more of the following plasma glucose values are met or exceeded:

Fasting	95 mg/dl
1 hr	180 mg/dl
2 hr	155 mg/dl
3 hr	140 mg/dl

—OR—

2-hr, 75 g OGTT (an alternative diagnostic test)

Abnormal, or diagnostic for GDM: two or more of the following plasma glucose values are met or exceeded:

Fasting	95 mg/dl
1 hr	180 mg/dl
2 hr	155 mg/dl

—OR—

If the screening GCT glucose value is > 200 mg/dl, then the diagnosis of GDM is made without a 2- or 3-hr OGTT.

Note: When processing the serum samples, the vast majority of laboratories will spin the blood down and use the plasma for evaluation of the glucose levels. Therefore, the values used here reflect the norms for plasma. If the testing is done in an office setting using whole blood samples with a glucometer, the normative values should be approximately 15 percent lower than listed above for plasma samples.

Source: American Diabetes Association. Gestational diabetes mellitus. Clinical Practice Recommendations 2002: Position Statement. *Diabetes Care* 25 (suppl.), 1:S95 (January) 2002.

nancy and lactation are the same for women with or without diabetes [49].

Home glucose monitoring by finger stick is widely available and has been shown to be an adequate measure of glycemic control. If possible, every woman with diabetes in pregnancy should have and be instructed in the use of a home glucose monitor. Daily self-monitoring of blood glucose (SMBG) has been shown to be a better method of tracking blood sugar values than intermittent office monitoring of plasma glucose. If a glucometer is not available, or if the woman cannot handle doing SMBG, then monitoring in the office or laboratory is an acceptable alternative. It may be prudent to occasionally test a woman in the laboratory setting, particularly if she is not consistent with SMBG. The target blood glucose values for whole blood with a glucose monitor should be as follows:

Fasting	<95 mg/dl
1 hour postprandial	<140 mg/dl
2 hour postprandial	<120 mg/dl

If a laboratory sample is performed with plasma, the values should be as follows [47]:

Fasting	<105 mg/dl
1 hour postprandial	<155 mg/dl
2 hour postprandial	<130 mg/dl

There is no absolute agreement regarding the best times for testing women with diet-controlled GDM. Some feel that fasting values are the best predictors of overall glycemic control, while others prefer postprandial [46]. The most important factor is consistency. A common practice is to perform fasting and 2-hour postprandial samples once or twice a week, and, if normal, only use one sample the remaining days.

Urine glucose monitoring in GDM is not useful, as there is very poor correlation between blood glucose levels and urine glucose levels in pregnancy due to the lowered renal threshold for glucose. If there is concern about inadequate caloric intake, urine sampling for ketonuria may be helpful.

For the woman who is maintained with dietary therapy alone, daily self-testing should be started at the time of diagnosis. If there is difficulty with glycemic control, or an upward trend in the values, then daily testing should continue until labor begins. If, however, fasting and postprandial blood sugar levels are routinely maintained in the normal ranges, a woman with diet-controlled GDM, may decrease the frequency of testing to every other day or twice a week, as long as the values remain normal [46]. A record of the blood glucose values should be maintained and brought to each prenatal visit.

If a woman is unable to maintain her blood sugar values within these ranges on medical nutrition therapy (MNT), then she should have a physician consult to evaluate her need for insulin. A thorough history is needed to evaluate the adherence to the dietary plan, as well as to identify other factors such as illness or severe stress that may be causing difficulty in management of euglycemia (normal blood sugar).

Exercise is known to improve glucose metabolism. Mild to moderate exercise may be of benefit in both pregestational and gestational diabetes and has no adverse fetal effects [46]. Women should be encouraged to continue mild to moderate exercise, such as walking, but to avoid exercise while in the fasting state (e.g., before breakfast). Exercise when fasting increases the risk of hypoglycemia for insulin-dependent diabetics.

Women with diet-controlled GDM may be managed by the midwife with appropriate medical

consultation. In addition to close observation of blood glucose levels, the midwife will observe for macrosomia, polyhydramnios, and hypertension or preeclampsia, as these are common complications of GDM.

As in routine prenatal care, careful abdominal palpation should be performed at each prenatal visit. A fundal height measurement greater than dates may indicate macrosomia or polyhydramnios. Ultrasound examination is indicated in this situation for evaluation of both fetal size as well as an amniotic fluid index. If the scan shows normal growth and fluid volumes, then prenatal care should proceed routinely.

Management of polyhydramnios is discussed earlier in this chapter, and Chapter 25 covers management of the large for dates fetus. If the fetus is shown to be large for dates, or if there is an excessive amount of amniotic fluid, physician consultation is advised. In either case, repeat ultrasound will be recommended for accurate, ongoing evaluation. In addition, the woman should be kept informed of the testing results and implications.

Fetal movement counting may be initiated by 34 to 36 weeks for diet-controlled GDM. If fetal growth remains within a normal range, amniotic fluid volumes appear to be normal, there is no hypertension, and no history of unexplained stillborn, no specific antepartum testing is required prior to term. At 40 weeks, a biophysical profile should be performed twice weekly until delivery.

For the gestational diabetic with an apparently appropriately grown infant and no evidence of hypertension, it is advisable to await spontaneous labor [46]. If there is concern for macrosomia or preeclampsia, or if there is a history of term stillbirth, induction at 40 weeks should be considered. Any increase in maternal blood pressure or evidence of preeclampsia should be managed as they would be for any pregnant woman, and the physician should be notified of abnormal findings.

Management of labor in women with diet-controlled gestational diabetes is no different from management of labor for any other woman. If intravenous fluids are necessary, a glucose mixture should not be used. Since the incidence of macrosomia is higher among women with diabetes, the midwife should carefully evaluate the estimated fetal weight and progress of labor with a higher level of suspicion for shoulder dystocia. The pediatrician should be informed when the woman goes into labor. Some babies may develop hypoglycemia following birth, especially if they are macrosomic.

Once birth has occurred, placental hormones are no longer present, and the gestational diabetes is no longer an issue. No further glucose testing is needed in the immediate postpartum period. All women with the diagnosis should have a 2- or 3-hour OGTT after their 6-week postpartum visit to determine if the abnormal carbohydrate metabolism was strictly related to pregnancy hormones or if she is indeed diabetic.

A woman with a diagnosis of gestational diabetes in one pregnancy will usually develop gestational diabetes in another pregnancy. Therefore, early testing is indicated in subsequent pregnancies. It is prudent to advise women of this and to recommend that they initiate the ADA dietary guidelines early in the next pregnancy.

An abnormal glucose tolerance test in pregnancy may also be predictive of later nonpregnant glucose intolerance. Approximately 60 percent of these women may develop glucose intolerance later in life [46, 47]. Therefore, the midwife should inform the woman with gestational diabetes of this potential and encourage her to develop a healthy lifestyle in order to delay or avoid adult onset diabetes. This emphasis on healthy lifestyle choices is also important because the children of mothers with GDM are at increased risk for obesity, glucose intolerance, and diabetes in their late teens and early twenties [48].

Women with diabetes confirmed at the postpartum visit or interconceptionally should be encouraged to seek preconception counseling prior to future pregnancy, as should all pregestational diabetics [47, 50]. They should understand that risks of abortion and fetal anomaly are reduced if they enter pregnancy with their diabetes well under control [46, 51].

Rh(D) Isoimmunization

All human blood is designated by an ABO blood group. The majority of humans have an antigen against an erythrocyte surface antigen of the rhesus blood group system. Those who have the antigen are considered to be Rh(D)-positive. Those without the Rh factor are termed Rh(D)-negative. The Rh antigen is further categorized into a complex of antigens, C, D, E, c, e, with the D antigen being the one most frequently associated with serious hemolytic disease of the fetus and newborn [52]. It is the presence or absence of the D antigen that is

most important aspect of the categorization of the Rh factor and associated antigens. Thus the term "Rh(D)-positive" reflects the presence of the D antigen, with absence of a D antigen correlating with an Rh(D)-negative type. For the purpose of this text, the terms Rh(D)-positive or Rh(D)-negative will be used. The incidence of Rh(D)-negativity differs between ethnic groups. European Whites have an incidence of about 15 percent, American Blacks 5 to 8 percent, and Asians and Native Americans 1 to 2 percent [52, 53].

If a woman does not have antigens to the rhesus D antigen—if she is Rh(D)-negative—she will develop antibodies against the Rh factor if it is introduced into her blood. The times when this can occur are when a blood transfusion of Rh(D)-positive blood is given or if she is pregnant with an Rh(D)-positive fetus and there is a bleed of fetal blood into the maternal circulation. Because the maternal and fetal blood supplies are entirely separate, this is not always a problem for Rh(D)-negative women with an Rh(D)-positive fetus.

In order for Rh(D) isoimmunization to occur, the mother must be Rh(D)-negative and the fetus must be Rh(D)-positive. A sufficient quantity of fetal red blood cells must enter the maternal circulation. A quantity as small as 0.1 milliliters of Rh(D)-positive red blood cells has been shown to trigger sensitization of some women. In addition, the woman must have the immunogenic capacity to produce antibody to the D antigen [52]. The most common time of feto-maternal hemorrhage is at the time of birth (see Table 24-17).

When Rh(D)-positive cells are introduced in the serum of an Rh(D)-negative woman, she may develop anti-D antibodies. The transfer of fetal blood to the mother during one pregnancy can thereby stimulate development of antibodies that may cause fetal red blood cell hemolysis in a subsequent pregnancy. When the mother has anti-D antibodies, they can be transferred across the placenta to the fetal circulation. Destruction of fetal erythrocytes ensues, followed by severe fetal anemia, cardiac decompensation, and eventual hydrops and possible fetal or early neonatal death, dependent upon the severity of the reaction and effectiveness of treatment.

Prior to the use of Rh(D)-immune globulin (RhoGAM), erythroblastosis fetalis was more frequent, occurring in about 10 in 1000 births [53]. Since the early 1960s, the incidence of fetal or neonatal death has fallen to approximately 4 to 5 per 100,000 births [53]. This remarkable improvement in perinatal health is attributed to a combination of the use of RhoGAM, decrease in the size of families, and tremendous strides in interventions such as amniotic fluid spectrophotometry, cordocentesis, ultrasound imaging, intrauterine fetal transfusion, neonatal exchange transfusion, and improved neonatal and maternal care. Unfortunately, many of the current cases are the result of missed opportunities to use Rh(D)-immune globulin after first trimester pregnancy loss, procedures or trauma during pregnancy, or postpartum [54]. It is a strong reminder that this disease process can only be halted by steadfast adherence to the recommendations for use of Rh(D)-immune globulin.

Introduced in the 1960s, Rh(D)-immune globulin (RhoGAM) is a passively administered antibody that prevents active maternal isoimmunization. It is manufactured from human plasma. The processing and filtration, in addition to rigorous screening of donors, make the risk of transfer of viruses (e.g., HIV, hepatitis C) a theoretic risk that has not been demonstrated [55]. The RhoGAM should be given in a dose related to the amount of the fetal blood that has entered the maternal circulation. During the second and third trimester, the full 300 micrograms dose is given, which can cover up to 15 milliliters of fetal blood. Fewer than 1 percent of births will result in a feto-maternal hemorrhage greater than 15 milliliters. If a hemorrhage greater than 15 milliliters is suspected, the RhoGAM dosage should be adjusted to the rate of 20 micrograms/ milliliters of fetal blood. (See later discussion of relevant laboratory studies.) In early pregnancy, the risk of feto-maternal hemorrhage is markedly less than during later pregnancy, and the total volume of fetal blood is very small. Therefore, small doses of Rh immune globulin (MICRhoGAM) are used in the amount of 50 micrograms (see Table 24-17). Adverse reactions to Rh(D)-immune globulin are rare (1:60,000) and include formation of anti-D antibodies despite treatment, and localized reaction at the site of injection [55].

Clinical Considerations

At the first prenatal visit, both history and laboratory examinations are important for screening for Rh(D) incompatibility. It is imperative that women presenting to emergency clinics for threatened or spontaneous abortions and ectopic pregnancies be similarly screened. In addition, elective termination of pregnancy in the first or second trimester must also be considered at risk for feto-maternal hemorrhage. History that may be relevant to Rh incompatibility includes the following:

TABLE 24-17 Opportunities for Feto-Maternal Hemorrhage and Dose of Rh(D)-Immune Globulin

Cause of Feto-Maternal Hemorrhage	Dose of Rh(D)-Immune Globulin (RhoGAM)
First trimester	
Abortion (spontaneous or elective)	50 μg
Ectopic pregnancy	50 μg
Chorionic villus sampling	50 μg
Second trimester	
Ectopic pregnancy	300 μg
Amniocentesis	300 μg
Second or third trimester	
Blunt abdominal trauma	300 μg
Fetal death, stillbirth	300 μg
Fetal manipulation—e.g., external cephalic version	
Vaginal or cesarean birth	300 μg
Major hemorrhage—e.g., placental abruption, uterine rupture	20 μg/ml estimated fetal whole blood (refer to Kleihauer-Betke)

1. Previous blood transfusion
2. Previous baby needing a blood transfusion
3. Stillbirth or neonatal death resulting from causes unknown to the mother
4. Receiving RhoGAM after previous deliveries or abortions
5. Known Rh(D)-negative blood type

Determination of the mother's ABO type and Rh group is made through routine laboratory work ordered during the initial prenatal visit. If the Rh(D) is positive, no further evaluation is necessary. If the Rh(D) is negative, the results of the antibody screen will be critical to further management.

An antibody screen should also be performed routinely at the first visit for all women (regardless of Rh group) to screen for anti-D as well as other possible antibodies. If the antibody screen is positive, a titer will be done automatically by most labs. A normal antibody screen will be negative. If anti-D antibodies are present—a titer of greater than 1:4—the woman is considered to be Rh(D)-sensitized. Referral for medical management is indicated for any woman who is Rh(D)-sensitized and the fetus is determined to be Rh(D)-positive.

For the woman who is Rh(D)-negative, there is a high likelihood that the fetus will be Rh(D)-positive. Due to the pattern of genetic inheritance, the Rh(D)-negative trait is autosomal recessive. Therefore, both parents must contribute the gene for an Rh(D)-negative blood group for the child to be Rh(D)-negative. If either parent contributes an Rh(D)-positive gene, then the fetus will be Rh(D)-positive. Occasionally, a couple will present who are both Rh(D)-negative. In this case, if paternity is certain, the fetus will be Rh(D)-negative, and Rh-immune globulin is not required. The concern is that no one can be certain about the paternity except for the woman herself. In most cases, the father's blood type is not known, and the antepartum dosage of Rh(D)-immune globulin is given as a routine for Rh(D)-negative women. If, however, the couple wishes to have documentation of the father's Rh(D)-negative blood type and desire to avoid antepartum RhoGAM—understanding the potential risk—then this is an acceptable option.

When the blood type is Rh(D)-negative, Rh(D)-immune globulin is given prophylactically at approximately 28 weeks' gestation. This timing is selected in order to protect against sensitization to feto-maternal bleeds in the third trimester, and because the duration of action of a single dose of Rh(D)-immune globulin is 12 weeks, which means that the pregnancy is protected throughout the third trimester. If the pregnancy extends longer than 12 weeks after the dose of Rh(D)-immune globulin was given, another dose should be given. If a woman then gives birth within 3 weeks of the second dose, an additional dose should not be necessary. If birth occurs longer than 3 weeks later, an additional dose of RhoGAM is to be given if the baby is Rh(D)-positive [55].

There is controversy regarding the need for an antibody screen at the time of the 28-week antepartum Rh(D)-immune globulin. The screen is recommended by the American Association of Blood Banks, with the thought that sensitization that has occurred early in pregnancy would be detected. However, this is a rare event, especially in pregnancies that have not had an incident of trauma or a procedure performed (e.g., amniocentesis). It is now common practice to administer Rh(D)-immune globulin (300 mcg) without a simultaneous antibody screen. An antibody screen at 35 to 36 weeks is also not indicated.

If a blood sample is taken within the active time frame of the immunization (12 to 14 weeks)—for example, on admission in labor—there may be titers of anti-D present that indicate passive immunity as a result of the RhoGAM. These titers should be 1:8 or less by 38 to 40 weeks' gestation. Titers greater than 1:8 suggest that active immunization because of Rh incompatibility has occurred.

After the birth, the infant will have its ABO and Rh type done from the cord blood sample. If the baby is found to be Rh(D)-positive, then Rh(D)-immune globulin (300 mcg) should be administered to the mother within 72 hours of the birth. This 72-hour time frame is not absolute. It is important to administer the Rh(D)-immune globulin before the woman mounts an antibody response to the Rh(D)-positive fetal cells. In the event that the dose is inadvertently not given, it may be given at any time up to 28 days following the birth in an attempt to prevent sensitization. If typing of the infant is delayed, it is preferable to administer the RhoGAM prophylactically that to risk subsequent sensitization.

If the fetus is shown to be Rh(D)-positive, the mother should also be screened for excessive feto-maternal bleeding, which occurs in about 1 percent of births. Risk factors for excessive feto-maternal bleeding are cesarean section, multiple pregnancy, placenta previa, abruptio placentae, manual removal of the placenta, and intrauterine manipulation [52]. However, excessive feto-maternal hemorrhage is not limited to births where risk factors are present. When Rh(D)-immune studies are ordered postpartum, most labs will run an erythrocyte rosette test to identify excessive feto-maternal bleeding. In the event that this test is positive, a Kleihauer-Betke test must be done to quantify the fetal blood in maternal circulation. This then becomes the guide to dosage of Rh(D)-immune globulin at a dose of 1 μg/ml of fetal blood.

Screening for Other Antigens

The D antigen is the most commonly occurring and the most responsible for fetal hemolytic disease. However, there are many other antigens on the erythrocyte that are referred to as minor or atypical antibodies. The incidence of these antibodies varies among ethnic groups and is frequently the result of a previous incompatible blood transfusion. Most of these antibodies cause minimal if any impact during pregnancy. Those that can produce fetal hemolysis are anti-E, anti-Kell, anti-c, anti c+E, and anti-Fy^a (Duffy) [50]. These antibodies will be identified on the initial antibody screen. Consultation is suggested for management of these atypical antibodies.

Placenta Previa

Placenta previa is the malposition of the placenta in the lower uterine segment, either anteriorly or posteriorly, so that the fully developed placenta extends to the cervical os. In a complete or central placenta previa, the body of the placenta fills the lower uterine segment, entirely overlying the cervical os. In a partial placenta previa, the placental edge covers (totally or partially) the cervical os. A marginal previa will have the edge of the placenta near, but not actually over the internal cervical os (see Figure 24-4).

Placenta previa may be a serious cause of antepartal hemorrhage in the third trimester. It is

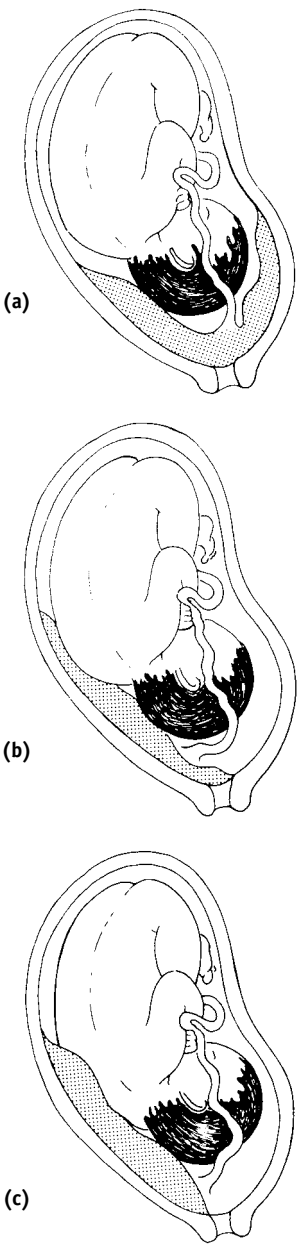

FIGURE 24-4 Placenta previa: (a) complete; (b) partial; (c) marginal.

more common in women with the following conditions [56–58]:

1. Multiparity
2. Maternal age greater than 35
3. Previous placenta previa
4. Previous uterine surgery, including cesarean section (risk increases with increased number of cesarean sections)
5. Multiple pregnancy (larger placenta)
6. Smoking (possible larger placenta)

The cardinal sign of placenta previa is painless vaginal bleeding with a sudden onset. It occurs during the third trimester and may be accompanied or precipitated by uterine irritability. A woman who is not in labor who experiences painless vaginal bleeding in the third trimester must be suspected of having placenta previa. Malpresentations (breech, transverse lie, floating head) are a common finding as the fetal head is prevented from entering the pelvis by the presence of the placenta in the lower uterine segment.

Placenta previa may be diagnosed by ultrasound prior to any symptomatology. If a sonogram demonstrates a low-lying placenta prior to 28 weeks, a repeat scan will be necessary in the third trimester to further document the position of the placenta in relationship to the cervix as the lower uterine segment grows in the last few weeks of pregnancy. It is common to see a placenta extending into the lower segment early in pregnancy. Most often, as the uterus grows, the distance between the cervix and the border of the placenta will increase. If the placenta remains encroaching over the cervix or if it is indeed a central placenta previa, then vaginal birth will be contraindicated.

If a woman presents with painless vaginal bleeding in the third trimester, it is imperative that the midwife not perform a vaginal examination until placental position is identified. Evaluation and stabilization of maternal and fetal status are the immediate goals of management. Reference to previous ultrasound reports may be useful and an emergent scan in the labor and delivery suite will be indicated. Only when a placenta previa is ruled out is it safe to perform a digital vaginal examination.

When placenta previa is diagnosed prior to any symptomatology, no intervention is necessary. The woman should be informed to call immediately with any evidence of vaginal bleeding. Ultrasound in the third trimester should be confirmatory if placenta previa is still present.

If a woman has bleeding associated with the placenta previa, management will be dictated by the gestational age, severity of bleeding, and fetal status [56–58]. When the dating criteria are certain, and the fetus is at 37 weeks or greater, cesarean section is indicated.

It is common for the woman to experience an episode of bleeding which then subsides. Close attention must be paid to the fetal response and maternal hemostasis. If there is unresolving fetal distress, delivery may be indicated. Usually, there is stabilization of the fetal heart rate patterns and the bleeding stops. Maternal intravenous hydration is indicated and tocolytics may be used as necessary. If maternal blood loss is significant, blood replacement may be required.

If the bleeding stops and the uterus remains quiet, the woman may be discharged to bedrest at home. It is necessary that she have 24-hour access to emergency transport to the hospital in case of bleeding. For some women, hospitalization with or without the use of tocolytics may be required until fetal maturity when a cesarean section can be performed [57, 58]. These women must observe pelvic rest; nothing should be inserted into the vagina (for example, vaginal therapeutics, douches, penis). In addition, the woman should be counseled to avoid orgasm, because orgasm results in uterine contractions that may exacerbate bleeding.

For women with a partial or marginal placenta previa, the degree of occlusion of the cervical os may depend on the degree of cervical dilatation. Therefore, if she presents in labor without uncontrollable bleeding, tamponade of the placenta by the fetal head may allow vaginal birth for some women.

Abruptio Placentae

Abruptio placentae is the premature separation of the normally implanted placenta (Figure 24-5). It can be a serious cause of antepartal hemorrhage in the third trimester. Hemorrhage may be concealed if the separation and bleeding are from an area central to the placenta, or it may be obvious if the separation or bleeding are at the borders of the placenta or cause a disruption of the edges of the placenta.

Specific etiological factors are unknown, but abruptio placentae is associated with the following conditions [56]:

1. Maternal hypertensive disorders
2. Advanced maternal age or parity

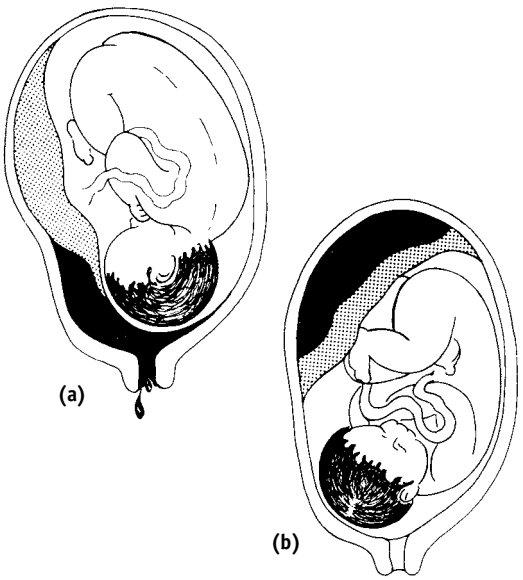

FIGURE 24-5 Abruptio placentae: (a) marginal separation with obvious bleeding; (b) central separation with concealed bleeding.

3. Maternal smoking
4. Poor maternal nutrition
5. Chorioamnionitis
6. Maternal blunt abdominal trauma
7. History of previous abruptio placentae
8. Sudden decrease in uterine volume or size (for example, with rupture of the membranes in polyhydramnios or between delivery of babies in multiple gestation)
9. External cephalic version
10. Cocaine, particularly crack cocaine, usage

The signs and symptoms of abruptio placentae depend on the degree of separation. They may be very mild, with generalized back pain and colicky, discoordinate uterine activity interspersed with relaxation of the uterus. Bleeding may be either concealed or obvious. It is common to mistake early signs of abruption as premature or false labor. The woman's perception of pain may be out of proportion to what the examiner feels; there may be increased uterine tone between what feel like contractions, and the woman may experience painful localized or generalized uterine tenderness. The classic hypertonic, boardlike uterus and uterine rigidity will usually occur only with a large abruption (Grade 2–3) [56], as shown in Table 24-18.

Other signs and symptoms vary according to the degree of separation. The fetal heart rate pattern may be normal with a small degree of abruption. A greater degree of separation will produce abnormal fetal heart rate tracings of variable or late decelerations, loss of beat-to-beat variability, or a sinusoidal pattern. Fetal movements may be decreased or absent for up to 12 hours prior to any obvious signs of an abruption. Other women may have violent fetal movement when there is a large abruption and massive hemorrhage. If a cesarean section is done within minutes of this occurrence, the baby may be born alive. Otherwise, fetal movement ceases.

Other signs and symptoms of a significant abruption include uterine enlargement (concealed hemorrhage only) and the signs and symptoms of maternal shock. The severity of maternal shock depends on the severity of the abruption. You should not make the mistake of thinking the blood loss from obvious bleeding is always the total actually lost, because there may be concomitant concealed hemorrhage. Uterine enlargement from concealed hemorrhage is measured by marking the abdomen at the level of the fundus, checking every 15 minutes for an increase, and remarking accordingly.

TABLE 24-18 Severity of Abruptio Placentae and Associated Clinical and Laboratory Signs

	Bleeding	Contraction	Fetal Heart Rate	Maternal Vital Signs	Labs
Grade 1	Slight	Uterine irritability	Normal	Unaffected	Normal
Grade 2	Mild to moderate external	Uterus irritable, tetanic or frequent contractions may be present	May show signs of compromise	↑ pulse, stable blood pressure	↓ Fibrinogen
Grade 3	Moderate to severe, but may be concealed (20%)	Tetanic contractions, painful, rigid abdomen	Fetal death	Hypotension	↓ Fibrinogen (<150 mg/dl) thrombocytopenia, factor depletion

Source: Adapted from Benedetti, J. J. Obstetric hemorrhage. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 17.

Ultrasonography for a retroplacental clot will yield information only if the bleed is of significant size and in a position that can be easily identified. A negative finding on ultrasound does not preclude the diagnosis of an abruption. In most cases, ultrasound may be useful to identify or rule out a placenta previa as the source of bleeding. It is usually not of value in identifying a placental abruption.

The management for abruptio placentae is delivery. If the woman is stable and there is no evidence of deterioration in the fetal or maternal condition, delivery may be vaginal. Management includes rupture of the membranes, internal monitoring of the fetus, and pitocin induction or stimulation. In cases where the fetus is very immature and the maternal and fetal vital signs are stable, the use of tocolytics may be useful to maintain uterine quiescence for at least 48 hours [56, 57].

The diagnosis of abruptio placentae should be considered for any woman who presents with back pain and colicky uterine activity. If she has sustained known uterine trauma, such as a motor vehicle accident or been the victim of maternal battering, an observation period of up to 24 hours may be indicated. Cervical findings, fetal movement history, fetal heart rate pattern, vital signs, urine for proteinuria, and maternal vital signs should be obtained. Uterine activity should be monitored by fetal monitor, but should always be palpated by hand as well. Particularly in preterm pregnancies, the external uterine monitor is not a good evaluator of the intensity of uterine contractions. In addition, it is important to monitor the woman's response to the contractions in relationship to the actual tensing and relaxation of the uterus. If an abruption is occurring, it should become apparent during this period of observation.

Management of Hemorrhage Due to Placenta Previa or Abruptio Placentae

Particularly with an abruptio placentae, diagnosis of the source of hemorrhage may not be identified until the birth. Management of a woman who is hemorrhaging from either placenta previa or abruptio placentae is the same and consists of the following:

1. Call for help and request that your physician consultant be notified.
2. Start 5% dextrose in Ringer's lactate intravenously with a 16-gauge intracatheter.

TABLE 24-19 Rapid Fibrinogen Assay—Use in the Presence of Hemorrhage for a Rapid Assessment for Coagulation Defect

Draw a red top tube of whole blood.
Tape to the wall; note time of blood draw.
If a clot has not formed in 6 min, or if a clot forms and lyses within 30 min, the fibrinogen level is < 150 mg/dl.

3. When starting the IV, obtain blood for type and cross-match for four or more units, CBC, platelets, prothrombin, partial prothrombin, fibrinogen, and a tube for clotting time to hang on the wall (see Table 24-19).
4. Place the woman in Trendelenburg position.
5. Monitor the woman's vital signs (blood pressure, pulse).
6. Monitor the fetal heart tones (use an external monitor).
7. Administer oxygen to the woman.
8. Cover the woman with warm blankets.
9. Start a second IV. Two intravenous infusion routes are needed: one for electrolyte solutions and the other for blood transfusion. Keep the IV line for blood transfusion open until the blood is obtained.
10. Inform the mother and her partner of the emergency nature of treatment as well as possible need for cesarean birth, blood transfusion, and neonatal resuscitation.
11. Have the operating room set up for an emergency cesarean section.
12. Insert a Foley catheter to measure output and in preparation for possible surgery.

Hypertensive Disorders of Pregnancy

The most common medical disorder of pregnancy is hypertension. Presenting in one or more of several ways, the incidence ranges between 5 and 10 percent. Over the past several decades, the nomenclature as well as identified symptomatology, methods of diagnosis, and approach to management have changed. Meanwhile, voluminous research has yet to clearly identify etiology or definitive means of predicting or treating the hypertensive disorders. The National Institutes of Health, through the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy [59] has established some guidelines for definition and management that will be the reference for many aspects of the discussion in this chapter.

Not only are hypertensive disorders common in pregnancy, but they are responsible for significant maternal and fetal morbidity and mortality. Abruptio placentae, disseminated intravascular coagulation, cerebral hemorrhage, hepatic failure, and acute renal failure are all potential maternal complications. The fetus has the risk of IUGR, prematurity, and death.

Definitions [59]

1. Chronic hypertension
   a. Hypertension is considered chronic if it is observed before pregnancy or by the 20th week of gestation.
   b. Blood pressure is measured as >140 mm Hg systolic or >90 mm Hg diastolic.
   c. If hypertension is diagnosed during pregnancy but unresolved postpartum, it is also considered chronic hypertension.
2. Preeclampsia is a pregnancy-specific syndrome that usually occurs after 20 weeks (except with trophoblastic disease) and can be diagnosed by any of the following criteria:
   a. There is gestational blood pressure elevation (≥140 mm Hg systolic or ≥90 mm Hg diastolic) in a previously normotensive woman accompanied by proteinuria (≥0.3 grams protein in a 24-hour specimen or ≥30 mg/dL (≥1+ reading on dipstick).
   b. If gestational hypertension is present without proteinuria, preeclampsia should be highly suspected with increased gestation if accompanied by headache, blurred vision, abdominal pain, low platelets, or abnormal liver enzymes.
3. Severe preeclampsia
   a. blood pressure ≥160 mm Hg systolic or ≥ 110 mm Hg diastolic
   b. proteinuria of >2.0 grams in 24 hours (2+ or 3+ dipstick), occurring for the first time in pregnancy and regresses after delivery
   c. serum creatinine increased (>1.2 mg/dl unless known to be previously elevated)
   d. platelet count <100,000 cells/mm^3
   e. hepatic enzyme activity elevated (alanine aminotransferase, aspirate aminotransferase or both)
   f. neurologic symptoms: persistent headache, visual disturbances
   g. persistent epigastric pain
   h. oliguria ″400 milliliters in 24 hours
4. Eclampsia
   a. presence of seizure in addition to preeclampsia (if seizures cannot be attributed to another cause)
5. Gestational hypertension
   a. gestational blood pressure elevation (≥140 mm Hg systolic or ≥90 mm Hg diastolic) after 20 weeks (previously referred to as pregnancy-induced hypertension) without proteinuria or abnormal laboratory evaluation during pregnancy and which returns to normal by 12 weeks postpartum
   b. final determination of gestational hypertension versus preeclampsia made only in the postpartum period.
6. Preeclampsia superimposed on chronic hypertension
   a. commonly occurs with chronic hypertension
   b. worsens prognosis for mother and fetus
   c. any new evidence of proteinuria
   d. sudden increase in blood pressure when previously well controlled
   e. thrombocytopenia (>100,000 platelets)
   f. increase in hepatic enzymes
7. HELLP (Hemolysis-Elevated Liver enzymes-Low Platelets) syndrome
   a. controversy as to whether this is a separate syndrome from severe preeclampsia
   b. perinatal morbidity similar to severe preeclampsia

Two notable changes have been made from the classic guidelines regarding diagnosis of preeclampsia. Edema is no longer considered to be a part of the diagnostic trio for preeclampsia [59–61]. The presence of edema is normative during pregnancy for many women without any other evidence of preeclampsia. In addition, it is sometimes not present even in the face of abnormal liver or renal function. Therefore, the new guidelines consider preeclampsia a diagnosis of gestational hypertension and proteinuria.

The other change regards the definition of hypertension. In the past, this was defined using an elevation of 30 mm Hg systolic and/or 15 mm Hg diastolic rise over the registration baseline blood pressure. This definition has not proved to be linked with evidence in defining preeclampsia. Therefore, the definition of gestational hypertension has been newly stated as being ≥140 mm Hg systolic or ≥90 mm Hg diastolic after 20 weeks of pregnancy. However, the NIH Working Group recommends close observation of women with a blood pressure elevation of 30/15 especially if there is associated proteinuria or hyperuricemia [59].

The role of the midwife in relation to the hypertensive disorders of pregnancy lies in meticulous screening, in early identification, and in knowing

when to consult or collaborate with the physician. Preeclampsia can be a very serious disease for both mother and fetus. Therefore, maintaining a high index of suspicion and avoiding overnormalization of findings will assist in appropriate diagnosis.

It is important to differentiate chronic hypertension from preeclampsia. It is even more important to recognize when preeclampsia is superimposed on chronic hypertension. Chronic hypertension, by strict definition, either precedes pregnancy or occurs before the twentieth week of gestation. A chronically hypertensive woman may be receiving an antihypertensive drug. Her blood pressure should remain stable during pregnancy. If the blood pressure rises above what is normal for her or if she suddenly develops proteinuria, these should be recognized as signs of superimposed preeclampsia or renal disease and not as part of the course of chronic hypertension. Collaborative management of these women is indicated. A baseline set of liver and kidney function tests and a diabetes screen should be obtained on the initial visit. A careful ophthalmic examination adds to the database regarding the severity of this disease process. (See Chapter 7 for discussion of chronic hypertension in the nonpregnant woman.)

Prevention of preeclampsia is limited primarily due to an unknown etiology. In addition, screening tests have not been demonstrated to have accurate prediction in low-risk populations. Therefore, the most judicious approach is identification of women with risk factors or development of any symptomatology. Conditions associated with or that predispose a woman to the development of preeclampsia include the following:

1. Nulliparity
2. Trophoblastic disease (occurs in up to 70 percent of women with hydatidiform mole)
3. Multiple pregnancy, regardless of parity
4. Preexisting medical disease
   a. Chronic hypertension
   b. Chronic renal disease
   c. Pregestational diabetes mellitus
5. Family history of preeclampsia or eclampsia
6. Previous history of preeclampsia
7. Increased risk for multipara with a new sexual partner
8. African-American or Asian ethnicity

The signs and symptoms of preeclampsia form the basis of a routine history, physical, and laboratory screening that are done on each prenatal visit. If any signs or symptoms are positive, then follow up is necessary.

1. History
   a. persistent headaches unresponsive to usual remedies, careful history regarding the headaches and visual disturbances to rule out migraine headaches, need for glasses, and stress and tension in the woman's personal life
   b. dizziness, blurring of vision, spots before the eyes, or scotomata
   c. persistent epigastric pain
2. Physical examination
   a. blood pressure elevation ≥ 140 mm Hg systolic or ≥ 90 mm Hg diastolic
   b. most accurate blood pressure taken
      (1) with an appropriate sized cuff (bladder covers more than 80 percent circumference of the arm)
      (2) patient sitting, or lying with left tilt, using right arm approximately at the level of the heart
      (3) after period of rest
      (4) best when two episodes are identified 4 to 6 hours apart
      (5) auscultated to hear last sound for diastolic pressure, not the diminishing sound (this is Korotkoff phase V)
   c. ophthalmic examination
      (1) papilledema
      (2) A-V nicking
      (3) vessel narrowing
      (4) hemorrhagic areas
3. Laboratory test
   a. urine for protein ≥ 1+ dipstick followed by 24-hour urine
   b. hemoglobin and hematocrit
   c. platelet count: if platelets <100,000 cells/mm^3, order coagulation labs
      (1) fibrinogen
      (2) fibrin split products
      (3) PT (prothrombin time)
      (4) PTT (partial prothrombin time)
   d. liver function tests
   e. renal function tests
      (1) 24-hour urine for total protein, creatinine clearance
      (2) serum creatinine
      (3) serum uric acid

As precise ranges vary from laboratory to laboratory, it is necessary to check the standard values for the laboratory from which you obtain test results. Table 24-20 provides an interpretation of laboratory findings in preeclampsia. You need to

TABLE 24-20 Interpretation of Laboratory Findings in Preeclampsia

Laboratory Test	Finding	Interpretation	Comment
Hemoglobin and hematocrit	Increased	Hemoconcentration	Fluid moves from intravascular to extracellular, causing edema
Platelet count	Decreased	Cause unknown	Falling platelets indicate progressive disease
		Reflects severity of preeclampsia	<100,000 platelets is severe disease
Serum uric acid	Increased	Decreased renal clearance	Serum uric acid increases as renal excretion of uric acid decreases
Blood urea nitrogen (BUN)	Normal	Mild preeclampsia	
	Increased	Decrease in renal blood flow and glomerular filtration rate indicates increasing severity of preeclampsia	Doubling of BUN represents 50 percent reduction in renal blood flow
Serum creatinine	Normal	Mild preeclampsia	
	Increased	Decrease in renal blood flow and glomerular filtration rate indicates increasing severity of preeclampsia	Doubling of serum creatinine represents 50 percent reduction in renal blood flow
Creatinine clearance	Decreased	May be normal in less severe preeclampsia; is decreased in severe preeclampsia	More useful measure than a single serum creatinine value
Liver function tests:	Elevated	Liver cell damage	Serious complication of preeclampsia is subcapsular hemorrhage in the liver
LDH (lactate dehydrogenase)		Indicates severe disease	
AST (SGOT)—serum glutamic oxalacetic transaminase			
ALT (SGPT)—serum glutamic pyruvic transaminase			
Coagulation profile:		Measures blood clotting ability; abnormal clotting function is indicative of severe disease	
Fibrinogen		Low	
Fibrin split products		Present	
PT—prothrombin time		Prolonged	
PPT—partial prothrombin time			
Urine protein (dipstick)	Increased	3+ and 4+ in severe disease	2+ indicates need for 24-hour collection
Urine protein (24-hr)	Increased protein	Renal compromise with increased permeability	300 mg in 24 hr, or 1 g/L in preeclampsia; 5 g/L in 24 hr in severe disease
	Decreased urine volume	Hypovolemia, hypoperfusion, renal compromise	Less than 400–500 mL in 24 hr in severe disease

discuss any abnormal values and an appropriate management plan with your consulting physician, even if hypertension is minimal or absent.

Preeclampsia is a disease that begins early in pregnancy and develops gradually, only demonstrating distinct symptomatology as the disease worsens. It is common to see subtle signs of preeclampsia prior to definitive diagnosis. In addition, all women do not necessarily have significantly elevated blood pressure. Although hypertension is a primary diagnostic symptom in preeclampsia, it is not present in all preeclamptic women and does not necessarily correlate with severity of disease [59–61].

Therefore, it is important to have a critical awareness when screening for symptoms. The woman may have mildly elevated blood pressure, or may develop edema of the hands and face that are not diagnostic but may indicate the sodium retention of preeclampsia and warrant close observation [59]. For women who are "tending toward" preeclampsia but do not meet the criteria for diagnosis, it is reasonable for the midwife to draw a panel of baseline lab studies (hemoglobin, hematocrit, platelets, LDH, AST, ALT). This baseline set of labs will be useful in making an early diagnosis of preeclampsia as well as determining the progression and severity of disease.

In addition to laboratory evaluation, the woman should be encouraged to decrease the stresses in her life and to increase rest periods. Fetal movement counting should be reinforced. If there is real suspicion of impending preeclampsia, more frequent office visits may also be encouraged. Increased fluid intake and a diet high in protein and with minimal excess sodium are healthy for all women and may help diminish symptomatology. Restriction of salt and the use of diuretics have no place in the management of impending or actual preeclampsia or eclampsia.

Management

When the diagnosis of preeclampsia is made or is strongly suspected, physician consultation is required. The only cure for preeclampsia is delivery. It is in the mother's best interest to facilitate delivery as soon as possible. However, gestational age may make this a life-threatening risk for the fetus. Therefore, management of preeclampsia is a balancing act between the best interests of mother and infant. If delivery is not indicated for fetal well-being, then the goal of treatment is to mediate maternal condition in order to allow for maturity of the fetus.

Evaluation of fetal well-being is done by assessment of fetal growth by ultrasound. As the pathophysiology of preeclampsia causes utero-placental insufficiency, the fetus is at risk for chronic hypoxia and IUGR. It is also at risk for acute episodes of hypoxia if the maternal condition is worsening or labile. Therefore, periodic biophysical profile scoring can be useful in assessing fetal status. (See Chapter 23 for discussion of fetal testing with maternal hypertensive disorders.)

If preeclampsia is mild and appears not to be taking a fulminate course, the woman may remain at home. This would include modified bedrest, home assessment of urine protein, and frequent office or home visits for assessment of blood pressure and other symptomatology. Women and their families must be educated in the signs and symptoms of worsening preeclampsia. In addition, the woman must be able to access medical attention 24 hours a day. Therefore, home care is dependent upon the availability of someone to bring her to the hospital. She must also be able to rest and carry out her own care at home. This means she cannot be primarily responsible for child care and care of the home environment. If this cannot be met at home, then hospitalization may be necessary.

If the woman's blood pressure continues to elevate, proteinuria progresses, laboratory studies indicate worsening disease, or fetal assessment testing is nonreassuring, hospitalization is required for management of the duration of the pregnancy. The decision to prolong pregnancy must be revisited daily, based on progression of maternal disease and fetal status.

Prior to birth, management focuses on bedrest, frequent assessment of maternal blood pressure, laboratory assessment of hematologic, renal, and hepatic function, and fetal well-being. In the presence of stability in all of these areas and the continued need for additional fetal maturity, close observation continues to be indicated. Magnesium sulfate is often used in order to prevent seizures in the preeclamptic woman. Dosages and monitoring of magnesium should be managed by the physician.

Table 24-21 lists indications for delivery based on maternal and fetal risk factors. The preferred route of delivery is vaginal in order to avoid the additional stresses and risk of surgery to mother and fetus. When the decision is made to progress to delivery, then aggressive induction of labor should

TABLE 24-21 Indications for Delivery in Preeclampsia

Maternal	Fetal
Gestational age > 38 weeks[a]	Severe fetal growth restriction
Platelet count < 100,000 cells/mm^3	Nonreassuring fetal testing
Progressive deterioration in hepatic function	Oligohydramnios
Progressive deterioration in renal function	
Suspected abruptio placentae	
Persistent severe headaches or visual changes	
Persistent severe epigastric pain, nausea, or vomiting	

[a] Delivery should be based on maternal and fetal conditions as well as on gestational age.

Source: National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy. Report of National High Blood Pressure Education Program Working Group on high blood pressure in pregnancy. *Am. J. Obstet. Gynecol.* 183(1):S1–S22, 2000. Reprinted by permission.

ensue [59]. If vaginal birth cannot be accomplished in a reasonable period of time or is contraindicated for another reason, cesarean birth may be performed. Epidural anesthesia is the labor anesthetic of choice if needed for labor or cesarean birth. General anesthesia carries increased risks and should be avoided if possible.

Eclampsia

Eclampsia is diagnosed when preeclampsia progresses to convulsions. Eclamptic seizures are most common prior to delivery but may occur up to 10 days postpartum. Premonitory signs and symptoms—including headache, visual disturbances, epigastric or upper right quadrant pain, and restlessness—may alert the midwife to an impending seizure.

The following are the appropriate steps in emergency management of care of a woman with an eclamptic seizure:

1. Call for help; notify the physician to respond emergently.
2. Observe the seizure, but do not attempt to stop it. Eclamptic seizures will last 30 to 90 seconds, regardless of intervention. Observation is critical to assist with differential diagnosis of the seizure etiology. Eclamptic seizures are generalized tonic-clonic seizures. The seizure from an intracranial event, such as a ruptured aneurysm, may produce focal seizures—i.e., seizures affecting one side of the body only.
3. Prevent injury:
   a. Put up side rails.
   b. Turn the woman on her side to prevent aspiration.
   c. Do not attempt to restrain the woman except to keep her in bed; forced restraint could result in injury.
   d. Insert a soft airway or padded tongue blade early in the seizure, to prevent injury to the tongue; do not attempt to place the airway or tongue blade once the seizure is well established and the jaws are clenched. Avoid stimulation of a gag reflex.
4. Prepare to administer magnesium sulfate as soon as the seizure is over, or start immediately if the woman has a patent IV. Nothing will stop the current seizure. Magnesium sulfate is the drug of choice to prevent future seizures [59, 61].

Meanwhile, the woman must be carefully stabilized and evaluated as follows:

1. Clear the airway; suction thoroughly. Place a soft airway to maintain patent airway and facilitate suctioning until the woman is conscious.
2. Administer oxygen by facemask at 8 L/min—the woman had no respirations during the seizure.
3. Initiate or reestablish electronic fetal monitoring to evaluate fetal status. It is common for the fetus to display a bradycardia during the hypoxic phase of the seizure, then recover with a rebound tachycardia, and gradually return to preseizure baseline. A compromised fetus may be unable to tolerate the hypoxic episode, and you may observe signs of fetal compromise—i.e., sustained bradycardia, late decelerations, or sustained severe tachycardia.
4. Evaluate the woman's contractions and labor status. Uterine contractions usually increase in frequency and intensity for up to 15 minutes following a seizure. If the woman was in active labor when the seizure occurred, her labor may progress rapidly after the seizure as a result of the hypertonicity.
5. Examine the woman for injury.
6. Carefully document the course of events including timing, specific occurrences associated with the seizure, any interventions, maternal and fetal vital signs prior to and following the seizure, who was notified, and what follow-up actions were taken.
7. A woman with eclampsia is critically ill and will require intensive nursing care and medical

management to prevent further complications such as intracranial hemorrhage, pulmonary edema, renal damage, and detached retina. The decision to expedite delivery will be based primarily on maternal indications. The mother's condition must be stabilized before induction or cesarean section can be considered. When the woman is stable, fetal indications for delivery may be considered. Management of a woman with eclampsia must be by the obstetrician-gynecologist. Midwifery support may be very helpful to the woman and her family members.

Fetal Death

Pregnancy loss in the first half of pregnancy is considered to be a spontaneous or missed abortion. After the expected age of viability (22 to 24 weeks), it is classified as a fetal death. Signs and symptoms of fetal death include the following:

1. Cessation of uterine growth or decrease in uterine size—fundal height stationary or decreasing over time
2. Cessation of fetal movement
3. Cessation of fetal heart tones—i.e., FHT not heard with a Doptone; items 2 and 3 constitute the so-called silent uterus, which gives rise to an ominous feeling of fetal death
4. Cessation of maternal weight gain or decrease in weight
5. Retrogressive breast changes
6. Collapsed fetal skull felt upon examination
7. Sonographic signs
   a. no heart movement
   b. no fetal movement
   c. overriding skull bones; occurs several days after death as a result of liquefaction of the brain
8. Radiologic signs (x-ray ordered if ultrasonography is not available)
   a. Spalding's sign, overlapping of the skull bones
   b. exaggerated curvature of the fetal spine; occurs several days after death due to maceration of the spinous ligaments
   c. gas formation in the circulatory system of the fetus

The midwife consults with the physician when the possibility of fetal death is suspected. The decision to induce labor or wait for labor to occur spontaneously will depend on the woman and her partner's feelings and desire, the cervical status, and any medical issues that need to be addressed—for example, preeclampsia or disseminated intravascular coagulation (DIC).

Expectant management involves awaiting the onset of labor, which can be anticipated within 2 to 3 weeks of fetal death; onset of labor is thought to be due to cessation of placental functioning. The risk involved in expectant management is the potential development of DIC. Coagulation studies consisting of prothrombin, partial prothrombin, fibrinogen, and platelets are done every week to screen for DIC. If these tests remain within normal range, it is acceptable to continue to wait for spontaneous labor to begin. If there is a drop in platelets or fibrinogen, and/or an increase in the partial prothrombin or prothrombin, consultation with the physician is indicated for induction of labor.

Emotional support is extremely important antepartally, intrapartally, and during the postpartal course. The midwife should help the woman explore her own or other family members' feelings of guilt or ambivalence during the first trimester (see Chapter 21) and her beliefs about possible causes of the death. Information should be supplied to counteract "old wives' tales" concerning possible causes of the fetal death (e.g., falling down stairs, raising arms over head, lifting heavy object). The midwife may need to initiate this discussion in order to elicit specific beliefs held by the woman or family members or significant others.

Support during labor will be difficult if the midwife does not examine her own personal feelings and reactions to an intrauterine death. If you keep in mind that the woman is still giving birth to a child, then you will not be tempted to offer her drugs to block out the experience. The woman, the baby's father, and other supportive family members should be encouraged to view, touch, and hold the infant. This may be difficult for the woman to do for a variety of reasons, including drowsiness secondary to medication or emotional reasons. The option to view the baby should be kept open and arrangements made with the morgue to allow the woman, the baby's father, and the family to view the baby whenever and as often as the may need to. This reality orientation is an essential ingredient in facilitating the grief process.

You should avoid making a false diagnosis of the cause of death but should point out to the parents even the smallest deviations from normal, if any (e.g., nuchal cord, twisted cord). Most intrauterine deaths cannot be attributed to a known cause, even after autopsy. These are the most difficult for women to handle.

The midwife should assist the family in decisions regarding autopsy and burial. If an autopsy is performed, she should arrange to meet with the woman and significant others as soon as the preliminary results are available. They need to be informed that the final results usually take 6 weeks to 3 months.

The midwife must evaluate and assess her own value system and responses to death and grieving before she can begin to understand and assist a woman through the grief process. The first stage of grief manifests itself in extreme emotion. These emotions should not be denied or hampered with well-intentioned but inappropriate and often destructive platitudes (e.g., "It's all right, you can have another baby"; "It's God's will, just accept it"; "Aren't you fortunate to have other children?"). For a discussion of the grief process, see Chapter 42.

The determination of whether and when a woman (or couple) should have another child should be based on the resolution of the grief process and her (or their) ability to see a subsequent child as a separate individual, not a replacement. If another pregnancy occurs, the midwife will need to provide anticipatory guidance regarding the woman's fears of another disastrous outcome.

References

1. American College of Nurse-Midwives. *Independent Midwifery Practice*. Clinical practice statement: Washington, DC: ACNM, 1997.
2. Simpson, J. L. Fetal wastage. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 22.
3. Lipscomb, G. H., Stovall, T. G., and Ling, F. W. Nonsurgical treatment of ectopic pregnancy. *N. Eng. J. Med.* 343:1325–1329, 2000.
4. Carson, S. A., and Buster, J. E. Current concepts: ectopic pregnancy. *N. Eng. J. Med.* 329(16):1174–1181 (October 14) 1993.
5. Hancock, B. W., and Tidy, J. A. Current management of molar pregnancy. *J. Reprod. Med.* 47(5):347–354 (May) 2002.
6. Gordon, M. C. Maternal physiology in pregnancy. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 6.
7. Johnson, T. R. B., and Niebyl, J. R. Preconception and prenatal care: part of the continuum. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 7.
8. Iams, J. D., Goldenberg, R. L., Mercer, B. M., et al. The preterm prediction study: recurrence risk of spontaneous preterm birth. *Am. J. Obstet. Gynecol.* 178(5):1035–1040 (May) 1998.
9. VanRooijen, M., and Persson, E. Pregnancy outcome after laser vaporization of the cervix. *Acta Obstet. Gynecol. Scandinavica*. 78(4):346–348 (April) 1999.
10. National Center for HIV, STD and TB Prevention. *Core Curriculum on Tuberculosis: What the Clinician Should Know*, 4th ed. November 2001. Internet (HTML) version of *Core Curriculum on Tuberculosis* accessed online on August 13, 2002. http://www.cdc.gov/nchstp/tb/pubs/corecurr.
11. Mays, M. Tuberculosis: a comprehensive review for the certified nurse-midwife. *J. Nurse-Midwifery* 38(3):132–139 (May/June) 1993.
12. Centers for Disease Control and Prevention. Measles, mumps, and rubella—vaccine use and strategies for elimination of measles, rubella, and congenital rubella syndrome and control of mumps: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 47(no. RR-8), 1998.
13. Reef, S., Frey, T. K., Theall, K., et al. The changing epidemiology of rubella in the 1990s: on the verge of elimination and new challenges for control and prevention. *JAMA* 287(4):464–472 (January 23/30) 2002.
14. Centers for Disease Control and Prevention. Notice to readers: revised ACIP recommendation for avoiding pregnancy after receiving a rubella-containing vaccine. *MMWR* 50(49):1117 (December 14) 2001.
15. Centers for Disease Control and Prevention. National Center for Infectious Diseases. *Rubella. The Yellow Book: Health Information for International Travel*. Atlanta, GA: CDC, 2001–2002.
16. Centers for Disease Control and Prevention. National Center for Infectious Diseases. *Pregnancy, Breast Feeding and Travel. The Yellow Book: Health Information for International Travel*. Atlanta, GA: CDC, 2001–2002.
17. Centers for Disease Control and Prevention. National Center for Infectious Diseases Cytomegalovirus (CMV) Infection accessed online October 26, 2002. http://www.cdc.gov/ncidod/diseases/cmv.htm.

18. Gaytant, M. A., Steegers, E. A., Semmekrot, B. A., et al. Congenital cytomegalovirus infection: review of the epidemiology and outcome. *Obstet. Gynecol. Survey* 57(4):245–256 (April) 2002.

19. Centers for Disease Control and Prevention. Preventing toxoplasmosis. *MMWR* 49(RR02); 57–75 (March 31) 2000.

20. Soto, C. Toxoplasmosis in pregnancy: is your patient at risk? *Clinician Rev.* 12(6):51–56 (June) 2002.

21. Duff, P. Maternal and Perinatal infection. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 40.

22. Centers for Disease Control and Prevention. National Immunization Program. Varicella. In *Epidemiology and Prevention of Vaccine-Preventable Diseases*, 7th ed. Atlanta, GA: CDC, April 2002, ch. 12.

23. Kuhlman, R. S., and Autry, A. M. An approach to nonbacterial infections in pregnancy. *Clin. Fam. Pract.* 3(2):267–286 (June) 2001.

24. American Academy of Pediatrics. Parvovirus, B19. *AAP 2000 Red Book: Report on the Committee of Infectious Diseases*, 25th ed. AAP. Elk Grove Village, IL.

25. Samuels, P., and Columbo, D. F. Renal disease. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 31.

26. Gilstrap, L. C., and Ramin, S. M. Urinary tract infections during pregnancy. *Obstet. Gynecol. Clin. North Am.* (3):581–591 (September) 2001.

27. Locksmith, G., and Duff, P. Infection, antibiotics, and preterm delivery. *Semin. Perinatol.* 25(5):295–309 (October) 2001.

28. Wing, D. A., Pyelonephritis in pregnancy: treatment options for optimal outcomes. *Drugs* 619140:2087–2096, 2001.

29. Centers for Disease Control and Prevention. Prevention of perinatal group B stretococcus disease. Revised guidelines from the CDC. *MMWR* 51(RRII), 1–22 (August 16) 2002.

30. Samuels, P. Hematologic complications of pregnancy. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 34.

31. Little, D. R. Ambulatory management of common forms of anemia. *Am. Fam. Physician* 59(6):1598–1604 (March 15) 1999.

32. Abramson, S. D., and Abramson, N. "Common" uncommon anemias. *Am. Fam. Physician* 59(4):851–858 (February 15) 1999.

33. Wians, F. H., Urban, J. E., Keffer, J. K., and Kroft, S. H. Discriminating between iron deficiency anemia and anemia of chronic disease using traditional indices of iron status vs. transferring receptor concentration. *Am. J. Clin. Path.* 115(1):112–118, 2001.

34. Varney, H., Kriebs, J. M., and Gegor, C. L. Antepartal complications. *Varney's Pocket Midwife*. Sudbury, MA: Jones and Bartlett, 1998.

35. Gei, A. F., and Hankins, G. D. V. Cardiac disease and pregnancy. *Obstet. Gynecol. Clin.* 28(3):465–512 (September) 2001.

36. Dajani, A. S., Taubert, K. A., Wilson, W., et al. Prevention of bacterial endocarditis: recommendations by the American Heart Association, *JAMA* 227(22):1794–1801 (June 11) 1997.

37. American College of Obstetrics and Gynecology. Thyroid disease in pregnancy: Clinical Management Guideline #37. *Obstet. Gynecol.* 98(5):878–879 (August) 2002.

38. Mestman, J. H. Endocrine diseases in pregnancy. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 33.

39. Ie, S., Rubio, E. R., Alper, B., et al. Respiratory complications of pregnancy. *Obstet. Gynecol. Survey* 57(1):39–46 (January) 2002.

40. Chitkara, U., and Berkowitz, R. L. Multiple Gestations. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 24.

41. Martinez-Frias, M. L., Bermejo, E., Rodriguez-Pinilla, E., and Frias, J. L. Maternal and fetal factors related to abnormal amniotic fluid. *J. Perinatol.* 19(7):514–520, 1999.

42. Magann, E. F., Chauhan, S. P., Kinsella, M. J., McNamara, M. F., Whitworth, N. S., and Morrison, J. C. Antenatal testing among 1001 patients at high risk: the role of ultrasonographic estimate of amniotic fluid volume. *Am. J. Obstet. Gynecol.* 180(6, pt. 1):1330–1336, 1999.

43. Larmon, J. E., and Ross, B. S. Clinical utility of amniotic fluid volume assessment. *Obstet. Gynecol. Clin. North Am.* 25(3):639 (September) 1998.

44. Magann, E. F., Kinsella, M. J., Chauhan S. P., McNamara, M. F., Gehring, B. W., and Morrison, J. C. Does an amniotic fluid index of

″ 5 cm necessitate delivery in high-risk pregnancies? A case-controlled study. *Am. J. Obstet. Gynecol.* 180:1354–1359, 1999.

45. Beckles, G. L. A., and Thompson-Reid, P. E. (Eds.) *Diabetes and Women's Health Across Life Stages: A Public Health Perspective*. Atlanta, GA: Centers for Disease Control and Prevention, 2001.

46. Landon, M. B., Catalano, P. M., and Gabbe, S. G. Diabetes Mellitus. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 32.

47. American Diabetes Association. Gestational diabetes mellitus. Clinical Practice Recommendations 2002: Position Statement. *Diabetes Care* 25 (suppl.) 1:S94–S96 (January) 2002.

48. Innes, K. E., Byers, T. E., Marshall, J. A., et al. Association between a woman's own birth weight with subsequent risk of gestational diabetes. *JAMA* 287(19)2534–2541 (May) 2002.

49. American Diabetes Association. Evidence-based nutrition principles and recommendations for the treatment and prevention of diabetes and related complications. *Diabetes Care* 25 (suppl.) 1:S50–S60 (January) 2002.

50. American Diabetes Association. Preconception care of women with diabetes. *Diabetes Care* 25 (suppl.) 1:S82–S84 (January) 2002.

51. Ray, J. G., O'Brien, T. E., and Chan, W. S. Preconception care and the risk of congenital anomalies in the offspring of women with diabetes mellitus: a meta-analysis. *QJM*. 94(8):435–444 (August) 2001.

52. Jackson, M., and Branch, D. W. Alloimmunization in pregnancy. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 26.

53. U.S. Department of Health and Human Services, Screening for D (Rh) Incompatibility. U.S. Preventive Services Task Force. *Guide to Clinical Preventive Services*, 2nd ed. Washington, DC: Office of Disease Prevention and Health Promotion, 1996.

54. American College of Obstetricians and Gynecologists. Prevention of Rh(D) alloimmunization. *ACOG Practice Bulletin*, No. 4 (May) 1999.

55. Ortho-Clinical Diagnostics. Rho(D) immune globulin. Package insert. February 2002.

56. Benedetti, T. J. Obstetric hemorrhage. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 17.

57. Towers, C. V., Pircon, R. A., and Heppard, M. Is tocolysis safe in the management of third-trimester bleeding? *Am. J. Obstet. Gynecol.* 180(6):1572–1578 (June) 1999.

58. Alexander, J. D. Vaginal bleeding associated with pregnancy. *Primary Care: Clin. Office Pract.* 27(1):137–151 (March) 2000.

59. National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy. Report of National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy. *Am. J. Obstet. Gynecol.* 183(1):S1–S22, 2000.

60. Sibai, B. M. Hypertension. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 28.

61. American College of Obstetricians and Gynecologists. Prevention of Rh D alloimmunization. *ACOG Practice Bulletin*, No. 4 (May) 1999.

CHAPTER

25

Complications of Gestational Age Assessment and the Postdate Pregnancy

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Fetal Age Determination

Accurate assessment of gestational age is one of the most critical judgments a midwife makes during the course of a pregnancy. Incorrect estimation of the duration of a pregnancy can lead to inappropriate timing for screening, misinterpretation of data, unnecessary intervention, or a failure to intervene when indicated [1]. Gestational age at the time for birth is the single most valuable predictor of infant health, and timing of delivery is often determined by assessment of gestational age [2]. The midwife has the responsibility of obtaining all available data related to establishing an accurate gestational age as early in the pregnancy as feasible. In general, the opportunity for accurate assessment of gestational age decreases with the passage of time.

Terminology for fetal age is somewhat confusing as gestational age, menstrual age, fetal age, conceptual age, ovulatory age, months of pregnancy, and weeks of pregnancy are all used to refer to advancement of embryonic and fetal development. The tradition of timing pregnancy from the first day of the last menstrual period (LMP) is in wide use since more women are aware of when menses last began than when they ovulated or when conception occurred. Gestational age is typically 2 weeks longer than ovulatory age in a 28-day cycle, and will be the default method of referring to fetal age within this chapter. Some helpful term equivalencies for gestational age are offered in Table 25-1.

TABLE 25-1 Gestational Age Equivalencies

Term	Days	Weeks	Months
Menstrual age	280	40	10 lunar, 9 calendar
Gestational age	280	40	10 lunar, 9 calendar
Fetal age	280	40	10 lunar, 9 calendar
Conceptual age	266	38	9 lunar, 8 calendar
Ovulatory age	266	38	9 lunar, 8 calendar
Postdate	>294	>42	>10 lunar

At the first prenatal visit, the midwife collects data that will be the basis for assessment of gestational age. The database will also include information about factors that may be responsible for variation in fetal growth as the pregnancy progresses. Data to be collected at the first visit should include the following:

1. First day of LMP
2. Normalcy (duration, amount of flow) of LMP (last normal menstrual period)
3. Menstrual history (frequency, duration)
4. Contraceptive history (use or not)
5. Pregnancy test—when positive? Urine or blood? Home or office test?
6. Previous pregnancy history, when, size of infants, gestational age at birth, route of delivery, complications of birth
7. Maternal chronic medical illness (e.g., diabetes, lupus, sickle cell anemia, hypertension)

8. Lifestyle practices (e.g., smoking, drug, alcohol use)
9. History of eating disorder

The database for reliable assessment of gestational age should include one or more of the first five criteria listed in Table 25-2. Criteria for dating are listed in descending order of accuracy, with the more reliable (smaller margin of error) methods of dating pregnancy listed first. Criteria 6 and 7 are considered unreliable means of establishing gestational age. Each criterion for dating will be considered in further detail. When available, any written record of the dating criteria will help validate the client's memory. If pregnancy tests have been done in a laboratory elsewhere, written confirmation of results should be requested.

During the prenatal visit in which the estimated date of birth (EDB) is calculated, the midwife should stress that the date is an estimation that represents the midpoint in a 4-week range, that some variation is not only normal but expected, and that approximately one woman in ten will have a pregnancy that will continue more than 2 weeks beyond that estimate [1, 2, 6, 9, 10]. Reassure the woman that you will follow established protocols for safe management of the postdate pregnancy if that should become necessary.

Basal Body Temperature

A few women keep basal body temperature (BBT) and coital records, particularly when actively attempting to conceive. Such records can be helpful in calculating the EDB, but it is rare that women enter a prenatal setting with this information. Conversely, if the woman has not followed instructions carefully, the data may be misleading. Whenever possible, several months' records should be reviewed when considering historical information, so that cycle length and regularity can be accurately assessed. Carefully recorded BBT records in infertility studies have established that this is a highly reliable (± 2 to 5 days) method of diagnosing pregnancy in its earliest stages [3]. Additionally, BBT records can reveal the prolonged preovulatory phase associated with almost 70 percent of postdate pregnancies, as well as those pregnancies exceeding 280 postconception days, which would have been undiagnosed due to a shortened preovulatory phase [11, 12]. Very few women are motivated to take daily temperatures and record them, so while accurate, the use of BBT records to establish gestational age is not a practical recommendation for most women. An added disadvantage is that the recording of daily temperatures for this purpose would have to take place in anticipation of pregnancy, and the majority of pregnancies are not planned. (See Chapter 17 for full instructions for recording BBT.)

Ultrasound

Increasing use of ultrasound technology early in pregnancy has reduced the frequency with which the midwife will be caring for a woman without reliable dates. If a woman presents without a reliable menstrual history, or if a size/date discrepancy is noted on the first visit, ultrasound information can add objective data from which an EDB can be calculated [4, 7, 11, 12]. Reliability of ultrasound results will be dependent upon the gestational age at assessment, skill of the examiner, technology available, and position of the fetus. First trimester ultrasound estimates based on crown-rump length are accurate to within 3 to 5 days [4]. Second trimester ultrasound estimates of fetal age are based on combined measurements of the biparietal diameter, femur length, and abdominal circumference to give the most reliable estimate (± 7 to 10 days) [7]. When ultrasound studies are ordered, the midwife should assess the level of reliability determined by that facility—i.e., the margin of error at each gestational age. The clinician must make a judgment about reliability of ultrasound data in comparison

TABLE 25-2 Criteria and Range of Accuracy for Dating Pregnancy

Criteria	Range of Accuracy
Basal body temperature chart with coital record, ovulation, and temperature elevation, combined with previous menstrual record	± 2–5 days [3]
First trimester ultrasound	± 3–5 days [4]
Serum beta hCG <10,000, 2 values, 1 week apart, rising appropriately	± 3–5 days [5]
LMP that is certain, normal, regular, and consistent with a first trimester examination	± 1–2 weeks [6]
Second trimester ultrasound	± 1–2 weeks [7]
Third trimester ultrasound	± 2–3 weeks [7]
Physical examination after 20 weeks	± 2–3 weeks [8]

to objective or historical data, keeping in mind that as pregnancy progresses, all methods of dating pregnancy become less reliable. Variability in fetal size increases as term approaches, and after 26 weeks the 2- to 3-week margin of error reflects increased variation in fetal growth rather than accurate correlates of gestational age [7].

Controversy remains concerning the wisdom of obtaining routine ultrasound measurements for all pregnancies [4, 7, 11, 12, 14, 15]. Proponents of routine ultrasound argue that there would be fewer errors in estimating gestational age of pregnancy with reduction in consequent misjudgment (e.g., misdiagnosed postdate pregnancy with resultant unnecessary inductions), earlier diagnosis of fetal anomaly or multiple pregnancy, and earlier identification of conditions that warrant increased fetal or maternal surveillance (e.g., placenta previa, low fluid volume). Critics point out that research findings have failed to conclusively demonstrate improved outcomes in low-risk women who receive routine ultrasound screening. (See Chapter 23 for full discussion of routine ultrasound and indications.)

When a significant discrepancy exists between the size of the uterus at clinical examination and the size expected based on estimated gestational age, ultrasound imaging is indicated to clarify gestational age. In addition, ultrasound will assist in ruling out fetal anomalies, multiple pregnancy, early pregnancy loss, ectopic pregnancy, uterine fibroids, or other pathology [4, 7, 11, 12, 14, 15].

Human Chorionic Gonadotropin

Measurement of human chorionic gonadotropin (hCG) or a subunit is the basis of endocrine-based tests for pregnancy. Highly sensitive serum testing can detect elevated hCG levels within 1 to 2 days of implantation (8 or 9 days after ovulation), and peak levels are reached at 60 to 70 days (8 to 10 weeks). Serum hCG levels double every 1.4 to 2.0 days during early pregnancy and can be used to assess viability, intrauterine implantation, and gestational age, particularly when there are two values under 10,000, which rise appropriately [5]. Individual laboratories can provide clinicians with guidelines for interpretation of quantitative results.

Commercially available urine pregnancy tests can be highly reliable if used correctly and may be a valuable adjunct in the determination of gestational age. Theoretical effectiveness of home pregnancy tests is superior to testing with actual patients, however, and some reports indicate sensitivity as low as 75 percent. False-negative results are more likely if the test is performed prior to the first day of the expected menstrual period [5].

Last Menstrual Period

When the first day of the LMP is known, a calculation of the EDB is made using Naegele's rule. The prediction of a 40-week gestation (LMP plus 1 year, subtract 3 months, add 1 week) originated in the nineteenth century with Dr. Frederich Naegele. Naegele authored a German text published in 1812 that contained the advice to estimate that a pregnancy would terminate approximately 40 weeks (280 days) after the first day of the last menstrual period [15]. Although this theory is not based on any modern concept of research, it remains widely accepted today. Subsequent research has indicated that the mean gestational age (i.e., menstrual age) for spontaneous labor in primigravid women is 41 weeks from LMP (287 days), or 40 weeks 3 days (283 days) for the multiparous woman [6, 8, 16]. Estimates based on pooled data are consistent with this finding and suggest that the mean menstrual age for pregnancy is 283 to 284 days [6, 8–10, 16].

The use of the LMP in calculation of the EDB is somewhat reliable (with a 2-week margin of error) if the woman has had regular cycles, has recorded her menstrual history, and has not used oral contraceptives for at least 3 months prior to conception [2]. However, studies have indicated that many women do not record their menstrual history, and light flow referred to as spotting renders the LMP invalid [1, 2, 6]. All menstruating women should be encouraged to keep a record of menses, and midwives should routinely consider cycle length when calculating the EDB. For example, if the cycle length is 30 days, add 2 days to the calculated EDB. The disadvantage of basing the EDB on menstrual history is that it may be notoriously unreliable, and there may be considerable variability in preovulatory interval in any case. Errors in calculation of the EDB, which is based on history, are primarily the result of errors in the woman's recall [1, 2, 6]. The midwife must also be aware that a woman may inaccurately report the LMP as a result of her strong desire for conception to have taken place on a particular date. Information that is supplemental to the LMP, and helpful in validating the EDB, includes coital timing (inclusion or exclusion dates for exposure to conception), use (or not) of contraception (type, timing, consistency, etc.), and date(s), type, and result(s) of any home pregnancy testing that the patient has done prior to seeking prenatal care.

Less Reliable Methods of Dating Pregnancy

Careful review of the literature reveals that uterine size does correlate positively with gestational age, but fundal measurement is a much less reliable predictor of EDB than the LMP [8, 17–19]. Clinical assessment of uterine size may be affected by distension of the bladder (up to 7 cm), maternal build, retroversion or retroflexion of the uterus, presence of fibroids, uterine anomaly, length of the cervix, position and presentation of the fetus, location of the placenta, amniotic fluid volume, clinician experience, and missing or incorrect data concerning menstrual dates (as high as 43 percent) [1, 2, 6, 17–19]. There is a common tendency to assess the uterine size as "appropriate for dates" if the menstrual history is known [19]. The closest correlation of the fundal height (measured in centimeters) and gestational age (expressed in weeks from the LMP) is between 20 and 30 weeks, with a margin of error of up to 3 weeks [8]. Thus, if the midwife finds that the uterus measures 26 centimeters at 28 weeks, consistent fundal growth has occurred to date, *and there are no other indications that the woman or fetus is not adequately nourished*, the uterine size may be considered consistent with the gestational age.

Research aimed at standardizing methods for calculation of gestational age has discredited quickening and the 20-week landmark "uterus at the umbilicus," as both have an unacceptably high margin of error. The clinician's notation of first fetal heart tones whether by ultrasound or fetoscope, and the client's signs and symptoms of pregnancy are likewise poor predictors of gestational age with an unacceptably high margin of error [8].

The Size/Date Discrepancy: Identifying the Problem

Once the pregnancy has been dated with the most accurate data available, the EDB should not be changed. The clinical objective for the midwife shifts from assessment of gestational age to assessment of fetal growth. During the early part of pregnancy, there is a narrow range for the size of a normal fetus. However, as the pregnancy progresses, the range for normal size and growth patterns expands [4, 7, 14]. As we know, an infant may weigh 6 pounds or it may weigh 9 pounds, and still be perfectly normal. This wide range makes the assessment of adequate growth later in pregnancy more difficult. It is imperative that abnormalities in growth—either too little or too much—be identified and monitored appropriately in order to prevent or minimize complications for the fetus. It is also important that unnecessary intervention in normal pregnancy be kept to a minimum.

One of the most frequently encountered challenges in the care of the pregnant woman is the problem of the size/date discrepancy. Although the midwife is discouraged from rigidly equating weeks of gestation with the fundal height in centimeters, this is common practice in many settings and can lead to an overdiagnosis of the size/date discrepancy. Some latitude must be allowed for individual fetal variation, multiparity, and maternal build [8]. While there is no single standard uterine size at any given gestational age, there is certainly progressive uterine enlargement as gestational age advances. Progressive uterine growth is considered indirect evidence of fetal growth, and if inadequate or excessive uterine growth is noted there is reason for concern [19]. The midwife makes an assessment about whether the uterine size is consistent with gestational age at every prenatal visit, and if dates are known to be reliable there are fewer options to consider when the clinician asks which part of the inconsistent database is more likely to be misleading—the size or the dates.

When uterine size is assessed during a prenatal visit, it may be either smaller or larger than expected. The judgment that there is a discrepancy between what is expected and what is found may occur at any time during the pregnancy, and it is compounded by the lack of broad clinical agreement about appropriate uterine size at any particular gestational age. Clinical decisions will reflect the midwife's thought process in gathering further data and then exploring the options about the significance of that data. When considering the potential diagnosis of a size/date discrepancy, the midwife needs to review the initial database and then incorporate or obtain any of the following additional information as appropriate:

1. Ultrasound reports to date
2. Total weight gain
3. Current nutritional status
4. Fundal height and pattern of growth
5. Fundal height and pattern of growth with prior pregnancies
6. Evidence of gestational diabetes
7. Current polyhydramnios or oligohydramnios
8. Lifestyle conditions: stressful home or work situation, continued smoking, substance abuse

Variables such as these are associated with the infant's weight at birth, but they will vary widely from case to case and may be difficult to objectively quantify during the prenatal period. Prior obstetric history of an appropriate-for-gestational-age (AGA) infant in spite of a similar size/date discrepancy is decidedly reassuring. The midwife who has reliable dating criteria (see Table 25-1) for an uncomplicated pregnancy will ordinarily not need further information *for the purpose of establishing gestational age*. However, if an apparent discrepancy develops, more reliable information should be sought when possible in the effort to determine whether fetal growth is appropriate, or whether some other condition exists that the midwife should know about. For example, if menstrual history and bimanual exam were used as the database for initial establishment of the EDB in a pregnancy that subsequently has a discrepancy between size and dates, an ultrasound should be obtained at the first opportunity since the ultrasound is more reliable earlier in pregnancy [4]. The decision to obtain a prenatal ultrasound is influenced by the apparent gestational age at the time of the clinical encounter, and the significance assigned to ultrasound data is likewise dependent upon gestational age. For example, third trimester ultrasound data may indicate a smaller (or larger) fetus than expected, but the estimated date of delivery should not be changed in the last trimester of pregnancy.

There are many variations on combinations of subjective and objective information that can be used to date a pregnancy. The student may find it helpful to list all criteria used for establishing the EDB in the order of reliability, question the accuracy of data that do not predict an EDB that is consistent and seek more reliable data whenever possible. A primary goal for the midwife considering the size/date discrepancy is the anticipation of potential problems. An error in establishing the gestational age of a fetus can lead to errors in the interpretation of other data such as the triple screen (Chapter 23), inappropriate timing for screening (triple screen or glucose challenge test), and mismanagement based on inaccurate data (e.g., failure to appropriately manage a postdate fetus) [1].

Size Greater than Dates

Table 25-3 identifies some causes of size/date discrepancies in each trimester.

Appropriate management will be determined by the correct interpretation of data collected at each prenatal visit. Consultation or referral may be necessary as additional data are evaluated.

Management of a size/date discrepancy will be influenced by the estimate of gestational age at the time of diagnosis, as clinical implications will be quite different for each trimester (see Table 25-3). Because clinical implications for each of the possible explanations vary widely, the midwife who reaches the conclusion that the fundal height is not consistent with the estimated gestational age (i.e., discrepancy 3 centimeters or greater) has the responsibility to investigate further. When a size/date discrepancy occurs, sonographic evaluation of the fetus is the preferred method for assessing fetal growth, fetal anatomy, amniotic fluid volume, placental location, and uterine structure [12]. Ultrasonic findings permit the midwife to reliably assess the pregnancy. For example, if dating of the pregnancy is found to be in error, the adjustment is made in the chart and subsequent assessments are based on this new information. If an anomaly is identified, appropriate counseling and referral can be made. Similarly, if abnormalities such as uterine fibroids, placenta previa, multiple gestation, oligohydramnios, or polyhydramnios are found, consultation or referral must be based on clinical practice guidelines in the midwife's practice setting. (Refer to Chapter 24 for discussion of antepartal complications.)

If the ultrasound documents macrosomia, the midwife must reevaluate the woman's history for the following:

1. Diabetes screening results
2. History or family history of diabetes
3. Obesity, weight gain, nutritional status
4. Weights of previous infants
5. Previous birth routes and possible complications, especially shoulder dystocia, failure to progress, cesarean section.

Dependent on the gestational age at the time a discrepancy is noted, subsequent ultrasound scans for an estimated fetal weight may be done in 3 to 4 weeks and prior to labor. Screening for glucose intolerance and noting the pattern of weight gain, combined with knowledge of the client's family, medical, and obstetric history, will lead to identification of most women with glucose intolerance. Management of the patient with gestational diabetes or Type II diabetes should follow practice guidelines (see Chapter 24).

While dietary assessment and counseling are routine for all gravid women, additional evaluation of caloric and nutrient intake may be indicated for the pregnant woman whose uterine size is consistently larger than expected. Intensive ongoing nu-

TABLE 25-3 Causes of Apparent Size/Date Discrepancies

Trimester	Size Less Than Dates	Size Greater Than Dates
First	Inaccurate dates Missed abortion Ectopic pregnancy Maternal build	Inaccurate dates Inaccurate measurement Full bladder or bowel Multiple pregnancy Uterine fibroids Ovarian cysts Maternal build
Second	Inaccurate dates Inaccurate measurement Fetal anomaly (GU, renal agenesis) Chromosomal abnormality Placental pathology Oligohydramnios Fetal death Severe, early onset IUGR related to chronic maternal illness (i.e., diabetes, lupus, sickle cell anemia) Fetal infection (parvovirus, CMV, rubella, toxoplasmosis) Elevated MSAPF/hCG	Inaccurate dates Inaccurate measurement Multiple pregnancy Fetal anomaly (CNS, GI [tracheo-esophageal fistula]) Chromosomal abnormality Polyhydramnios Early macrosomia
Third	IUGR SGA—genetically small infant, normally grown Placental pathology (previa, abruption, infarction, circumvallate) Fetal death Oligohydramnios (may be covert ruptured membranes or maternal dehydration) Transverse or oblique lie Poor maternal weight gain	Macrosomia LGA—genetically large infant, normally grown Gestational diabetes Breech presentation Placenta previa Polyhydramnios Excessive maternal weight gain

tritional evaluation and counseling may be necessary, depending upon initial assessment and individual circumstance [13, 19, 20]. Management of the gravid woman with an established diagnosis of LGA will include consultation as well as anticipation of a macrosomic infant. Prophylactic cesarean section for the expected macrosomic infant is not recommended. If the EFW is 5000 grams or more, consideration of previous obstetric history, clinical pelvimetry, cervical Bishop score, station of the presenting part, and availability of cesarean section if needed, as well as the woman's preference, should be considered in planning for route of birth [1, 13, 20–25].

Size Smaller than Dates

There are a variety of considerations when the uterus seems to be smaller than gestational age would suggest, as shown in Table 25-3. In the first half of pregnancy, this is often attributed to inaccurate dating. However, in the second half of pregnancy, fetal growth problems are more likely to be present and may contribute to poor outcomes, especially if they are not identified [7].

As with the size greater than dates problem, continued management of the pregnancy when size lags behind dates will depend upon the correct interpretation of additional data. In most cases, an ultrasound scan will assist the midwife with appropriate anticipatory management. For example, if low station is responsible for an assessment of size behind dates, no intervention is needed. Another common situation is that of the genetically small but well-grown infant who is small for gestational age (SGA). If comparison of two sonogram studies shows the fetus to be within the normal range for size and for growth, then subsequent consistent fundal growth can be considered a reassuring indicator of appropriate fetal enlargement [8, 18–20].

If fetal size is determined to be significantly less than expected, appropriate management would include serial ultrasound scans, an attempt to deter-

mine the cause of the IUGR, and antepartal fetal testing (see Chapter 23). Although diminished fetal growth appears on a continuum of severity that becomes diagnostic of SGA at the tenth percentile, any undergrown fetus will benefit from excellent maternal nutrition as well as reduction in workload and stress. Nutritional assessment and counseling are critical, as is smoking cessation, or identification and appropriate management of other substance abuse. Excessive work hours or stress must be decreased to allow for adequate rest periods and caloric conservation. An ultrasound diagnosis of IUGR requires consultation with the physician. In most situations, collaborative midwifery management is appropriate.

Postdate Pregnancy: The Clinical Problem

Research and clinical discussions have been hampered by the lack of consistency in language. Various terms used to describe the pregnancy lasting beyond 42 weeks include prolonged pregnancy, postdate pregnancy, postterm pregnancy, and postmaturity. The postdate pregnancy, an antepartal condition, must be distinguished from postmaturity syndrome, which is a neonatal condition diagnosed after examination of the newborn. The standard definition of the postdate pregnancy is 294 days beyond the last menstrual period (LMP), or 280 days after ovulation/fertilization (refer to Table 25-1) [1, 2]. The term *postdate* will be used in this chapter, since it does not imply direct knowledge about duration of pregnancy or maturity of the fetus.

Accuracy in dating pregnancy has improved dramatically since the use of ultrasound for dating has become more common, and the reported incidence of pregnancies that carry beyond 42 weeks has fallen as a result [26–28]. The optimal range of variation for the length of human gestation is not yet known, and the selection of 2 weeks past the EDB for defining the postdate pregnancy is somewhat arbitrary. When pregnancy is carefully dated and menstrual and ultrasound assessments are consistent, the incidence of postdate pregnancy falls to 1 to 3 percent [9–12, 26–28]. In spite of the relatively low incidence of true prolonged pregnancy, several studies have shown that a large portion of inductions scheduled with the indication of postdate pregnancy were in fact less than 42 weeks by ultrasound scan dating [9–12]. In effect, these are elective inductions.

Criteria for the diagnosis of postdate pregnancy are met if labor does not occur within 2 weeks after the calculated EDB. Some authors have suggested that a pregnancy be considered prolonged at 41 weeks since some measures of neonatal morbidity and mortality increase after 40 to 41 weeks [10, 29–34]. However, approximately 18 percent of all pregnancies will continue beyond 41 weeks, and 7 to 11 percent will extend to 42 weeks, depending upon the population and the criteria used for dating [2, 6, 8–10]. Investigation of the incidence of true prolonged pregnancy—i.e., pregnancy that lasts more than 280 days beyond conception (or 294 days beyond the LMP)—remains at between 1 and 3 percent, while the remainder of pregnancies that extend at least 2 weeks beyond the calculated EDB are apparently misdated. Clearly, the more accurate the assignment of gestational age, the lower the likelihood that a pregnancy will extend beyond 42 weeks. Since it is not currently possible to accurately assign gestational age in the last trimester, the estimate of gestational age must take place as early in pregnancy as possible when an error in dating is less likely. When the EDB is established in the last trimester or based on unreliable data, the midwife should remain cautious about the reliability of the calculated due date.

Pooled data reveal that the risk of stillbirth rises with increasing gestational age after 40 weeks, a finding that has certainly contributed to the increasing popularity of induction of labor at term [10, 29–34]. The cause of the rise in incidence of stillbirth after 40 weeks' gestational age is not well understood, nor is there clinical agreement on the best management approach for prevention of these deaths [25–28, 30–32].

An area of agreement is that the risk for perinatal mortality is higher for IUGR or SGA infants than it is for AGA infants in the postdate period [29–34]. Clausson et al. determined that the odds ratios for perinatal death are not significantly different for AGA infants at term versus postterm; however, SGA infants had an odds ratio of 10.5 for stillbirth in the postterm period [35]. Therefore, accurate identification of the SGA or IUGR fetus in women who continue pregnancy beyond 42 weeks is important in minimizing risk and maximizing positive outcomes. Active management of the woman with a postdate pregnancy with an AGA fetus may in fact be counterproductive to desired outcomes, raising the rate of epidural anesthesia, cesarean delivery, and its attendant morbidity [28–38].

The increased risk associated with true postdate pregnancy is thought to be associated with uteroplacental insufficiency, which eventually leads to fetal hypoxia [38, 39]. An associated marker and risk factor for the postdate pregnancy is amniotic fluid volume, which drops significantly in the last few weeks of pregnancy [40]. The decline in amniotic fluid volume, probably related to diminishing placental function, is associated with cord compression, particularly during the intrapartum period [30, 40]. Low amniotic fluid volume is also associated with some cases of thick meconium stained fluid (i.e., less fluid to dilute meconium that is passed), and consequent problems in the neonate with meconium aspiration pneumonia [30–38]. There is an apparent loss of subcutaneous fat for some postdate fetuses, while others are more likely to have macrosomia [21–35]. Such dichotomous outcomes suggest multifactorial etiologies in the pregnancies that extend beyond 42 weeks.

Anatomy and Physiology of the Cervix

An understanding of the anatomy and physiology of the cervix will be helpful to the midwife contemplating more active management of the postdate pregnancy. The normal parturient cervix gradually softens, thins out, begins to dilate, and moves anteriorly as term approaches [41–44]. The multiparous cervix ripens more readily than the nulliparous cervix, and knowledge of parity is important in the interpretation of the cervical examination in late pregnancy [42]. Cervical ripeness is known to be associated with the probable route of delivery after labor ensues, and is therefore a valuable predictor to the midwife [41–44]. The need for an objective means to quantify cervical ripeness led to the development of what is now known as the Bishop score [43], and the original scoring system was refined to reflect the greater importance of cervical dilatation in the prediction of a vaginal delivery. The Bishop Scoring System (Table 25-4) evaluates cervical readiness for induction or need for preinduction cervical ripening. The Bishop score is the total of the scores for each factor, with a maximum score of 13 possible.

In contrast to the uterine body, which is primarily smooth muscle, the cervix is only 10–15 percent smooth muscle and the balance of the cervix is connective tissue [41]. Although the cervix is anatomically a part of the uterus, it has a highly specific function that is different from the rest of the uterus and that difference is evident histologically, anatomically, physiologically, and biochemically. In the case of childbirth, the cervix must change dramatically to allow expulsion of the fetus and placenta. While the uterine muscle is contracting and thickening during labor, the cervix is thinning and opening in response to the wedgelike effect of the presenting portion of the fetus, which is being driven toward the pelvic floor [41, 42]. Each contraction during labor shortens the uterine smooth muscle fiber, gradually reducing the volume of the uterus. If the smooth muscle fiber in the cervix responded in the same manner, the cervix would become tighter and smaller rather than looser and larger [44].

TABLE 25-4 The Bishop Scoring System

Point Value	0	1	2	3
Dilatation (cm)	0	1–2	3–4	>5
Effacement (%)	0–30	40–50	60–70	>80
Station	−3	−2	−1/0	+1/+2
Consistency	Firm	Medium	Soft	
Position	Posterior	Midposition	Anterior	

Source: Adapted from Bishop, E. H. Pelvic scoring for elective induction. *Obstet. Gynecol.* 24(2):267 (August) 1964.

Because the condition of the cervix is the best predictor of successful induction of labor, it has been hypothesized that ripening the cervix would increase the likelihood of a vaginal delivery [44]. In fact, the cervix that does not spontaneously ripen is not like the cervix that does; furthermore the palpable cervix is akin to "the tip of the iceberg" in comparison to the cervical and lower uterine tissue that is inaccessible to the examiner [62]. The timing of events leading to successful delivery is also an issue [41]. For instance, is it necessary or even better if the cervix becomes favorable prior to the onset of regular painful uterine contractions, or can outcomes be equally satisfactory if uterine contractions precede cervical change?

Circulating levels of oxytocin increase during labor and are released in a pulsatile fashion from the posterior pituitary [45]. Stimulation of the lower genital tract, cervix, and the breast also leads to oxytocin release and sensitivity of the uterine muscle to circulating levels of oxytocin increases toward term [44–49]. After the onset of labor, sensitivity of oxytocin receptors increases until the end of second stage, then decreases. This is consistent with the finding that higher doses of oxytocin are

required to induce labor than to augment labor. Thus, the effect of a specific dose of oxytocin will vary according to the sensitivity of receptors in the myometrium and decidua [44–46]. Oxytocin acts directly on uterine action through its effect on the oxytocin receptors in the uterus, and indirectly through its action in stimulating the release of prostaglandin from the decidua, which then encourages more uterine contraction—a spiraling effect that is necessary for successful vaginal delivery. The cervix has relatively few oxytocin receptors, which may explain why the unripe cervix is such an obstacle to induction of labor with standard oxytocin induction protocols [41, 44, 45]. As a consideration in the active management of postdate pregnancy, induction of labor will be addressed in the next section of this chapter.

Management Approach for the Postdate Pregnancy: Anticipatory Versus Active

The two principal schools of thought are (1) anticipatory management—anticipation of fetal well-being with increased assessment and intervention only when indicated and (2) active management—induction of labor for all women who reach 42+ weeks. Either approach may be favored by the woman or by the midwife, and clinical practice guidelines for the postdate pregnancy should be reviewed with women and their families in the effort to reach consensus and prevent any misunderstanding.

Many variations on anticipatory and active management are possible, and they include consideration of cervical readiness (Bishop score), estimated fetal weight (by Leopold's maneuvers, sonogram, or both), fetal well-being, preference of the woman, amniotic fluid volume, prior obstetric history, maternal medical status, and method of induction under consideration. A heavily weighted variable is the gestational age of the fetus, with an increasing trend toward consideration of gestational age as a continuum rather than the discrete and mutually exclusive categories of "preterm, term, and postterm" [50–53]. Active versus anticipatory management of the postdate pregnancy will also be dependent upon reliability of the criteria used for assignment of gestational age.

Clinicians have long recognized the need to effect birth when serious medical and obstetric conditions threaten either the mother or the fetus. Prior to the development of acceptable methods for inducing labor, cesarean section was the only recourse in such cases. However, there are risks associated with the induction of labor as well as risks associated with prolonged pregnancy. The decision to initiate labor, or not, must always be made as a comparison of risks to benefits with either management decision. In general, methods of induction that are most effective in leading to active labor are those associated with increased frequency of fetal heart rate changes and uterine hyperstimulation [50–56]. Further information about each of the methods for induction of labor is summarized below.

The question remains as to the appropriate role for induction of labor with the postdate pregnancy. While there is considerable consensus on the necessity of induction for selected obstetric and medical complications, the decision to induce labor in the uncomplicated postdate pregnancy carries potential for harm [50–56]. Induction of labor is associated with an increase in epidural anesthesia and cesarean delivery for the primigravid woman beyond 41 weeks whose infant's birth weight is 3800 grams or greater [52], and the primigravid with an unripe cervix (Bishop score at or below 5) who is electively induced has a cesarean delivery rate as high as 50 percent [50–56].

When reliable dating information is not available, less reliable criteria for dating pregnancy must necessarily be considered in the assignment of gestational age. However, the clinician's decision to actively intervene is difficult to justify on the basis of an unreliable database. Assessment and evaluation of fetal and maternal well-being would be a more prudent course in the event of a pregnancy dated with unreliable or missing menstrual dates (e.g., breastfeeding, spotting), last trimester ultrasound, quickening, or uterine size. Evidence of compromise to fetal well-being may encourage the decision to effect birth, but such a decision should be tempered with reasonable caution about fetal maturity.

An unripe cervix (Bishop score less than 6) is more strongly associated with cesarean section in the primigravida than the multipara [50–56]. Cost remains an unresolved issue for many, and debate continues as to whether the cost of induction exceeds the cost of additional monitoring in the pregnancy that exceeds term [57–59]. Meta-analysis of clinical trials suggests that a minimum of 500 inductions would be needed to reveal any improvement in perinatal mortality, suggesting that clinically significant outcomes for induction of

labor versus anticipatory management in the postdate pregnancy are sufficiently small as to make either choice reasonable [1, 26–28, 50–56].

Before initiation of any management plan, women and their families or support persons need to understand the risks and benefits of cautious observation of normal processes and of intervention. It is important to review dating accuracy so that they realize that the baby is most likely not actually "late," but this ambiguity is the result of not being able to determine absolute dating of the pregnancy. They also must understand that induction of labor is not as easy as it may sound or as it looks on television. That, in fact, there is no magic bullet or potion that will necessarily lead to a normal labor and subsequent vaginal birth. The fact that medical induction of labor carries with it an increased risk of fetal distress, cesarean section, infection, and hemorrhage is a great surprise to most laypersons. The midwife has the responsibility to inform women of their risks, and to document the discussion in the chart. Conversely, women should also know that truly prolonged pregnancies have an increased incidence of stillbirth, meconium-stained fluid, neonatal meconium aspiration syndrome, shoulder dystocia when the fetus is macrosomic [59–61], and fetal distress if the fetus is small for gestational age [35].

Each midwife must know the practice guidelines in the clinical setting and be able to interpret these to women in their care. It is important to know the obstetric and medical indications for induction and to explain to women that induction of labor without indication is poor practice. By 40 weeks of pregnancy, most women are tired and uncomfortable. They have difficulty sleeping and waiting becomes burdensome emotionally to the whole family. These are indicators for support, not for induction of labor. Indications for induction of labor include but are not limited to the following:

1. Nonreassuring fetal testing (low biophysical profile score; see Chapter 23)
2. Oligohydramnios
3. Worsening preeclampsia at term
4. Insulin-dependent diabetes
5. IUGR at term
6. History of a previous term stillbirth

In addition, there are some circumstances in which the convenience of induction may equate to safer care. An example would be the woman with a history of very rapid labors who presents at 40 weeks, completely effaced and 4 centimeters dilated, without labor. In order to avoid a precipitous labor away from supportive care, induction may be a reasonable choice [62]. However, scheduling induction of labor as a result of a busy office schedule or to have the baby on someone's birthday is clearly elective, and introduces unnecessary risk.

Table 25-5 offers a plan for anticipatory management of the uncomplicated pregnancy between 40 and 42 weeks; all items should be actively reviewed with the pregnant woman at each prenatal visit beginning at 40 weeks. (Refer to Chapter 23 for a review of antepartal fetal assessment methods to be initiated for care of the postdate pregnancy.)

Anticipatory management for the postdate pregnancy may appropriately begin at term since approximately one in five pregnancies at 40 weeks will continue for at least another week. An important factor for the midwife to consider is the reliability of the estimated date of birth; the less reliable the EDB is, the more cautious the midwife should be with active intervention. Midwives should also be informed concerning local laws and regulations regarding their scope of practice, consistency with their own practice guidelines, and awareness of the local community's standard of care for the postdate pregnancy. In addition, management decisions should be mutually agreeable to the woman, midwife, and physician consultant, and this should be well documented. When women are well informed about treatment options for management of postdates pregnancy and can make a well-informed

TABLE 25-5 Anticipatory Management of a Woman with a Pregnancy Between 40 and 42 Weeks

1. Review EDB with woman as the midpoint in a 4-week range (40+ weeks).
2. Review postdate management plan with woman; carefully document mutual acceptance of the plan (40+ weeks).
3. Initiate nonstress test (NST) twice weekly, starting by 41 weeks, continuing until birth.
4. Initiate amniotic fluid volume (AFV) twice weekly, starting by 41 weeks, continuing until birth.
5. Initiate full biophysical profile and consult with a physician for nonreactive NST or low AFV.
6. Consult with a physician (providing documentation) for any pregnancy reaching 42 weeks.
7. If the pregnancy continues to 42 weeks and dates are reliable (see Table 25-2, items 1–5), begin active management per protocol.

choice, and fetal well-being is assured, it is reasonable to continue anticipatory management until 42 weeks or until there is an indication for delivery. The woman's preference for management after term has been reached should be a heavily weighted and well-documented variable in management decisions, as should fetal well-being.

A note of caution concerning suggested guidelines for management of the pregnancy exceeding 42 weeks is to keep in mind the poor quality of research supporting postdate pregnancy protocols. Evidence-based practice has no clear guidelines for the management of pregnancy after term has been reached. Multi-institutional, prospective, controlled clinical trials with double-blind random assignment to treatment or control group have simply not been done, and the barriers to such research are probably insurmountable. Clinical trials are flawed by patient (and provider) self-selection to group, lack of control regarding specific measurement of each variable, and lack of clinical consensus on appropriate outcome measures. Several authors quantify the patient's self-selection bias, ranging from 20 to 34 percent, and others have addressed the impact of women's requests for the induction of labor [61–66]. Differences in regional management protocols, changes in pharmaceutical recommendations, and technology for fetal assessment have changed so rapidly that multicenter clinical trials only a few years old are not readily generalizable to current debates.

Analysis of clinical trials reveals that while there is no clear evidence that antepartum assessment (e.g., NST) reduces the incidence of morbidity and mortality in the postdate pregnancy, retrospective data analysis indicates a lower risk of morbidity for monitored women [60, 61, 67, 68]. It is not clear whether factors other than the gestational age were associated with the additional risk, but the fact remains that the NST is now firmly integrated into the care of women who are considered postdates [67–69]. Finally, the vast majority of research on induction of labor addresses comparison of one method to another rather than the underlying question of whether induction of labor at any particular gestational age improves outcomes for either mother or infant.

Active Management of the Postdate Pregnancy: Induction of Labor

In the 1970s there was a growing awareness of increased perinatal mortality with advanced gestational age. This awareness quickly led to the hypothesis that reduction of the incidence of postdate pregnancy would improve outcomes. Some have objected to induction on the basis that induction of labor is unnecessary and unnatural, and potentially harmful. The lack of credible evidence-based criteria for induction of labor in the uncomplicated postdate pregnancy has led to localized management patterns that do not necessarily minimize risk or maximize the utilization of available resources for the care of women and infants. In spite of the arguments against induction of labor and the lack of standardized criteria, the practice of induction has increased markedly over the past decade [1, 11, 26–28, 36, 37].

According to the American College of Obstetricians and Gynecologists, the desired result of induction of labor is "to achieve vaginal delivery by stimulating uterine contractions before the spontaneous onset of labor" [69]. Although the methods for induction of labor are primarily directed at initiating uterine contractions, there is increasing recognition that cervical change plays an important role that is not entirely mediated by uterine activity. Pharmacologic initiation of labor has centered on the use of oxytocin since the 1960s [70] and prostaglandin compounds since the 1970s [49, 62]. Table 25-6 presents a summary of hormonal methods for induction of labor; nonhormonal methods of inducing labor are listed separately later in this

TABLE 25-6 Hormonal Methods for Induction of Labor

1. Oxytocin (Pitocin) administered intravenously (FDA approved for induction of labor)
2. Prostaglandins
   a. Misoprostol
      (1) Brand name Cytotec: A synthetic PGE1 analogue tablet administered intravaginally (FDA approved for peptic ulcer prevention, *not induction*)
   b. Dinoprostone
      (1) Brand name Cervidil: A synthetic PGE2 preparation available as controlled release 10-mg vaginal insert (FDA approved for induction of labor in 1995)
      (2) Brand name Prepidil: A synthetic PGE2 preparation available in 0.5-mg gel form and administered intracervically (FDA approved for induction of labor in 1993)
3. Mifepristone (RU 486, a progesterone receptor antagonist) (FDA approved as a first trimester abortifacient, *not induction*) available in 200 mg tablet to be taken orally

chapter in Table 25-7. Dosing, route, and timing of administration for all methods are still being actively researched; specific recommendations are given in the text if research supports them.

In terms of effecting safe birth, successful induction of labor after cervical ripening with prostaglandin E2 (PGE2) may take place with oxytocin, and prostaglandins have proved to be more effective as a cervical ripening agent than oxytocin. Other methods of inducing labor (e.g., castor oil, breast stimulation, mechanical stretching of the cervix) have highly variable rates of success and/or little research to guide recommendations.

Oxytocin Oxytocin is the most commonly administered intrapartal medication [45]. Discovery of its pharmacologic actions in 1906 led to research that has demonstrated usefulness in reducing uterine atony after cesarean or vaginal delivery and initiating or augmenting uterine contractions [46, 70]. Appropriate use of oxytocin has significantly reduced maternal and fetal mortality. However, inappropriate use of oxytocin has resulted in grave maternal and fetal consequences, spurring the development of protocols to guide clinicians with judicious use [69].

Use of the standard oxytocin protocol with the parturient who has an unripe cervix is unsuccessful in leading to a vaginal delivery in approximately one-half of the women who are induced by this method [50, 54–56]. The most serious limitation in using oxytocin for induction of labor is in fact for the woman with an unfavorable cervix. The problems known to be associated with labor induction for these woman have led to the suggestion that a very low dose oxytocin infusion (0.5 mu/min, doubled every 40 to 60 min to a maximum of 2–4 mu/min) over 12 to 18 hours can be used for ripening the unfavorable cervix, prior to the initiation of the protocol used for induction of labor [45, 46, 51, 52, 69]. Such infusions should necessarily be done only in cases when warranted, via continuous or pulsatile intravenous infusion piggybacked to an appropriate fluid, and with appropriate monitoring of maternal and fetal status.

Oxytocin induction of labor for the woman whose cervical Bishop score is 6 or greater may begin with an initial dose of 2 mu/min, which is increased in increments of 1–2 mu/min at 30-minute intervals. Dosages, intervals for increase, and duration of administration of pitocin for the induction of labor are still actively debated, and should probably vary according to gestational age, parity and cervical score, and response to the dosage of pitocin. Individual clinical settings will have a wide range of oxytocin protocols to which they adhere. Each midwife must be familiar with these protocols if managing an induction of labor. When oxytocin is used for induction of labor after the cervix is ripe, 30-minute incremental increases are found to be associated with fewer instances of fetal distress and a lower cesarean delivery rate than a 15-minute interval, although labors are longer [71].

The fact that the cervix has relatively few oxytocin receptors may explain why the unripe cervix is such an obstacle to induction of labor with standard oxytocin induction protocols [41, 44]. Many clinicians prefer to prepare the unripe cervix with administration of prostaglandin rather than intravenous oxytocin. Studies have shown that preparation of the unripe cervix with a prostaglandin gel or suppository can safely and effectively reduce the rate of failed induction and subsequent cesarean section [71–73]. The use of oxytocin as a means of ripening the cervix follows a different protocol than oxytocin used as a labor stimulant [69].

Prostaglandins The high failure rate of oxytocin induction for women with a long closed cervix led to renewed efforts to find ways to ripen the cervix prior to induction efforts [66, 69, 71]. Intravenous administration of prostaglandins was investigated during the 1960s but sometimes severe side effects associated with systemic use led to trials with oral or local administration [71]. A meta-analysis of studies examining the use of prostaglandins for induction of labor led to the conclusion that such use reduced the incidence of failed induction, and thereby increased the likelihood of vaginal delivery [50].

Clinical trials have sought to determine the most appropriate dosages and route of administration; oral, intravenous, and intracervical and transvaginal preparations have all been evaluated [71, 72]. Oral administration is simpler and more acceptable to women, but it is much more difficult to avoid problems such as systemic side effects and hyperstimulation with oral doses [71–73, 77–80]. Many studies have compared prostaglandins to use of oxytocin or placebo for induction of labor, but if the prostaglandins are more physiologically suited to cervical ripening rather than active labor induction these comparisons may well be inappropriate.

There is some evidence to suggest that the use of prostaglandins for cervical ripening is most ad-

vantageous for the woman with an unripe cervix, and, when the cervix is already favorable, outcomes are very similar for women who are induced via PGE2 or oxytocin infusion [26–28, 54]. Outcomes such as cervical change in points (Bishop score) or time to delivery are prostaglandin-dose related, and associated with gestational age, parity, and cervical status. Mechanical stretching of the cervix such as that which takes place with "stripping the membranes" releases prostaglandin F2-alpha [47, 48].

Dose-related responses to administration of prostaglandins include cervical ripening, fetal distress, hyperstimulation, cesarean section for fetal distress, and neonatal jaundice [53–56]. Vaginal gel administration is less likely than cervical administration to be associated with an increase in cesarean deliveries, but this route of administration is associated with compromised fetal and neonatal status on several outcome measures. Tachysystole and the rate of operative vaginal birth for abnormalities in the fetal heart rate are also more likely with administration of misoprostol than dinoprostone [53–56].

Ripening or dilatation of the cervix is not always associated with any improvement in the rate of vaginal birth [24, 35, 44, 47]. The cervix is more likely to ripen with vaginal administration of PGE2 than with endocervical, yet this difference was not associated with changes in other outcome measures—e.g., use of analgesia or cesarean section [50]. Meta-analysis was not able to determine any clear differences between intracervical and vaginal administration of prostaglandin gels [50]; many studies reflect dated management protocols as well as outmoded methods of establishing gestational age.

Two prostaglandins have been the primary focus for use with labor induction; prostaglandin E1 (PGE1) and PGE2, which are both effective oxytocic agents [49]. Examples of these products are Cytotec (PGE1) and Cervidil and Prepidil (both PGE2). Misoprostol (Cytotec) is a tablet that is placed intravaginally by means of the examining hand. The tablet should be placed in the posterior fornix. It is not necessary to use a speculum for placement. Dosing should be done according to protocol in the clinical setting. ACOG recommends that a 25-mcg tablet be used for the initial dose, that doses should not be given more often than every 3 to 6 hours, and that oxytocin should not be given until at least 4 hours after the most recent misoprostol tablet [69, 73–77]. Safety of misoprostol (Cytotec) as a means of inducing labor is a concern. It is contraindicated for women with a previous uterine scar and should always be used with caution. Recently G. D. Searle, the manufacturer of misoprostol, has made public a drug warning that states that misoprostol ought not be used in pregnant women, but this has been refuted by ACOG, which states that "given the current evidence, intravaginal misoprostol tablets appear effective in inducing labor in pregnant women who have unfavorable cervices" [74].

Cervidil is a prostaglandin preparation placed in a mesh insert, which should be positioned in the posterior fornix with just a few centimeters of the attached string visible outside the vagina. The insert absorbs secretions, enlarges, and releases dinoprostone at the rate of about 0.3 mg/hr for 12 hr, at which time it is removed. The woman is asked to stay in a recumbent position for at least 2 hours after insertion so that location of the drug is maintained [75, 76]. If oxytocin is used after Cervidil is removed, the midwife should wait at least 30 minutes prior to beginning oxytocin infusion. Cervidil should be removed if active labor, fetal distress, tachycardia, or hyperstimulation occurs. An advantage to the use of Cervidil is that it can be easily inserted without the use of a speculum, and quickly and easily removed in the event of hyperstimulation or active labor, making it more convenient and safer to use on an outpatient basis [75–79].

Prepidil is a gel usually administered via a prefilled syringe into the cervical canal just inside the internal os. The syringe contains 0.5 mg dinoprostone and is brought to room temperature just prior to insertion. Speculum insertion and visualization of the cervix are necessary in order to place the gel appropriately, which is a disadvantage to this preparation. The woman is asked to remain in the dorsal position for 10 to 15 minutes to minimize leakage. The maximum recommended dosage for a 24-hour period is 1.5 mg, or 3 doses [75–79]. Prepidil gel should be swept from the vagina if active labor, fetal distress, tachycardia, or uterine hyperstimulation (tachysystole) occurs. In addition, potential side effects include uterine contractile abnormality, gastrointestinal effects (nausea and diarrhea), back pain, warm feeling in the vagina, and fever [75–79].

Mifepristone (RU 486) is not recommended for cervical ripening or induction of labor. Oral medication for induction of labor has significant drawbacks due to difficulty in reversing the effect, and there are insufficient data to establish safety of this method. Mifepristone has not been approved by the FDA for induction of labor at term [80].

Nonhormonal Methods for Induction of Labor

Several nonhormonal methods for induction of labor have been used with widely varying degrees of success. These methods are listed in Table 25-7.

Membrane Stripping The procedure known as stripping or sweeping the membranes refers to the practice of attempting to separate amniotic membranes from the reachable portion of the cervix and lower uterine segment during a vaginal examination [81, 82]. With a gloved hand, the midwife examines the woman to determine cervical effacement, dilatation, and position in the usual fashion. Care is taken to be certain that the vertex is presenting. The examiner extends the index finger as far as possible through the internal os, rotating the distal end of the finger slowly between the lower uterine segment and the membranes. Several sweeps are usually sufficient to stimulate onset of regular contractions within 72 hours [81–84]. The mechanism of action is probably the release of prostaglandins into maternal circulation. Membrane stripping is apparently safe if done appropriately, and shortens the gestational period by an average of 2 to 5 days thereby reducing the frequency of postdate pregnancy [81–84]. Stripping of the membranes should not be performed if inadvertent rupture of the membranes would be considered unsafe for the mother and infant. Membrane stripping should not be considered in cases of cervicitis, low lying or placenta previa, unknown lie, or undiagnosed vaginal bleeding.

Amniotomy Artificial rupture of the membranes (AROM) is another traditional method for induction or augmentation of labor [85]. As with membrane stripping, the midwife must do a careful vaginal examination to assess cervical effacement, dilatation, position, and the station of the presenting part. A nonvertex presentation is a contraindication to AROM, and other relative contraindications include an unengaged head, or small baby, as both conditions predispose to fetal cord prolapse. Precautions to weigh when AROM is considered include the commitment to birth (since the fetus is no longer in a sterile environment) and the increased likelihood of cord compression without hydraulic protection of the umbilical cord [85–87]. The usual method for AROM is bimanual examination with assessment for safety of the procedure, followed by insertion of an amnihook or similar instrument along the palmar surface of the examining hand. Early amniotomy (mean 2 centimeters dilatation) has been associated with more amnionitis, uterine hyperstimulation, and fetal distress than with later amniotomy (mean 5 centimeters dilatation) [85–87]. While amniotomy is used frequently to induce labor, there are no well-designed studies that prospectively randomize women to group for the purpose of evaluating this practice. It is not recommended that AROM be used alone to induce labor [69, 76, 85–87].

TABLE 25-7	Nonhormonal Methods for Induction of Labor
1. Membrane stripping or sweeping	
2. Artificial rupture of the membranes (AROM)	
3. Breast pump or nipple stimulation	
4. Ingestion of castor oil	
5. Foley bulb or balloon catheter	
6. Sexual activity	
7. Herbal preparations	

Breast Pump or Nipple Stimulation Few large studies have evaluated the safety and efficacy of breast stimulation as a method of inducing labor. However, the cumulative effect of many studies using the treatment of breast pump or manual nipple stimulation, combined with the physiologic basis for cervical change has led to an increased trend in recommendation of this relatively benign means to induce labor [88, 89]. Various treatments have included automatic electric breast pump, stimulating each breast for 15 minutes, interrupted by 15-minute rest periods; stimulation of breasts by gentle massage with a warm moist cloth for 1 hour, three times a day; breast stimulation for 45 minutes three times a day, and gentle massage of alternate breasts for a total of 3 hours a day [88, 89]. Weaknesses in the research include lack of compliance with the suggested intervention, small numbers in the groups, little control with critical variables such as gestational age, and inherent unreliability of the measure of the intervention. Not enough is known about the effect of breast or nipple stimulation to provide clear guidance regarding recommendation for use as either a means to soften the cervix or a method for induction of labor. Women who try this technique should be cautioned to limit nipple contact so that hyperstimulation of the uterus does not occur [88, 89]. (See Chapter 23 for the procedure for breast stimulation to induce a contraction stress test.)

Castor Oil The oral ingestion of 60 mg of castor oil mixed in apple or orange juice does appear to in-

crease the incidence of spontaneous onset of labor when used in term pregnancy [90, 91]. The intervention appears to have few drawbacks, but very little research is available on the topic. The best timing for ingestion of castor oil used for induction of labor is after a good night's sleep and 1 to 2 hours before the woman gets up for the day. Castor oil acts by stimulating the gut, which stimulates the vagal nerve, thereby stimulating the uterus [90, 91]. Onset of action is within 2 to 6 hours.

Foley Bulb or Balloon Catheter The Foley catheter or bulb has several advantages as a mechanical device used to stretch the cervix [92, 93]. It is readily available to the midwife, relatively safe to use, inexpensive, easy to place, and easy to remove. Additionally, fetal monitoring is not necessary while the Foley is in place, as it is to at least some extent with the use of hormonal methods of cervical ripening. Most commonly, the 16-gauge Foley catheter is inserted through the cervical canal, and then the balloon is inflated to 25 to 50 milliliters to hold it in place. Small clinical trials have shown this to be a promising technique, and many of the subjects entered labor while the Foleys were in place [92, 93]. Similar effects have been noted with the use of laminaria and synthetic osmotic dilators [94]. Clinical trials have not been sufficient to make specific recommendations.

Sexual Activity, Herbal Preparations Although there are some additional methods that have been used to ripen the cervix, initiate uterine contractions, or augment labor [95–97], there is little research to guide any specific recommendation. Nevertheless, many midwives have been routinely suggesting coitus and/or genital manipulation if the membranes are intact, nipple and breast stimulation, or herbal preparations as safe methods to hasten the onset of labor. The woman with an uncomplicated term pregnancy and intact membranes may be advised that lovemaking and breast stimulation are not contraindicated and could physiologically be associated with earlier onset of labor. Drinking herbal preparations such as evening primrose oil, black cohosh tincture, and blue cohosh tincture may be helpful, but a lack of research establishing dosage, safety, and efficacy guidelines hinders advisement. Acupuncture and homeopathy are additional venues for induction of labor that need further study [95–97].

If the midwife does conclude that active management of the postdate pregnancy is indicated, the protocol in Table 25-8 presents a guide to recommendations regarding administration, timing, dosage, and precautions. As with anticipatory management, the midwife is advised to carefully document mutual acceptance of the management plan by the woman, consulting physician, and midwife. The midwife should be familiar with the local standard of care for the postdate pregnancy, as should the woman. The woman should be informed if there is any off-label status in prescription use, and the midwife must remain current with literature related to management of postdate pregnancy. The woman's informed preference for timing of active management with postdate pregnancy should be a heavily weighted variable.

Summary

The clinical problem has been threefold: (1) reliable diagnosis of postdate pregnancy remains a challenge, (2) there is no consensus on the clinically appropriate time to suspend anticipatory management in favor of an effort to initiate birth, and (3) there are no clear evidence-based guidelines for the induction of labor in the uncomplicated postdate pregnancy.

While it is clear that there are maternal and fetal risks associated with pregnancy lasting longer than 41 weeks, it may be that some of those risks are a result of the management of that pregnancy rather than the prolongation of it. For example,

TABLE 25-8 Active Management of Postdate Pregnancy

1. Midwife follows Steps 1 through 6 in Table 25-5, as needed.
2. Woman may self-administer castor oil after 40+ weeks when the cervix is ripe, according to woman and midwife preference.
3. Midwife may sweep membranes after 41+ weeks, according to woman and midwife preference.
4. Midwife may administer prostaglandin gel (Prepidil) or insert (Cervidil) if cervix is unripe, in anticipation of induction, between 41 and 42 weeks.
5. Midwife may schedule pitocin induction of labor if 42 weeks is reached, according to woman, midwife, and consulting physician preference.
6. Midwife should not allow pregnancy to extend beyond 42 completed weeks (300 days) if dates are reliable.

Note: Prostaglandins and oxytocin are never administered simultaneously.

dysfunctional labor, fetal distress, and postpartum hemorrhage may be results of labor induction and augmentation, or they may be results of macrosomia. Knowledge of cervical readiness may be helpful for prediction of successful induction of labor, but information about fetal size apparently does not improve outcomes.

The philosophy of the American College of Nurse Midwives (ACNM) includes language that supports the normalcy of childbirth and advocates nonintervention in normal processes. When there are deviations from normal, the ACNM "supports the use of appropriate technological interventions where the benefits of such technology outweigh the risks" [98]. This belief in the normalcy of childbirth challenges the growing practice of induction of labor, particularly when risks, benefits, indications, and criteria for induction have not been clearly delineated.

References

1. Alexander, G. R., Tompkins, M. E., Peterson, D. J., Hulsey, T. C., and Mor, J. Discordance between LMP-based and clinically estimated gestational age: implications for research, programs, and policy. *Public Health Rep.* 110(4):395–402, 1995.
2. Kramer, M. S., McLean, F. H., Boyd, M. E., and Usher, R. H. The validity of gestational age estimates by menstrual dating in term, preterm, and postterm gestations. *JAMA* 260:3306–3308, 1988.
3. Frank-Hermann, P., Greund, G., Baur, S., et al. Effectiveness and acceptability of the symptothermal method of natural family planning in Germany. *Am. J. Obstet. Gynecol.* 165:2008–2011, 1991.
4. Bricker, L., and Neilson, J. P. Routine Doppler ultrasound in pregnancy (Cochrane Review). In *The Cochrane Library*, Issue 3. Oxford, England: Update Software, 2000.
5. Sacher, R. A., and McPherson, R. A. *Widmann's Clinical Interpretation of Laboratory Tests*, 11th ed. Philadelphia, PA: F. A. Davis, 2000.
6. Mittendorf, R., Williams, M. A., Berkey, C. S., et al. The length of uncomplicated human gestation. *Obstet. Gynecol.* 75(6):929–932, 1990.
7. Bricker, L., and Neilson, J. P. Routine ultrasound in late pregnancy (after 24 weeks gestation) (Cochrane Review). In *The Cochrane Library*, Issue 3. Oxford, England: Update Software, 2000.
8. Nichols, C. Dating pregnancy: gathering and using a reliable data base. *J. Nurse-Midwifery* 32(4):195–204, 1987.
9. Ventura, S. J., Martin, J. A., Curtin, S. C., et al. Births: Final data for 1998. National Vital Statistics Report, vol. 48, no. 3. Hyattsville, MD: National Center for Health Statistics, 2000.
10. Ahmed, A. I., and Versi, E. Prolonged pregnancy. *Curr. Opinion Obstet. Gynecol.* 5(5):669–674, 1993.
11. Ewigman, B. G., Crane, J. P., Frigoletto, F. D., et al. Effect of prenatal ultrasound screening on perinatal outcome. *N. Eng. J. Med.* 329(12):821–827, 1993.
12. Tunon, K., Eik-Nes, S. H., and Grottum, P. Fetal outcome in pregnancies defined as postterm according to the last menstrual period estimate, but not according to the ultrasound estimate. *Ultrasound Obstet. Gynecol.* 14(1):12–16, 1999.
13. LeFevre, M. L., Eain, R. P., Ewigman, E. G., et al. A randomized trial of prenatal ultrasonographic screening: impact on maternal management and outcome. RADIUS (Routine Antenatal Diagnostic Imaging with Ultrasound) Study Group. *Am. J. Obstet. Gynecol.* 169(3):483–489, 1993.
14. American College of Obstetricians and Gynecologists. *Routine Ultrasound in Low-Risk Pregnancy*. No. 5, 1997. Washington, DC: ACOG, 1997.
15. Naegele, F. S. Erfahrung and Abhandlungen des Weiblichen Geschlechtes. Mannheim, Germany: Ben Lobias Loeffler, 1812.
16. Nichols, C. W. Postdate pregnancy: Part I. A literature review. *J. Nurse-Midwifery* 30(4):222–239, 1985.
17. Beazley, J., and Underhill, R. Fallacy of the fundal height. *Br. Med. J.* 4:404, 1997.
18. Neilson, J. P. Symphysis-fundal height measurement in pregnancy (Cochrane Review). In *The Cochrane Library*, Issue 3. Oxford, England: Update Software, 2000.
19. Engstrom, J. L., Sittler, C. P., and Swift, K. E. Fundal height measurement. Part 5: The effect of clinician bias on fundal height measurements. *J. Nurse-Midwifery* 39(3):130–141, 1994.
20. Lurie, S., Zalel, Y., and Hagay, Z. J. The evaluation of accelerated fetal growth. *Curr. Opinion Obstet. Gynecol.* 7(6):477–481, 1995.
21. Pollack, R. N., Rauer-Pollack, G., and Divon, M. Macrosomia in postdates pregnancies: the accuracy of routine ultrasonographic screening. *Am. J. Obstet. Gynecol.* 167(1):7–11, 1992.

22. Chervenak, J. L. Macrosomia in the postdates pregnancy. *Clin. Obstet. Gynecol.* 35(1):151–155, 1992.

23. Chauhan, S. P., Sullivan, C. A., Magann, E. F., et al. Estimate of birthweight among post-term pregnancy: clinical versus sonographic. *J. Maternal Fetal Med.* 3(5):208–211, 1994.

24. Irion, O., and Boulvain, M. Induction of labour for suspected fetal macrosomia (Cochrane Review). In *The Cochrane Library*, Issue 4. Oxford, England: Update Software, 2000.

25. Ryo, E., Kozuma, S., Sultana, J., et al. Fetal size as a determinant of obstetrical outcome of post-term pregnancy. *Gynecol. Obstet. Invest.* 47(3):172–176, 1999.

26. Hannah, M., Hannah, W., Hellman, J., Hewson, S., Milner, R., and Willan, A. Canadian Multicenter Post-Term Pregnancy Trial Group. Induction of labor as compared with serial antenatal monitoring in post-term pregnancy. *N. Eng. J. Med.* 326(24):1587–1592, 1992.

27. National Institute of Child Health and Human Development Network of Maternal-Fetal Medicine. Trial of induction of labor versus expectant management in postterm pregnancy. *Am. J. Obstet. Gynecol.* 170(3):716–723, 1994.

28. Gardosi, J., Vanner, T., and Francis, A. Gestational age and induction of labour for prolonged pregnancy. *Br. J. Obstet. Gynaecol.* 104(7):792–797, 1997.

29. Divon, M. Y., Haglund, B., Nisell, H., et al. Fetal and neonatal mortality in the postterm pregnancy: the impact of gestational age and fetal growth restriction. *Am. J. Obstet. Gynecol.* 178(4):726–731, 1998.

30. Campbell, M. K., Ostbye, T., and Irgens, L. M. Post-term birth: risk factors and outcomes in a 10-year cohort of Norwegian births. *Obstet. Gynecol.* 89(4):543–548, 1997.

31. Fabre, E., Gonzalez de Aguero, R., de Agustin, J. L., et al. Perinatal mortality in term and postterm births. *J. Perinatol. Med.* 24(2):163–169, 1996.

32. Abotalib, Z. M., Soltan, M. H., Chowdhury, N., and Adelusi, B. Obstetric outcome in uncomplicated prolonged pregnancy. *Int. J. Gynecol. Obstet.* 55(3):225–230, 1996.

33. Griffiths, M. Stillbirths and rate of neonatal deaths in 76,761 postterm pregnancies in Sweden, 1982–1991; a register study. *Acta Obstet. Gynecol. Scand.* 77(5):583–584, 1998.

34. Alexander, J. M., Mclntire, D. D., and Leveno, K. J. Forty weeks and beyond: pregnancy outcomes by week of gestation. *Obstet. Gynecol.* 96(2):291–294, 2000.

35. Clausson, E., Cnattingius, S., and Axelsson, O. Outcomes of post-term births: the role of fetal growth restriction and malformations. *Obstet. Gynecol.* 94(5, pt. 1):758–762, 1999.

36. Hannah, M., Huh, C., Hewson, S., and Hannah, W. Postterm pregnancy: putting the merits of a policy of induction of labor into perspective. *Birth* 23(1):13–19, 1996.

37. National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. A clinical trial of induction of labor versus expectant management in postterm pregnancy. *Am. J. Obstet. Gynecol.* 170(3):716–723, 1994.

38. Clausson, E., Cnattingius, S., Axelsson, O. Outcomes of post-term births: the role of fetal growth restriction and malformations. *Obstet. Gynecol.* 94(5, pt. 1):758–762, 1999.

39. Clifford, S. R. Postmaturity—with placental dysfunction. *J. Pediatr.* 44(1):1–13, 1954.

40. Divon, M., Marks, A., and Henderson, C. Longitudinal measurements of amniotic fluid index in postterm pregnancies and its association with fetal outcome. *Am. J. Obstet. Gynecol.* 172(1):142–146, 1995.

41. Leppert, P. C. Anatomy and physiology of cervical ripening. *Clin. Obstet. Gynecol.* 38(2):267–279, 1995.

42. Fuentes, A., and Williams, M. Cervical assessment. *Clin. Obstet. Gynecol.* 38(2):224–231, 1995.

43. Bishop, E. H. Pelvic scoring for elective induction. *Obstet. Gynecol.* 24:266–268, 1964.

44. Brien, W. F. Cervical ripening and labor induction. *Clin. Obstet. Gynecol.* 38(2):221–223, 1995.

45. Shyken, J. M., and Petrie, R. H. Oxytocin to induce labor. *Clin. Obstet. Gynecol.* 38(2):232–245, 1995

46. Crall, D. H., and Mattison, D. R. Oxytocin pharmacodynamics: effect of long infusions on uterine activity. *Gynecol. Obstet. Invest.* 31:17–22, 1991.

47. Krammer, J., and O'Brien, W. F. Mechanical methods of cervical ripening. *Clin. Obstet. Gynecol.* 38(2):280–286, 1995.

48. Summers, L. Methods of cervical ripening and labor induction. *J. Nurse-Midwifery* 42(2):71–85, 1997.

49. Mastrogiannis, D. S., and Knuppel, R. A. Labor induced using methods that do not involve oxytocin. *Clin. Obstet. Gynecol.* 38(2):259–266, 1995.

50. Keirse, M., and de Koning, H. J. Randomized comparison of the effects of endocervical and

vaginal prostaglandin E2 gel in women with various degrees of cervical ripeness. *Am. J. Obstet. Gynecol.* 173:1859–1864, 1995.

51. Hofmeyr, G. J., Alfirevic, Z., Kelly, T., et al. Methods for cervical ripening and labour induction in late pregnancy (Cochrane Protocol). In *The Cochrane Library*, Issue 3. Oxford, England: Update Software, 2000.

52. Kramer, R. L., Gilson, G. J., Morrison, D. S., Martin, D., Gonzales, J. L., and Qualls, C. R. A randomized trial of misoprostol and oxytocin for induction of labor: safety and efficacy. *Obstet. Gynecol.* 89(3):387–391, 1997.

53. Hilder, L., Costeloe, K., and Thilaganathan, B. Prolonged pregnancy: evaluating gestation-specific risks of fetal and infant mortality. *Br. J. Obstet. Gynaecol.* 105(2):169–173, 1998.

54. Yeast, L. L., Jones, A., and Poskin, M. Induction of labor and the relationship to cesarean delivery: a review of 7001 consecutive inductions. *Am. J. Obstet. Gynecol.* 180(3, pt. 1):628–633, 1999.

55. Scollo, P. Epidemiology of cesarean sections: prolonged pregnancy. *Clin. Exp. Obstet. Gynecol.* 26(1):22–26, 1999.

56. Seyb, S. T., Berka, R. J., Socol, M. L., et al. Risk of cesarean delivery with elective induction of labor at term in nulliparous women. *Obstet. Gynecol.* 94(4):600–607, 1999.

57. Goeree, R., Hannah, M., Hewson, S. Cost-effectiveness of induction of labor versus serial antenatal monitoring in the Canadian Multicenter Postterm Pregnancy trial. *Can. Med. Assoc. J.* 152(9):1445–1450, 1995.

58. Bors-Koefoed, R., Zylstra, S., Resseguie, L. J., et al. A cost analysis of ambulatory antenatal testing in a tertiary care center. *J. Maternal Fetal Invest.* 2(1):5–9, 1993.

59. Rouse, D. I., Owen, J., Goldenberg, R. L., et al. The effectiveness and costs of elective cesarean delivery for fetal macrosomia diagnosed by ultrasound. *JAMA* 276(18):1480–1486, 1996.

60. Crowley, P. Interventions for preventing or improving the outcome of delivery at or beyond term (Cochrane Review). In *The Cochrane Library*, Issue 2. Oxford, England: Update Software, 2000.

61. Bramadat, I. J. Induction of labor: an integrated review. *Health Care Women Int.* 15:135–148, 1994.

62. Day, M. L., and Snell, B. J. Use of prostaglandins for induction of labor. *J. Nurse-Midwifery* 38(2):42s–48s, 1993.

63. Prysak, M., and Castronova, F. C. Elective induction versus spontaneous labor: a case-control analysis of safety and efficacy. *Obstet. Gynecol.* 92:47–52, 1998.

64. Roberts, L., and Young, K. The management of prolonged pregnancy: an analysis of women's attitudes before and after term. *Br. J. Obstet. Gynecol.* 98:1102–1106, 1991.

65. Roberts, C. L., Taylor, L., and Henderson-Smart, D. Trends in births at and beyond term: evidence of a change? *Br. J. Obstet. Gynaecol.* 106(9):937–942, 1999.

66. Sharma, J. B., Smith, R. J., and Wilkin, D. J. Induction of labour at term. Women not for waiting. *Br. Med. J.* 306(6889):1413, 1993.

67. American College of Obstetricians and Gynecologists. ACOG practice patterns. *Management of Postterm Pregnancy*. No. 6, October 1997. Washington, DC: ACOG, 1995.

68. American College of Obstetricians and Gynecologists. *Antepartum Fetal Surveillance*. Practice Bulletin No. 4. Washington, DC: ACOG, 1999.

69. American College of Obstetricians and Gynecologists. *Induction and Augmentation of Labor*. ACOG Technical Bulletin No. 217. Washington, DC: ACOG, 1995.

70. Speert, H. Some physiologic trailblazers. In American College of Obstetricians and Gynecologists. *Obstetrics and Gynecology in America: A History*. Baltimore, MD: Waverly Press, 75:757–761, 1990.

71. Hourvitz, A., Alcalay, M., Korach, J., et al. A prospective study of high versus low dose oxytocin for induction of labor. *Acta Obstet. Gynecol. Scand.* 75(7):636–641, 1996.

72. Center for Reviews and Dissemination Reviewers. Misoprostol for cervical ripening and labor induction: a meta-analysis. *Database of Abstracts of Reviews of Effectiveness*, No. 1, 2000.

73. American College of Obstetricians and Gynecologists. *Induction of Labor with Misoprostol*. Committee Opinion 228. Washington, DC: ACOG, 1999.

74. American College of Obstetricians and Gynecologists. *Response to Searle's Drug Warning on Misoprostol*. Committee Opinion 228. Washington, DC: ACOG, 2000.

75. American College of Obstetricians and Gynecologists. *Monitoring During Induction of Labor with Dinoprostone*. Committee Opinion 209. Washington, DC: ACOG, 1998.

76. American College of Obstetricians and Gynecologists. *Induction of Labor*. Practice Bulletin No. 10. Washington, DC: ACOG, 1999.

77. Wing, D. A. Labor induction with misoprostol. *Am. J. Obstet. Gynecol.* 181:339–340, 1999.

78. Wing, D. A., Jones, M. M., Rahall, A., et al. A comparison of misoprostol and prostaglandin E2 gel for preinduction cervical ripening and labor induction. *Am. J. Obstet. Gynecol.* 172(6):1804–1810, 1995.

79. Alfirevic, Z., Howarth, G., and Gaussmann, A. Oral misoprostol for induction of labor (Cochrane Review). In *The Cochrane Library*, Issue 2. Oxford, England: Update Software, 2000.

80. Lumbiganon, P., Laopaiboon, M., Kuchaisit, C., et al. Oral prostaglandins (excluding misoprostol) for cervical ripening and labour induction when the baby is alive (Cochrane Review). In *The Cochrane Library*, Issue 3. Oxford, England: Update Software, 2000.

81. Boulvain, M., and Irion, O. Stripping/sweeping the membranes for inducing labour or preventing post-term pregnancy (Cochrane Review). In *The Cochrane Library*, Issue 2. Oxford, England: Update Software, 2001.

82. Boulvain, M., Irion, O., Marcoux, S., et al. Sweeping of the membranes to prevent post-term pregnancy and to induce labour: a systematic review. *Br. J. Obstet. Gynaecol.* 106(5):481–485, 1999.

83. Berghella, V., Rogers, R. A., Lescale, K., et al. Stripping of membranes as a safe method to reduce prolonged pregnancies. *Obstet. Gynecol.* 87(6):927–931, 1996.

84. Idrisa, A., Obisesan, K. A., and Adeleye, I. A. Fetal membrane sweeping for stimulation of labour in prolonged pregnancy: a controlled study. *Obstet. Gynaecol.* 13(4):235–237, 1993.

85. Mercer, B. M., McNanley, T., O'Brien, J. M., Randal, L., and Sibai, B. M. Early versus late amniotomy for labor induction: a randomized trial. *Am. J. Obstet. Gynecol.* 173:1321–1325, 1995.

86. Busowski, J. D., and Parsons, M. T. Amniotomy to induce labor. *Clin. Obstet. Gynecol.* 38(2):246–258, 1995.

87. Moldin, P. G., and Sundell, G. Induction of labour: a randomized clinical trial of amniotomy versus amniotomy with oxytocin infusion. *Br. J. Obstet. Gynaecol.* 103:306–312, 1996

88. Kadar, N., Tapp, A., and Wong, A. The influence of nipple stimulation at term on the duration of pregnancy. *J. Perinatol.* 10(2): 164–166, 1990.

89. Tal, Z., Frankel, Z. N., Ballas, S., et al. Breast electrostimulation for the induction of labor. *Obstet. Gynecol.* 72(4):671–674, 1988.

90. Garry, D., Figueroa, R., Guillaume, I., et al. Use of castor oil in pregnancies at term. *Alternative Therapies Health Med.* 6(1):77–79, 2000.

91. Davis, L. The use of castor oil to stimulate labor in patients with premature rupture of membranes. *J. Nurse-Midwifery* 29(6):366–370, 1984.

92. Sherman, L. L., Frenkel, E., and Pansky, M. Balloon cervical ripening with extra-amniotic infusion of saline or prostaglandin E2: a double-blind, randomized controlled study. *Obstet. Gynecol.* 97930:375–380, 2001.

93. Sciscione, A. C., Nguyen, L., Manley, J., et al. A randomized comparison of transcervical Foley catheter to intravaginal misoprostol for preinduction cervical ripening. *Obstet. Gynecol.* 97:603–607, 2001.

94. Alexander, L., Kupferminc, M., and Dooley, S. L. A randomized trial of extra-amniotic saline infusion versus laminaria for cervical ripening. *Obstet. Gynecol.* 86:545–549, 1995.

95. Chez, R. A., and Jonas, W. E. Complementary and alternative medicine. Part I: Clinical studies in obstetrics. *Obstet. Gynecol. Surv.* 52(11):704–708, 1997.

96. Dove, D., and Johnson, P. Oral evening primrose oil: its effect on length of pregnancy and selected intrapartum outcomes in low-risk nulliparous women. *J. Nurse-Midwifery* 44(3):320–324, 1999.

97. Smith, C. A., and Crowther, C. A. Acupuncture for induction of labour (Cochrane Review). In *The Cochrane Library*, Issue 1. Oxford, England: Update Software, 2001.

98. American College of Nurse Midwives. Statement of philosophy. Washington, DC: ACNM, 1989.

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PART

V

Intrapartal Care

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CHAPTER

26

The Normal First Stage of Labor

Labor comprises those processes that result in the expulsion of the products of conception by the mother. It begins with true labor contractions, as evidenced by progressive cervical change, and ends with the delivery of the placenta. The cause of the onset of spontaneous labor is not known, although a number of interesting theories have been advanced and health care professionals know how to induce labor under certain conditions.

The first stage of labor is defined as beginning with true labor contractions as evidenced by progressive cervical change, and ending with the cervix completely dilated (10 centimeters). It is known as the stage of cervical dilatation.

Signs and Symptoms of Impending Labor

There are a number of premonitory signs and symptoms that may alert you to a woman's approaching labor. A woman may exhibit any, all, or none of these, but it is useful to keep them in mind when seeing a woman late in her pregnancy so you can provide appropriate anticipatory counseling and guidance. The signs and symptoms of impending labor are lightening, cervical changes, false labor, premature rupture of membranes, bloody show, energy spurt, and gastrointestinal upsets.

Lightening

Lightening, which occurs approximately 2 weeks before labor, is the descent of the presenting part of the baby into the true pelvis. The baby's head, if there is a cephalic presentation, usually is fixed or engaged afterwards. The woman frequently refers to lightening as "the baby has dropped." She will experience a decrease in the pregnancy discomfort of shortness of breath she has had during the third trimester because lightening will give her more room in the upper abdomen for lung expansion. However, lightening will cause other discomforts because of the pressure of the presenting part on structures in the area of the true pelvis. See parts C and D of Figure 21-2 (page 548). Specifically, she will have the following:

1. Frequency of urination, because the bladder is under pressure and has less room for expansion
2. An uncomfortable feeling of generalized pelvic pressure, which may make her feel awkward and produces the constant sensation that something needs to come out or that a bowel movement is needed
3. Leg cramps, which may be caused by the pressure of the presenting part on the nerves that course through the greater sciatic foramen and lead to the legs
4. Increased venous stasis producing dependent edema because the pressure of the presenting part in the true pelvis inhibits blood return from the lower extremities

Lightening lowers the height of the fundus to a position similar to that of the eighth month of pregnancy, and you are no longer able to ballotte the previously movable head of the baby above the symphysis pubis during abdominal palpation. Your examining fingers will now diverge rather than converge during the fourth step of Leopold's maneuvers.

Since lightening usually occurs prior to labor only in primigravidas, it is probably the result of the increasing intensity of the Braxton Hicks contrac-

tions combined with the good abdominal muscle tone more common to primigravidas.

Knowing that lightening has occurred is of value in being able to reassure the woman of the normality of the bodily changes she is experiencing and explain why they are occurring. Lightening also provides a good opportunity to review with the woman her plans for labor. Moreover it provides an indication of the adequacy of the pelvic inlet. Because the length of time between lightening and true labor varies with individuals, it is of little use in predicting the onset of labor except in a most generalized fashion of a few days to a couple of weeks. However, lightening tends to encourage the woman that the long-awaited end of pregnancy is in sight.

Cervical Changes

As labor approaches, the cervix becomes "ripe." In contrast to its closed, long, soft state during pregnancy, it becomes still softer, with the consistency of pudding, and evidences some degree of effacement and perhaps slight dilatation. Evaluation of ripeness is relative to the individual woman and her parity—for example, during pregnancy a grand multipara's cervix may normally be 2 centimeters dilated as opposed to a primigravida's normally closed cervix.

It is thought that these cervical changes are brought about by the increasing intensity of the Braxton Hicks contractions. A cervix may be ripe for a variable period of time prior to labor. Ripeness indicates a readiness of the cervix for labor. Determining ripeness allows the midwife to assure the woman that she will go into labor with the onset of labor contractions and that the time of labor is relatively close at hand. It also allows you to assess the probable success of an indicated induction of labor.

False Labor

False labor consists of painful uterine contractions that have no measurable progressive effect on the cervix. False labor contractions are in actuality an exaggeration of the usually painless Braxton Hicks contractions, which have been been occurring since about 6 weeks' gestation.

False labor may occur for days or intermittently even 3 or 4 weeks before the onset of true labor. False labor is genuinely painful, and a woman may lose sleep and energy coping with it. She has no way of knowing for sure whether she is in true labor since this can be determined only by vaginal examination. The intermittent recurrence of false labor and trips back and forth to your office or the hospital are exhausting and frustrating to the woman and her family. This situation calls for a great degree of understanding, patience, support, reassurance, and many explanations on the part of all personnel who see the woman during her trips to your office or the hospital. False labor, however, does indicate the approach of labor.

Premature Rupture of Membranes

Normally the membranes rupture by the end of the first stage of labor. Rupture before the onset of labor is called premature rupture of the membranes and occurs in about 12 percent of women. Approximately 80 percent of near-term women with premature rupture of membranes begin labor spontaneously within 24 hours (see Chapter 29).

Bloody Show

A mucus plug, created by cervical secretions from proliferation of the glands of the cervical mucosa early in pregnancy, serves as a protective barrier and closes the cervical canal throughout pregnancy (Figure 26-1). Bloody show is the expulsion of this mucus plug.

Bloody show is most often seen as a tenacious, blood-tinged mucus discharge that must be carefully differentiated from frank bleeding. Women often refer to the discharge as "seeing the sign." Occasionally the entire mucus plug is expelled en masse; if the plug is expelled during labor and can be seen extruding from the woman's vagina, inex-

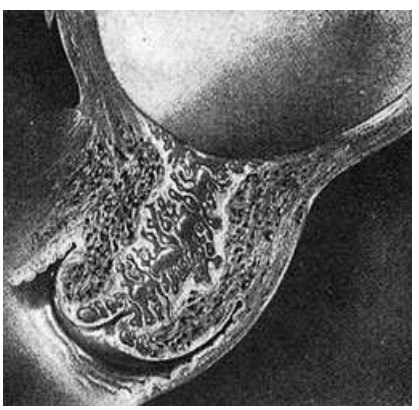


FIGURE 26-1 Cervix in pregnancy. Note the elaboration of the mucosa into a honeycomblike structure, the meshes of which are filled with a tenacious mucus (the mucus plug).

Source: From Pritchard, J. A., and MacDonald, P. C. *Williams Obstetrics*, 15th ed. New York: Appleton-Century-Croft, 1976. Reproduced by permission.

perienced obstetrical personnel may think the umbilical cord has prolapsed. More commonly it is expelled over 1 to 2 days.

Bloody show is a sign of imminent labor, which usually takes place within 24 to 48 hours. However, bloody show is of no value as a sign of labor if a vaginal examination has been done within the past 48 hours, because a blood-tinged mucus discharge during this time may be only the effect of minor trauma to or disruption of the mucus plug during the examination.

Energy Spurt

Many women experience an energy spurt approximately 24 to 48 hours before the onset of labor. After days or weeks of feeling physically tired and tired of being pregnant, they get up one day to find themselves full of energy and vigor. Typically these women feel energetic for a period of a few hours, during which they do things like clean the house, wash and iron curtains, scrub floors, cook and freeze food, and perform a variety of other household tasks that they either have not had the energy to do or now feel the need to do before the baby's arrival. Consequently they enter labor exhausted and often have long, difficult labors.

There is no known explanation for this energy spurt other than it is nature's way of giving a woman the energy she needs for the work of labor. Women should be informed of the possibility of their having this energy spurt and advised to deliberately refrain from expending it and instead to conserve it for use during labor.

Gastrointestinal Upsets

In the absence of any causative factors for the occurrence of diarrhea, indigestion, nausea, and vomiting, it is thought they might be indicative of impending labor although no explanation for this is known. Some women experience one or more of these signs.

Database for the First Stage of Labor

Components of the data base for determining the well-being of the mother and the fetus during the first stage of labor are as follows:

1. Continuing evaluation of any significant findings from the history, physical and pelvic examinations, and laboratory work done during the initial evaluation of the mother and fetus in labor
2. Evaluation of the progress of labor
3. Evaluation of the woman's behavior and her response to labor and her significant others
4. Continuing evaluation of the normality of the fetal presentation, position, and variety and fetal adaptation to the pelvis
5. Evaluation of the fetal heart tones (see Chapter 27)
6. Evaluation of maternal physiologic changes
7. Continued screening for signs and symptoms of obstetrical complications and nonreassurance of fetal well-being (see Chapters 27, 29, and 30)

In order to evaluate any of the components of the database, the midwife must know what the parameters of normal are for each of the specific pieces of information obtained for each component.

Contractions

Labor itself is an intricate interplay of physiologic and psychologic forces within the woman and the effect of these forces on the process of birth and on the baby. These forces result in the birth of the baby. The primary physiologic force during labor is that of uterine contractions. It is impossible to understand and evaluate labor progress, to understand the discomforts and pain of labor, to devise comfort measures, or to be aware of complications without a thorough comprehension of uterine contractions and their action.

The uterine contractions of labor are unique as the only painful physiologic muscular contractions in the body. Furthermore, these contractions are involuntary, as they are under intrinsic nervous control. This means that the woman has no physiologic control over the frequency and duration of these contractions, because they are not regulated by any extrauterine neural process. Every midwife, however, can recount situations in which a woman's psychological forces were such as to temporarily forestall or stop labor.

Uterine contractions are intermittent, providing for a period of uterine relaxation between contractions. These periods of relaxation between contractions serve the following essential functions:

1. Provide rest to the uterine muscle
2. Provide rest to the woman
3. Maintain the welfare of the baby, since uterine contractions constrict the placental blood vessels

The duration of a uterine contraction varies considerably, depending on where the woman is in her labor. The contractions of active labor last from

45 to 90 seconds with an average of 60 seconds. In early labor the contractions may be only 15 to 20 seconds in duration.

The frequency of contractions is determined by measuring the time from the beginning of one contraction to the beginning of the next contraction. The duration of the contraction is also noted; subtracting the duration from the frequency gives the length of the period of relaxation. For example, a woman who begins contractions at 5:05, 5:10, 5:15, 5:20, and 5:25, each lasting 60 seconds, is having contractions with a frequency of every 5 minutes and a duration of 60 seconds. The period of relaxation of 4 minutes between the end of one contraction and the beginning of the next is more than adequate for the welfare of baby, mother, and uterine muscle. An absolute critical point is reached when the contractions are more frequent than every 2 minutes and have durations longer than 90 seconds, because this does not allow for sufficient relaxation time. While more frequent contractions with longer durations beyond this critical point do not occur with normal spontaneous labor, they must be closely guarded against during pitocin induction or augmentation of labor.

In evaluating the frequency and intensity of uterine contractions, it is important to know that each contraction has three phases: increment, acme, and decrement. The increment phase is longer than the other two phases combined. With experience, you can feel an oncoming contraction with your hand before the woman can feel it. Conversely, the woman may feel the contraction for several to many seconds after you no longer feel it with your hand. What the woman is feeling may be the aftermath of the pain just experienced. When you consider, in addition, the extreme variations in individual pain thresholds, it becomes apparent that to time contractions on the basis of the woman's vocal or behavioral manifestations of pain is most inaccurate.

This holds true also for evaluating the intensity of a contraction. A frightened woman who is unknowledgeable about what is happening to her and unprepared in the relaxation and breathing techniques that can help her cope with her contractions may cry out in pain and thrash about in her bed with the mildest of contractions. Conversely, the woman who has been prepared for her childbearing experience and is supported by her significant other or a professional prepared in labor support, or the woman who is a stoic, may never evince loss of control or cry out even with the most severe contractions. Intensity, therefore, can be evaluated only by the indentability of the uterine wall by your fingers during the acme of the contraction or by the intrauterine pressure catheter of a fetal monitor. During a good, effective labor contraction, the uterine wall cannot be digitally indented and reaches a uterine pressure of more than 40 mm of mercury during the acme of the contraction.

Contractions must be evaluated not only for frequency, duration, and intensity but also for the interplay of the three factors. Generally speaking, uterine contractions start as infrequent or irregular contractions (e.g., every 20 to 30 minutes) of short duration (15 to 20 seconds) and mild intensity; become more frequent, longer, and more intense as labor progresses; and are usually every 2 to 3 minutes, lasting 60 to 90 seconds, and of severe intensity by the end of the first stage of labor. However, there are infrequent variations of this pattern that also result in birth of the baby. If a woman starts with contractions with a frequency of every 5 minutes, lasting 60 seconds, and of moderately hard intensity, don't expect them to become irregular, of short duration, and mild intensity before becoming more frequent, longer, and harder—unless she develops uterine dysfunction. Also, women have been known to deliver babies with 5- to 7- minute contractions lasting 30 to 40 seconds and of mild to moderate intensity.

Normal uterine contractions also follow another pattern, known as the normal gradient pattern. This term refers to synchronous activity of the uterine muscle that causes a contraction to be stronger and longer in the fundal portion of the uterus, decreasing in the midportion, and minimal to nonexistent toward the cervix. This pattern is essential to dilatation of the cervix. The effect of contractions on the uterus is to differentiate it into two zones (Figure 26-2): (1) the upper, contracting zone, which thickens and expels the baby during labor, and (2) the lower passive zone, composed of the isthmus of the uterus (known during labor as the lower uterine segment) and the cervix. The lower zone does not contract but thins out into an expanded muscular tube through which the baby can pass. Differentiation of the uterus into two zones is accomplished through a mechanism of contraction in which the muscle does not return to its original length in the upper zone during relaxation, but stays relatively fixed at a shorter length. The upper zone is thus kept in constant contact with the intrauterine contents, and the uterine cavity becomes progressively smaller with each successive contraction. In order for this to occur, the uterine contents must decrease in volume in the upper zone, which is

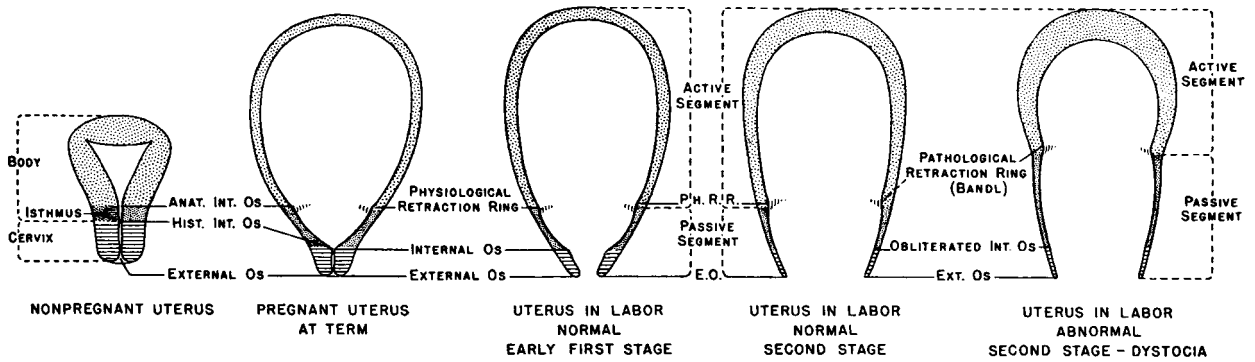


FIGURE 26-2 Sequence of development of the segments and rings in the uterus in pregnant women at term and in labor. Note comparison between the uterus of a nonpregnant woman, the uterus at term, and the uterus during labor. The passive lower segment of the uterine body is derived from the isthmus; the physiological retraction ring develops at the junction of the upper and lower uterine segments. The pathological retraction ring develops from the physiological ring. Anat. Int. Os = anatomical internal os; Hist. Int. Os = histological internal os; PH.R.R. = physiological retraction ring; E.O. = external os.

Source: From Cunningham, F. Gary, Gant, Norman F., Leveno, Kenneth J., Gilstrap, Larry C. III, Hauth, John C., Wenstrom, Katherine D. *Williams Obstetrics*, 21st Edition. McGraw-Hill, New York, 2001. Reproduced with permission of the McGraw-Hill Companies.

accomplished by expansion of the musculature of the lower zone so that more of the intrauterine contents can distend its walls. The muscle fibers of the lower zone lengthen under the influence of upper-zone contractions and do not return to their shorter length during relaxation but remain relatively fixed at a longer length. The changes in the two zones complement each other: The upper zone thickens only to the extent that the lower zone expands and thins. If the uterus were to contract equally all over rather than in its normal gradient pattern, nothing would be accomplished. If the lower zone were to contract more than the upper zone, labor would be dysfunctional and cervical dilatation would not occur.

Contractions have the additional effect of elongating the uterine ovoid by an estimated 5 to 10 centimeters with a corresponding decrease in the horizontal plane. This has the effect of straightening the fetal vertebral column, thereby bringing the upper pole of the fetus in solid direct contact with the contracting uterine fundus while the lower pole is directed downward and pushed into the pelvis. Known as fetal axis pressure, this also results in the exertion of pressure against the cervix and lower uterine segment, thereby additionally affecting cervical effacement and dilatation.

Effacement and Dilatation

Effacement and dilatation are the direct result of the contractions as described above.

Effacement is the shortening of the cervical canal from its usual length of 2 to 3 centimeters to the point where the cervical canal is obliterated, leaving only the external os as a circular orifice with thin edges. This shortening results from the lengthening of the muscular fibers around the internal os as they are taken up into the lower uterine segment. Effacement is facilitated by the cleftlike arrangement of the endocervix, which in effect unfolds like an accordion as it is stretched and taken up to become part of the lower uterine segment. The process of effacement is also facilitated by and is the cause of expulsion of the mucus plug. Effacement is clinically evaluated in terms of percentages, with no effacement being 0 percent and complete effacement being 100 percent.

Dilatation is the enlargement of the external cervical os from an orifice of a few millimeters in diameter to an opening large enough for the baby to pass through. In addition to the primary action of the contractions, dilatation is facilitated by the hydrostatic action of the amniotic fluid under the influence of the contractions, which causes the membranes to serve as a dilating wedge in the area of least resistance in the uterus. Although intact membranes enable this hydrostatic action of the amniotic fluid and provide the most effective dilating wedge, if the membranes have ruptured, the pressure of the presenting part on the cervix and the lower uterine segment can also have a dilating effect depending on the presenting part and its position in relation to the cervix.

Dilatation is clinically evaluated by measuring the diameter of the cervical opening in centimeters, with 0 centimeters being a closed external cervical

os and 10 centimeters being complete dilatation. The magic number of 10 centimeters is based on the fact that the suboccipital-bregmatic diameter of the fetal head, which is the widest diameter of the flexed head in the normal mechanisms of labor, is approximately 9.5 centimeters at term.

Initial effacement and dilatation vary between a primigravida and a multigravida entering labor. A primigravida's cervix is frequently 50 to 60 percent effaced and a fingertip to 1 centimeter dilated prior to labor as the result of the Braxton Hicks contractions before labor begins. Such early effacement and dilatation are part of the cervical changes that contribute to the "ripeness" of the cervix as a premonitory sign of labor. Progressive cervical change in a primigravida in labor is generally sequential, then simultaneous, with 50 to 100 percent effacement occurring first, followed by a combination of any remaining effacement and dilatation. A primigravida with a paper-thin cervix is on the verge of active labor. The cervix of a multigravida entering labor is frequently 1 to 2 centimeters dilated (or more, depending on parity) with little to no effacement.

You can develop clinical judgment in your fingers for assessing centimeters of dilatation not only by practicing on cervical effacement and dilatation models but also by running your fingers around the edge of and across any circular object with which you come into contact (e.g., drinking glasses, telephone receivers, cups, vases, flat circular knobs on machines), estimating its diameter in centimeters, and then checking its actual measurement with a centimeter measuring tape or ruler.

Because it is difficult at times to distinguish between true and false labor contractions, the only indicator that enables one to diagnose labor accurately is progressive cervical change—that is, cervical effacement *and* dilatation. All information concerning the contractions, location of pain, and the premonitory signs of labor is useful in differentiating between early labor and false labor but is diagnostically adjunctive to assessment of the cervix.

Station

Station is the relationship of the lowermost part of the presenting part to an imaginary line drawn between the ischial spines of the woman's pelvis. The lowermost part of the presenting part at the level of the ischial spines is called 0 station. Station is measured in terms of centimeters above or below the level of the ischial spines, with *above* being designated as –1, –2, –3, –4, and –5 station and *below* being designated as +1, +2, +3, +4, and +5 station. A –5 station is equivalent to a floating head and a +5 station is equivalent to a head at the vaginal orifice (see Figure 26-3).

Frequently, a description of 0 station is given inaccurately as a definition of engagement. The reason

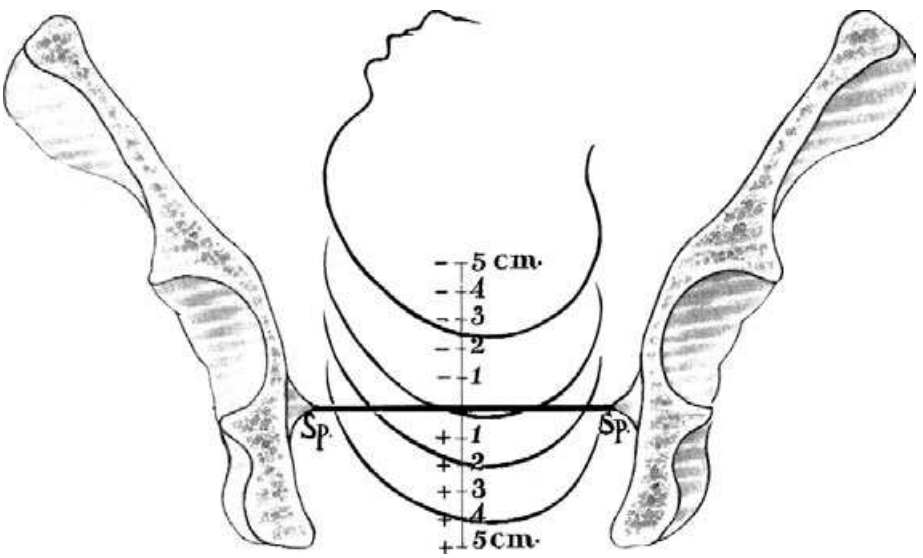


FIGURE 26-3 Station, or level of descent, of the head of the fetus through the pelvis. The location of the forward leading edge (lowest part of the head) is designated in centimeters above or below the plane of the interspinous line.

Source: From Greenhill, J. P., and Friedman, E. A. *Biological Principles and Modern Practice of Obstetrics*. Philadelphia, PA: Saunders, 1974. Reproduced by permission.

for this error is that, generally speaking, when the head is engaged the lowermost part of the presenting part is at the level of the ischial spines, because the distance from the pelvic inlet to the ischial spines is usually 5 centimeters and the distance from the biparietal diameter of the full-term fetal head to the occiput is $4^1/_2$ centimeters. This is not always true, however, inasmuch as pelvic structure varies with the individual woman and the size of the fetal head may alter this finding. For example, a preterm infant of 34 weeks' gestation may well have its head engaged and be at a –1 station. Remember that *engagement* is defined as the point when the widest diameter of the presenting part (which, in a cephalic occipital presentation, is the biparietal diameter) has passed through the pelvic inlet.

Station is at times difficult to ascertain if there has been considerable molding of the fetal skull and development of caput succedaneum. In a cephalic presentation, the actual lowermost part of the presenting part, which is the skull bones, may be a centimeter or so higher than the caput, which is what your fingers are feeling. This is important to remember if you are concerned about the adequacy of the midpelvis and are using station as an indication that the fetal head has maneuvered this portion of the pelvis.

Status of Membranes

Determination of whether the membranes have ruptured is essential and at times difficult. (See also Chapter 29.) This diagnosis is made difficult by a hazy history, false-positive results on the nitrazine paper test, and the fact that the membranes may have a high leak that has sealed over as a result of the pressure of the presenting part against the cervix and lower uterine segment.

When a woman gives a history suggestive of ruptured membranes and she is not in active labor, a sterile speculum examination is indicated to observe the cervix for escaping amniotic fluid. Some clinicians believe a nitrazine test is also indicated. The nitrazine paper test is based on the fact that the usually dark yellow paper turns blue-green to deep blue when moistened with a substance with an alkaline pH. The pH of amniotic fluid is an alkaline 7.0 to 7.5. Unfortunately, blood, cervical mucus, and secretions produced by certain vaginal infections (bacterial vaginosis; trichomoniasis) are also alkaline and, if present, these may invalidate the test for rupture of the membranes.

A nitrazine test is properly performed during the sterile speculum examination but *not* by holding a strip of nitrazine paper between gloved fingers and inserting them in the vagina or by clamping a strip of nitrazine paper with a ring forceps and placing it at the cervical os. Remember that the nitrazine paper is not sterile. The chance of an invalid nitrazine test is reduced, and sterility is maintained, by obtaining a specimen during the sterile speculum examination with a sterile cotton-tipped applicator in a pool of fluid in the posterior vaginal fornix, avoiding all structures while withdrawing the specimen, and then touching it to the nitrazine paper. (The emphasis on sterility is to reduce the chance of infection in the event the membranes are ruptured, especially if there is no labor.) However, the specimen is obtained from the same area where extrusion of the mucus plug occurs, and some minute bleeding accompanies its disruption. Also, it is possible for the collecting device to rub against the membranes, which would render the resulting positive nitrazine test invalid. An alternative method is to press a strip of nitrazine paper against the inside of the lower blade of the speculum after withdrawing the speculum from the vagina. Although the nitrazine test can be a helpful adjunct, it should not be relied on for making a definitive diagnosis of ruptured membranes.

A specimen from the vaginal pool, if present, can be used for doing a fern test for detecting amniotic fluid in the secretions. This test is based on a fernlike crystallization of the sodium chloride in amniotic fluid, which can be observed microscopically when the specimen is dried (see Figure 29-1 on page 864). However, a moderate amount of bloody show or vaginal or cervical secretions caused by an infection can interfere with this test, rendering it invalid.

Digital examination for rupture of the membranes is most helpful, especially if speculum findings are inconclusive and you are not concerned with premature rupture of the membranes and the development of chorioamnionitis. If you cannot easily feel the membranes bulging over the presenting part, it is helpful either to have the woman bear down or to apply fundal pressure, which may cause the membranes to bulge if they are there. Membranes in close contact with a head feel smooth and slick to the touch in contrast with the slightly irregular and comparatively more coarse feel of hair. A digital examination is *not* necessary for diagnosing ruptured membranes if findings during the speculum examination are definitive.

Diagnosis is definitive for ruptured membranes (1) when you see amniotic fluid escaping from the cervical os and pooled in the vaginal vault during

speculum examination or (2) when you cannot feel the membranes over the presenting part at the cervical orifice. When you feel the membranes bulging against your examining fingers during vaginal examination of the cervix, other possibilities must be considered, including (1) unruptured membranes, (2) a high leak that is occluded by pressure from the presenting part, or (3) escape of fluid trapped between the membranes with rupture of the chorion only, and not the amnion.

Progress of Labor

The first stage of labor is divided into two sequential phases: latent and active. Midwives have long described a transitional phase of labor late in the active phase from approximately 8 to 10 centimeters of dilatation [1]. In 1955, Friedman [2] depicted the progress of labor as a sigmoid curve and subdivided the active phase into three sequential phases: acceleration, maximum slope, and deceleration. In 1970 Philpott and Castle [3] developed the partogram that described the active phases of labor as progressing in a straight line. Likewise, the work of Kilpatrick and Laros in 1989 [4] and of Albers, Schiff, and Gorwoda in 1996 [5] does not delineate subdivided phases within the active phase of labor when discussing the length of labor. This chapter provides the average length of time for the first stage of labor or cervical dilatation rate ascertained by these different authors and cites both the most recent data published by Albers in 1999 [6] and the long established limits dictated by the Friedman graph, which is widely used in obstetrics in the United States.

The later data support the concept that normal labor may last longer than is generally acknowledged based on the Friedman curve. It is critically essential that the midwife not consider deviation from the Friedman curve as abnormal but as a signal that this woman needs to be carefully and comprehensively evaluated to assess whether she and her fetus indeed are still within the realm of normal and will remain so over time. The operative word is *progress*. If there is not progress in one area (e.g., dilatation), is there progress in another area (e.g., descent, working through any psychologic obstacle)? Is the progress sufficient for continuing maternal and fetal well-being?

Each phase of labor is characterized by measurable physical changes and by psychological changes. The physical changes are used to evaluate progress in labor; the psychological changes are used to estimate where a woman is within a phase of labor without resorting to a vaginal examination and to guide the midwife in devising appropriate support and comfort measures.

Latent Phase The latent phase covers the period of time from the beginning of labor to the point when dilatation begins to progress actively. This generally is from the onset of regular contractions to 3 to 4 centimeters dilatation or to the beginning of the active phase. Little to no descent of the presenting part occurs during the latent phase.

Contractions become established during the latent phase as they increase in frequency, duration, and intensity—from occurring every 10 to 20 minutes, lasting 15 to 20 seconds and being of mild intensity to contractions of moderate intensity (averaging 40 mm Hg at their acme from a baseline uterine tonus of 10 mm Hg) occurring approximately every 5 to 7 minutes and lasting 30 to 40 seconds.

Accurate measurement of the length of the latent phase of the first stage of labor is impossible for a number of reasons: (1) the difficulty of differential diagnosis between latent phase and false labor, (2) not being able to objectively quantify the start of the latent phase and thereby having to rely on a report by the woman or whoever is with her as to when she became aware of her contractions and when they became "regular," and (3) variations between women on cervical ripeness at the onset of labor. Vaginal examination during this period of time documents cervical changes, expecially effacement in primigravidas, and beginning dilatation.

Usually during the latent phase of labor the woman experiences a mixture of emotions: she is excited, happy, and relieved that the end of pregnancy has come and the long period of waiting has ended, but she feels a sense of anticipation and some apprehension about what is yet to come. Generally, she is not too uncomfortable and copes well with her situation. However, for a woman who has had no preparation regarding what to expect, the latent phase of labor may be a time when she cries out as much in fear as with pain with the mildest contractions and does not seem able to cope until with increased frequency and intensity of the contractions it becomes obvious to her that she really is in labor. Often this coincides with entry into the active phase of labor and admission to the labor and birth unit, which she may perceive as a source of security and help—all of which will enable her to be less frightened and better able to cope. For a women who has been suffering from the general miseries of the end of pregnancy and false labor, the emotional response

to the latent phase of labor is at times dramatic: relief, relaxation, and increased coping ability regardless of the planned locale of birth. Even though tired, she knows she is at last actually in labor and what she is now experiencing is productive.

Active Phase The active phase covers the period of time from the start of active progression of dilatation to the completion of dilatation and includes the transitional phase. This is generally from 3 to 4 centimeters (or the end of the latent phase) to 10 centimeters dilatation (or the end of the first stage of labor). Progressive descent of the presenting part occurs during the latter part of the active phase and during second stage.

Contractions during the active phase become increasingly frequent, of longer duration, and of greater intensity. Effective contractions are those that have a normal triple gradient pattern, reach a uterine pressure of 40 to 50 millimeters of mercury during the acme of the contraction, and return to a resting uterine tonus of 10 millimeters of mercury. By the end of the active phase, contractions are usually coming every 2 to 3 minutes, lasting around 60 seconds, and reaching firm intensity (more than 40 mm Hg) with an average of about 55 millimeters of mercury.

According to Freidman [7], the *acceleration phase* starts the active phase of labor and leads into the phase of maximum slope. The *phase of maximum slope* is the time when cervical dilatation is occurring most rapidly and increasing from 3 to 4 centimeters to about 8 centimeters. Normally the rate of dilatation is constant, averaging 3 centimeters per hour, with a minimum rate of not less than 1.2 centimeters per hour in nulliparas. In multiparas, the average rate of dilatation during the phase of maximum slope is 5.7 centimeters per hour, with a minimum rate of 1.5 centimeters per hour. The *deceleration phase* is the end of the active phase, during which the rate of dilatation slows and the cervix reaches a dilatation of from 8 to 10 centimeters while descent reaches its maximum rate. The average maximum rate of descent in nulliparas is 1.6 centimeters per hour and normally at least 1.0 centimeters per hour. In multiparas, the rate of descent averages 5.4 centimeters per hour, with a minimum rate of 2.1 centimeters per hour.

Philpott and Castle [3] developed a single straight Alert Line based on a rate of 1 cm per hour for primigravidas, which they considered an acceptable limit in defining progress. They then established an Action Line that parallels the Alert Line, only it is 4 hours later. This arbitrarily chosen time was selected as sufficient time, once a woman crossed the Alert Line, for her to transfer from rural areas in Rhodesia, Africa, to a central unit where interventions could be made. In their study of 624 consecutive primigravid patients published in 1972, 438 (70 percent) delivered inside the Alert Line and half of the remaining group delivered normally (without oxytocic stimulation or cesarean section) within the 4 hours between the Alert Line and the Action Line. Kilpatrick and Laros [4] determined a statistically significant difference in the length of the first stage of labor dependent on whether conduction anesthesia was used (see Table 28-1). The first stage of labor for nulliparas averaged 8.1 hours without conduction anesthesia and 10.2 hours with conduction anesthesia; multiparas averaged 5.7 hours without conduction anesthesia and 7.4 hours with conduction anesthesia. Perl and Hunter [8] found that of 505 consecutive singleton labors without a protocol in place for "slow" cervical dilatation, 105 progressed at an overall cervical dilatation rate of less than 1 centimeter per hour but that only those progressing at less than 0.5 centimeter per hour had a significant increase in cesarean sections.

A study published in 1996 by Albers, Schiff, and Gorwoda [5] of 1473 low-risk women without either oxytocin or conduction anesthesia determined an average length of first stage labor as 7.7 hours for nulliparas and 5.7 hours for multiparas. A later study published by Albers in 1999 [6] of 2511 women without either oxytocin or conduction anesthesia found a mean length of first stage labor of 7.7 hours for nulliparas and 5.6 hours for multiparas. Concurring with others who raise the question of reassessing the length and definition of normal labor, Albers recommends that 0.5 centimeter per hour in the absence of other problems or symptoms be considered within the normal limits of progress for the first stage of labor.

Tables 26-1 and 26-2 show the average and upper limit of normal active labor for nulliparas and multiparas, respectively, in four comparable studies [2, 4–6, 9, 10].

As labor progresses through the active phase, the woman may become increasingly apprehensive. As the contractions become harder, last longer, and occur more often, it becomes apparent to her that she cannot control them. With this realization she becomes more serious. She wants someone with her, as she is frightened of being left alone and of being unable to cope with the contractions. She experiences a number of ill-defined doubts and fears. She can tell you she is scared but is unable to tell you what she is scared of.

TABLE 26-1 Average and Upper Limit Length of Normal Active Labor for Nulliparas

Author	Mean (hours)	Upper Limit[a] (hours)
Friedman (1956; 1967) (Measured from 3–4 cm to 10 cm)	4.9	11.7
Kilpatrick and Laros (1989) (Measured from regular, painful contractions q 3–5 min by history to 10 cm)		
No conduction anesthesia	8.1	16.6
With conduction anesthesia[b]	10.2	19.0
Albers, Schiff, and Gorwoda (1996) (Measured from 4 cm to 10 cm)	7.7	19.4
Albers (1999) (Measured from 4 cm to 10 cm)	7.7	17.5

[a] Mean plus two standard deviations (95th percentile)

[b] Conduction anesthesia: 95% epidurals; 5% saddle blocks

TABLE 26-2 Average and Upper Limit Length of Normal Active Labor for Multiparas

Author	Mean (hours)	Upper Limit[a] (hours)
Friedman (1956; 1967) (Measured from 3–4 cm to 10 cm)	2.2	5.2
Kilpatrick and Laros (1989) (Measured from regular, painful contractions q 3–5 min by history to 10 cm)		
No conduction anesthesia	5.7	12.5
With conduction anesthesia[b]	7.4	14.9
Albers, Schiff, and Gorwoda (1996) (Measured from 4 cm to 10 cm)	5.7	13.7
Albers (1999) (Measured from 4 cm to 10 cm)	5.6	13.8

[a] Mean plus two standard deviations (95th percentile)

[b] Conduction anesthesia: 95% epidurals; 5% saddle blocks

There are other observations you can make that indicate the woman's progress in labor. These are based on the fact that descent of the fetus in the pelvis changes the location of findings elaborated from the fetus. The low back pain a woman experiences is caused by the pressure of the fetal head against her spine. This is not a generalized pain but rather pain that the woman can precisely pinpoint for you. As the baby descends, the location of this back pain correspondingly moves down her lower spine. Also, the location of the fetal heart tones moves lower in her abdomen as descent occurs.

Transitional Phase During the transitional phase, the woman is ending the first stage of labor as she nears and prepares for the second stage of labor. A large number of signs and symptoms, including behavior changes, have been identified as indicative of this transition. The signs and symptoms are listed below; those occurring late in the transitional phase are known as the signs of impending second stage and are marked with an asterisk (*).

Beads of perspiration on the upper lip or brow
Shaking legs
Chattering teeth
Cramps in the buttocks, thighs, or calves
Hiccupping
Belching and burping
Thirst
Anorexia
Nausea and possibly vomiting
Inability to breathe abdominally
Irritable abdomen—increased tenderness to touch over the abdomen and back
Marked restlessness
Natural amnesia between contractions—appears exhausted and is difficult to rouse
Difficulty in readily comprehending directions
Contractions every $1^1/_2$ to 2 minutes, lasting 60 to 90 seconds, of severe intensity; seem almost continuous and are quite painful
Toes curl with contractions
Generalized discomfort
Doesn't want to be touched
Bewildered, frustrated, and exasperated by the severity of the contractions
Severe low backache
Marked decrease in the sense of modesty
Unable to cope with the contractions if left alone
Irritable behavior
Pulling or stretching sensation deep in the pelvis
Rejection of those about her
Quite apprehensive
*Increase in bloody show
*Rectal pressure, feeling of having to have a bowel movement, repeated requests for a bedpan or to go to the bathroom
*Uncontrollable desire to bear down
*Membranes rupture

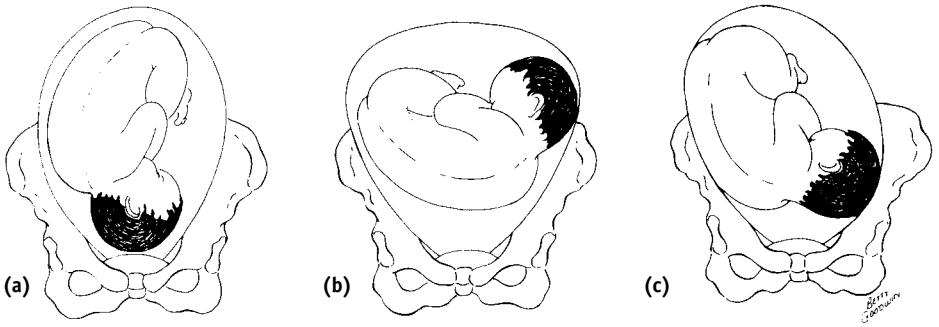


FIGURE 26-4 Lies: (a) longitudinal; (b) transverse; (c) oblique.

*Rectal and perineal bulging and flattening
*Expulsive grunt upon exhalation

Usually a woman exhibits a combination of several of these signs and symptoms during transition. It is not uncommon for a woman to exhibit all or nearly all of these signs and symptoms, particularly if she is a primigravida who has not had the benefits of preparation from childbearing classes.

Fetal Components

Lie, Presentation, Position, and Variety Determination of the lie, presentation, position, and variety of the fetus is essential database information. These determinations require an understanding of the words used and of the anatomical landmarks of the fetal skull in relation to the maternal pelvis.

Lie is the relationship of the long axis of the fetus to the long axis of the mother. There are three possible lies: longitudinal, transverse, and oblique (Figure 26-4).

Presentation is determined by the presenting part, which is the first portion of the fetus to enter the pelvic inlet. There are three possible presentations: cephalic, breech, and shoulder. Cephalic and breech presentations are further subdivided. A cephalic presentation can be either vertex, sincipital, brow, or face. A breech presentation can be either frank, full/complete, or footling (single or double).

The *attitude* of the fetus is its characteristic posture. This is determined by the relationship of the fetal parts to each other and the effect this has on the fetal vertebral column. The attitude of the fetus varies according to its presentation. For example, a fetus in a vertex presentation has a well-flexed head, flexion of the extremities over the thorax and abdomen, and a convex curved back; the ramrod straight attitude of a fetus with a sinciput presentation has given it the name of a military attitude; and a fetus with a face presentation has a head that is acutely extended, flexion of the extremities on the thorax and abdomen, and a vertebral column that is arched to some degree (Figure 26-5).

Position is the arbitrarily chosen point on the fetus for each presentation in relation to the left or right side of the mother's pelvis. These are shown in Table 26-3.

Position is commonly used to refer to the designations of left occipital anterior (LOA), right sacral transverse (RST), and so forth, and one of these is

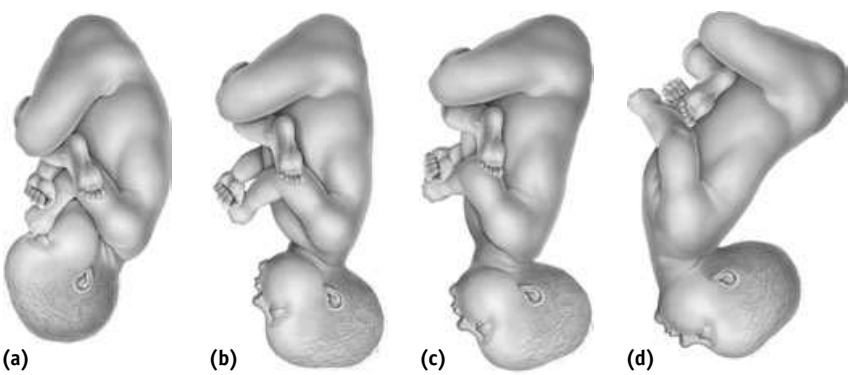


FIGURE 26-5 Attitude of the fetus in (a) vertex, (b) sinciput, (c) brow, and (d) face presentations.

TABLE 26-3 Possible Fetal Relationships to the Maternal Pelvis for Each Lie and Presentation

Lie	Presentation	Arbitrarily Chosen Point on the Fetus	Designation for Position (left or right side) and Variety (anterior, transverse, or posterior portion of the mother's pelvis)	
Longitudinal	Cephalic			
	Vertex	Occiput	ROA	LOA
			ROT	LOT
			ROP	LOP
	Sinciput	Sinciput (bregma, anterior fontanel)	Sinciput and brow presentations usually convert to either a vertex or a face presentation.	
	Brow	Brow		
	Face	Mentum (chin)	RMA	LMA
			RMT	LMT
			RMP	LMP
	Breech			
	Frank	Sacrum	RSA	LSA
			RST	LST
			RSP	LSP
	Full/Complete	Sacrum	Same as frank presentation	
	Footling	Sacrum	Same as frank presentation	
Transverse	Shoulder	Acromion	RAA	LAA
			RAP	LAP
			A transverse variety is not possible.	
Oblique	With an oblique lie, the midwife will feel nothing at the inlet. There is no presentation, position, or variety associated with an oblique lie, which is usually a transitory condition.			

the expected answer to the question "What is the position?" Technically such designations are not accurate, but they serve as shorthand, since such a designation gives not only the position and variety but also the lie and presentation. For example, the designation LOA tells you that the lie is longitudinal, the presentation is vertex, the position is the occiput in the left side of the mother's pelvis, and the variety is the occiput in the anterior portion of the pelvis.

Variety is the same arbitrarily chosen point on the fetus used in defining position in relation to the anterior, transverse, or posterior portion of the pelvis. Table 26-3 summarizes the possibilities.

Transverse and oblique lies in labor are abnormal conditions. They require collaboration with your consulting physician and will most likely necessitate cesarean section. Approximately 0.5 percent of women enter labor with a shoulder presentation.

Of the presentations associated with a longitudinal lie, the most common is the vertex cephalic presentation. It has an incidence of approximately 95 percent. Of these, approximately two-thirds will be positioned with the occiput in the left side of the mother's pelvis (LOA, LOT, LOP) and one-third with the occiput in the right side of the mother's pelvis (ROA, ROT, ROP). Because the head usually enters the inlet with the occiput directed to the transverse portion of the mother's pelvis, the most common position at the onset of labor is left occiput transverse (LOT). Figures 26-6 and 26-7 show left occipital positions.

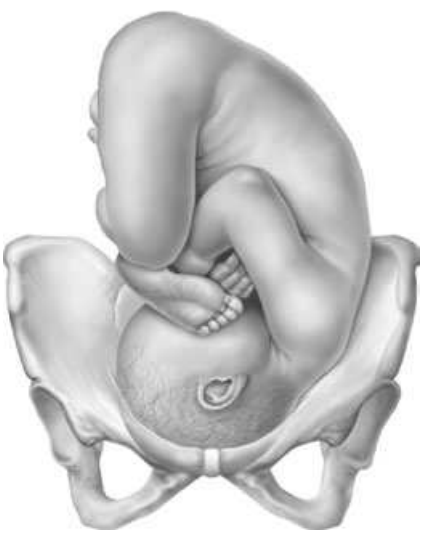


FIGURE 26-6 Left occiput transverse (LOT).

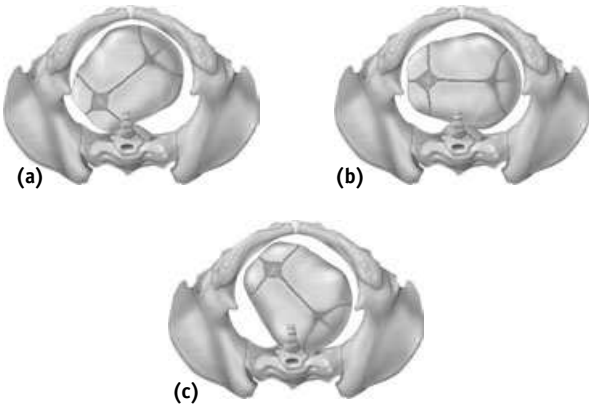


FIGURE 26-7 Varieties of the cephalic left occipital position, view from below. (a) left occipital anterior (LOA); (b) left occipital transverse (LOT); (c) left occipital posterior (LOP).

Approximately 3.0 to 3.5 percent of women enter labor with a breech presentation and 0.5 percent with a face presentation. The midwife collaborates with a physician in the management of women with a breech or face presentation. (See Chapter 30.)

It is thought that the reason the vast majority of presentations are cephalic at term is the interrelationship between the decreased amount of amniotic fluid and the piriform shape of the uterus, with the roomier portion being in the fundus. Although the breech of the fetus (podalic pole) is smaller than the fetal head (cephalic pole), the combination of the breech and the flexed lower extremities is bulkier, because the flexed upper extremities are not as close to the head as the lower extremities are to the breech. Prior to the thirty-second week of pregnancy, the bulkiness of the poles of the fetus is not a factor in fetal presentation because the amniotic cavity is large in relation to the total fetal mass. The incidence of breech presentation at this time may be as high as 50 percent. After the thirty-second week, the combination of fetal growth and the decrease in amniotic fluid causes the fetus to be constrained by the uterine walls. The fetus thus accommodates itself to the shape of the uterus so that the majority of the earlier breech presentations spontaneously convert to vertex presentations by term. Those that do not convert spontaneously may be responding to abnormal uterine shape, extension of the fetal vertebral column, placenta previa, hydrocephaly, or unknown influences. Hydrocephaly must be ruled out, because this condition makes the cephalic pole bulkier than the podalic pole. Accommodation by the hydrocephalic fetus puts the larger cephalic pole in the fundus and accounts for the high incidence of breech presentation when the fetus is hydrocephalic.

Vaginal examination during labor after the cervix has begun to dilate is invaluable for confirming abdominal findings as well as enabling more definitive diagnoses regarding the fetal presentation, position, and variety. This is because you will be able to feel the fetal suture lines and fontanels, or portions of the fetal face, or portions of the fetal breech or external genitalia, or the fetal extremities (hands or feet). Since the cephalic vertex presentations are by far the most common, it is vital to be well versed in the essential landmarks of the fetal skull as indicated in Table 26-4 and Figure 26-8.

Position and variety of the vertex presentation, therefore, are determined vaginally by feeling the anterior or posterior fontanel (its shape and the sutures leading off the fontanel) and identifying which fontanel is in which side and portion of the maternal pelvis. In order to identify which part of the fetal skull you are feeling, it helps to remember that the sagittal suture is the only suture that has the anterior fontanel at one end and the posterior fontanel at the other end.

Adaptation to the Pelvis Vaginal examination during labor also provides other information regarding the adaptation of the fetus to the pelvis, specifically, the synclitism or asynclitism of the fetal head and the extent of any molding and caput succedaneum.

Synclitism/Asynclitism. Synclitism and asynclitism are terms to describe the relationship of the sagittal suture of the fetal head to the symphysis pubis and the sacrum of the mother's pelvis. This relationship is determined when the anteroposterior diameter of the fetal head is in alignment with the transverse diameter of the pelvic inlet, which is the usual case for entry into the pelvic inlet and engagement. This places the sagittal suture line of the fetal skull in the same line as the transverse diameter of the pelvic inlet and the occiput of the fetal head in the transverse portion of the mother's pelvis. *Synclitism* is the term used when the sagittal suture is midway between the symphysis pubis and the sacral promontory. *Asynclitism* indicates that the sagittal suture is directed either toward the symphysis pubis or toward the sacral promontory (Figure 26-9). Determination of whether this is anterior asynclitism or posterior asynclitism is based *not* on which maternal pelvic structure the sagittal suture

TABLE 26-4 Essential Landmarks of the Fetal Skull

Anatomical Part	Description
Bones	
Frontal	There are 2 frontal bones.
Parietal	There are 2 parietal bones.
Occipital	There is 1 occipital bone.
Sutures	
Frontal	The frontal suture is between the 2 frontal bones.
Sagittal	The sagittal suture is between the 2 parietal bones.
Coronal	There are 2 coronal sutures, 1 each between the frontal and parietal bones on either side of the head.
Lambdoid	There are 2 lambdoid sutures, 1 each between the parietal bones and the upper margin of the occipital bone on either side of the head.
Fontanels	
Anterior	Formed by the meeting of the frontal, sagittal, and 2 coronal sutures. The anterior fontanel is roughly the shape of a diamond (◊), and 4 sutures can be felt leading off the anterior fontanel in 4 directions as indicated by the points on the diamond.
Posterior	Formed by the meeting of the sagittal and the 2 lambdoid sutures. The posterior fontanel is roughly the shape of a triangle (∇), and 3 sutures can be felt leading off the posterior fontanel in 3 directions as indicated by the points of the triangle. The occipital bone, which serves as the base of the triangle, can also be felt.

is closer to but instead on which parietal bone is dominant. Therefore, anterior asynclitism occurs when the anterior parietal bone (the one closest to the symphysis pubis) becomes the lowermost part of the presenting part, due to deflection of the head toward the sacral promontory, causing the sagittal suture to lie closer to the sacral promontory. Posterior asynclitism occurs when the posterior parietal bone (the one closest to the sacral promontory) becomes the lowermost part of the presenting part as a result of deflection of the head toward the symphysis pubis, causing the sagittal suture to lie closer to the symphysis pubis. In normal labor, the head usually enters the pelvic inlet with a moderate degree of posterior asynclitism and then changes to anterior asynclitism as it descends further into the pelvis before the mechanism of internal rotation takes place. This sequential change from posterior to anterior asynclitism facilitates the mechanism of descent; it is an accommodation by the fetus to take

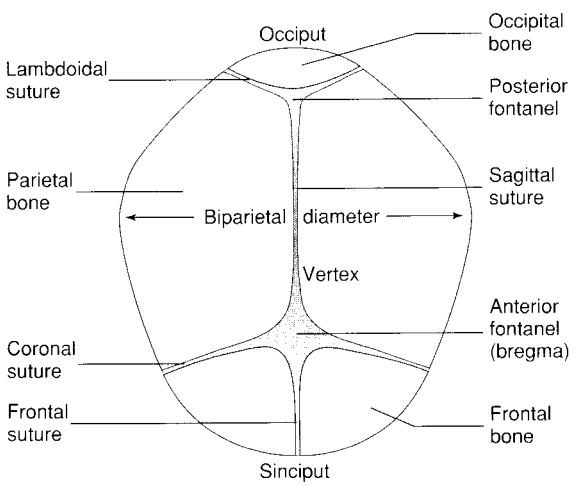


FIGURE 26-8 Fetal skull: Landmarks, bones, fontanels, sutures, and biparietal diameter.

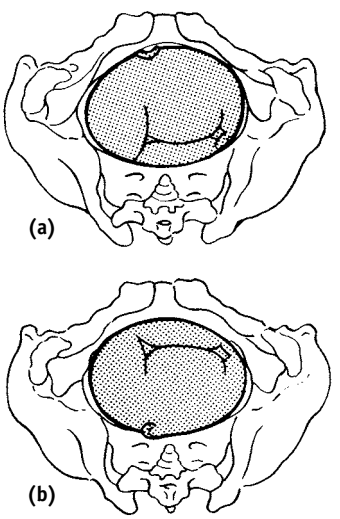


FIGURE 26-9 Asynclitism: (a) anterior; (b) posterior.

advantage of the roomiest portions of the true pelvis.

Molding and Caput Succedaneum. Both molding and caput succedaneum result from pressure exerted on the fetal head by the maternal structures of the birth canal.

Molding is the change in the shape of the head as a result of the soft skull bones' overriding, or overlapping, each other because they are not yet firmly united and movement is possible at the sutures. The shape the head becomes depends on the presentation, because this determines which parts of the skull are subjected to pressure. Because of the prevalence of occipital cephalic presentations, molding usually occurs as the overriding of the parietal bones over the occipital bone, which, in effect, obliterates the posterior fontanel and leaves a ridge. When the parietal bones overlap at the sagittal suture, which is not uncommon, the parietal bone that was anterior in the pelvis overlaps the "posterior" parietal bone, which was depressed because of pressure from the sacral promontory. Therefore, in an ROT position that rotates to ROA, the left parietal bone overrides the right parietal bone, and vice versa for an LOT position that rotates to LOA. In thinking about the overriding of the parietal bones, do not confuse the location of the left and right parietal bones (either anterior or posterior) with anterior and posterior asynclitism. Whether the left or right parietal bone is anterior is based solely on whether the occiput is to the left or right of the pelvis, which then determines which one lies closest to the symphysis pubis and which one lies closest to the sacrum.

Molding involves the entire skull, with overlapping in one area being counterbalanced with movement elsewhere. This creates harmony between the base and the vertex of the skull in order to prevent destructive tension and possible rupture of the cranial membrane, the dura mater.

Caput succedaneum is the formation of an edematous swelling over the most dependent portion of the presenting fetal head. Pressure around the presenting part by the cervical opening produces congestion and edema of the portion of the fetal head over the cervical opening. If the fetal membranes are ruptured and the fetal head (rather than the membranes) is functioning as the dilating wedge against the cervical opening, a greater amount of caput succedaneum will be formed. Caput succedaneum can be differentiated from *cephalhematoma* by the fact that caput succedaneum crosses suture lines as a generalized swelling, whereas a cephalhematoma, which is bleeding beneath the periosteum, may occur over more than one cranial bone but is limited to each individual bone and does not cross any sutures.

The formation of a few millimeters of caput succedaneum is not unusual or abnormal. A small caput succedaneum may be indicative of a somewhat prolonged labor resulting from uterine inertia with weak contractions. Formation of extensive caput succedaneum, which makes the identification of fetal sutures and fontanels impossible, combined with severe amounts of molding is usually seen only when the pressure has been great and labor prolonged; cephalopelvic disproportion must be suspected. A sizable caput may also be seen from positional pressure when the fetal position was occipitoposterior.

Maternal Physiological Changes

A number of normal maternal physiological changes take place during labor. It is important to know those that may be ascertained clinically in order to accurately interpret certain signs, symptoms, and physical and laboratory findings as normal or abnormal during the first stage of labor. These are detailed in Table 26-5, along with their significance in the management of care of the woman during labor.

Maternal Psychological and Behavioral Changes

The maternal psychological and behavioral changes that occur during the latent, active, and transitional phases of the first stage of labor were discussed earlier in this chapter. Unlike the physiological changes that are more general to the first stage of labor, but like the physical changes such as contractions and cervical changes, these psychological and behavioral changes are quite specific as labor goes on. They comprise a means of evaluation of a woman's progress in labor and how she is coping with the demands being placed upon her by labor and the environment within which she is laboring.

In addition to the specific changes, the overall psychology of a woman in labor will vary widely depending on the preparation and anticipatory guidance she has had prior to labor; the support she is receiving from her partner, significant others, family, and caretakers; the environment she is in; and whether this baby is a wanted baby. Many babies are not planned for but the majority of babies are wanted by the end of pregnancy. However, if the

TABLE 26-5 Significance of Maternal Physiological Changes Occurring During Labor

Physiological Change	Significance
Blood Pressure	
Rises during contractions with the systolic rising an average of 15 (10–20) mm Hg and the diastolic rising an average of 5–10 mm Hg	To ascertain the true blood pressure, be sure to check it well between contractions, preferably with the woman in a side-lying position.
Between contractions, the blood pressure returns to its prelabor levels.	
A shift of the woman from a supine to a lateral position eliminates the change in blood pressure during a contraction.	
Pain, fear, and apprehension may further raise the blood pressure.	If a woman is extremely fearful or apprehensive, consider the possibility that her fear (rather than preeclampsia) is causing an elevated blood pressure. Check other parameters to rule out preeclampsia. Give supportive care and medications that will relax the woman before making a final diagnosis if preeclampsia is not readily evident.
Metabolism	
During labor, both aerobic and anaerobic carbohydrate metabolism steadily rises. These increases are due largely to anxiety and to skeletal muscle activity.	
The increased metabolic activity is reflected by an increase in body temperature, pulse, respirations, cardiac output, and fluid loss.	The increase in body temperature, pulse, and respirations is discussed below. The increase in cardiac output and fluid loss affects renal function and necessitates concern for and action to prevent the development of dehydration.
Temperature	
Slightly elevated throughout labor; highest during and immediately after delivery To be considered normal, this elevation should not exceed 1 to 2°F (0.5 to 1°C). It reflects the increase in metabolism that occurs during labor.	A slightly elevated temperature may be normal. If labor is prolonged, however, an elevated temperature may be indicative of dehydration, and other parameters should be checked. Also, if the membranes ruptured prematurely, an elevated temperature may be indicative of infection and cannot be considered normal in these circumstances.
Pulse (Cardiac Rate)	
Marked change during contractions with an increase during the increment, a decrease during the acme to a rate lower than that between contractions, and an increase during the decrement to the rate usual for the woman between contractions.	
The marked decrease during the acme of the uterine contraction does not occur if the woman is in a lateral rather than a supine position.	
The pulse rate between contractions is slightly higher than during the immediate prelabor period. This reflects the increase in metabolism that occurs during labor.	A slightly elevated pulse may be normal. Check other parameters to rule out an infectious process.
Respirations	
A slight increase in respiratory rate is normal during labor and reflects the increase in metabolism that is occurring.	It is difficult to obtain accurate findings regarding respirations as their rate and rhythm are affected by excitement, pain, apprehension, and the utilization of breathing techniques.
Prolonged hyperventilation is abnormal and may result in alkalosis.	Observe the woman's breathing and aid her in controlling it to avoid prolonged hyperventilation, which is evidenced by her feeling tingling in her extremities and feeling dizzy.

TABLE 26-5 Significance of Maternal Physiological Changes Occurring During Labor (*continued*)

Physiological Change	Significance
Renal Changes	
Polyuria is frequent during labor. It may be the result of a further increased cardiac output during labor and probable increase in glomerular filtration rate and renal plasma flow. Polyuria is less pronounced in the supine position, which has the effect of decreasing urine flow during pregnancy.	The bladder must be frequently evaluated (every 2 hr) for distention and emptied to prevent (1) obstruction of labor by a full bladder that prevents descent of the presenting part and (2) trauma to the bladder from prolonged pressure, which will cause hypotonia of the bladder and urinary retention during the immediate postpartal period.
Slight proteinuria (trace, 1+) is common in a third to half of women in labor.	More frequent in women who are primiparas, or have anemia, or are in prolonged labor
Proteinuria 2+ and above is abnormal	Indicative of preeclampsia
Gastrointestinal Changes	
Gastric motility and absorption of solid food are severely reduced. This, combined with a further decrease in the secretion of gastric juice during labor, brings digestion to a virtual standstill and yields a significantly prolonged gastric emptying time. Liquids are not affected and leave the stomach in the usual amount of time. Food ingested during the immediate prelabor period or the prodromal or latent phase of labor will most likely remain in the stomach throughout labor.	A full stomach may cause discomfort and general misery during transition. Women should therefore be instructed not to eat a big meal or drink excessive fluids but to drink and eat at will to maintain energy and hydration.
Nausea and vomiting are not uncommon during the transition phase marking the end of the first stage of labor.	Oral medications are rendered ineffective during labor. Gastrointestinal changes are probably a response to one or a combination of the following factors: uterine contractions, pain, fear and apprehension, medications, or complications.
Hematologic Changes	
Hemoglobin increases an average of 1.2 gm/100 mL during labor, returning to prelabor levels the first postpartum day in the absence of abnormal blood loss.	Don't be falsely reassured that a woman is not anemic if the results of blood tests are borderline and thus be lulled into ignoring the increased risks of the anemic woman during the intrapartal period.
Blood coagulation time decreases and there is a further increase in plasma fibrinogen during labor.	These changes decrease the risk of postpartum hemorrhage in the normal woman.
The white blood cell count progressively increases throughout the first stage of labor by about 5000 to an average total WBC count of 15,000 at the time of complete dilatation. There is no further increase after this.	Increased white cell count is not necessarily indicative of an infectious process when at this level. If much above this level, check other parameters for an infectious process.
Blood sugar decreases during labor, dropping markedly in prolonged and difficult labors, most likely as a result of the increase in activity of the uterine and skeletal muscles.	Use of laboratory tests to screen a woman for diabetes during the intrapartum period would yield most inaccurate and unreliable results.

baby is not wanted, the psychology of the mother may affect the course of labor.

Preparation and anticipatory guidance vary widely depending on the philosophy and experience of the childbirth educator. There is childbirth education that is institution-based and may reflect the attitudes and practices of the institution; there is childbirth education that reflects a plan to birth in a birth center or at home; there is childbirth education that gives knowledge of the process but still leaves the woman subordinate to the institution or the practitioner; there is childbirth education that gives knowledge of the process but uses it to empower the woman to own her body and birth; there is childbirth education that has a set curriculum outline; there is childbirth education that begins with what the participants want to know, discuss, or explore; there is childbirth education that

"teaches from the 'outside,' in other words, how it is perceived and managed by professionals" and there is childbirth education that "prepares a mother for birthing from within . . . what labor and birth will be like from her perspective" [11]. Each type of childbirth education deeply influences a woman's psyche: her self-image, expectations, and self-confidence.

The support that a woman does or does not receive in her birthing environment, including from those who are with her, profoundly affects her psychologically at a time when she may easily feel vulnerable as each contraction and its pain continues to come again and again. The freedom to be herself and to be able to "let go and go with the flow" is critical to her feeling of acceptance and sense of well-being. The support and comfort measures discussed later in this chapter communicate caring, compassion, and a sustaining human presence to a woman.

Management of Care During the First Stage of Labor

Management of care during the first stage of labor includes responsibility for the following:

1. Differential diagnosis of labor
2. Management of false labor and of early labor
3. Initial evaluation of the mother and fetus in labor
4. The 12 basic management of care decisions
5. Continuing evaluation of maternal and fetal well-being
6. Continuing evaluation and facilitation of the progress of labor
7. Bodily and supportive care of the mother and her significant other/family/friends

Many of the activities involved with each of these responsibilities may be going on simultaneously.

Differential Diagnosis of Labor

In making a diagnosis of labor, you must differentiate not only between true and false labor but also between labor and any discomforts or complications that masquerade or can be misinterpreted as labor. These most commonly include urinary tract infections and what may be called "the general miseries of the end of pregnancy," which some women have to a rather severe degree. Abruptio placentae with a posterior placenta should also be considered (see Chapter 24).

A woman with false labor may be experiencing considerable discomfort and exhaustion from days of false labor contractions. Such contractions are differentiated from true labor contractions in that false labor contractions do not increase in frequency, duration, and intensity; they are irregular and of short duration; they are rarely intensified and may actually be relieved by walking; and they are usually felt in the lower abdomen and groin. True labor contractions may start as irregular and of short duration but then become regular with increased frequency, duration, and intensity; they are intensified by walking, and they are usually felt as radiating across the uterus and the lower back. At times, though, it is not easy to differentiate between false and true labor contractions. The actual diagnosis of false labor is based on the definition of labor as progressive cervical change. The fact that false labor contractions do not result in cervical effacement and dilatation leads to the diagnosis being made on the basis of a lack of cervical change.

The suprapubic, flank, and back pain that may be associated with a urinary tract infection are frequently mistaken by both woman and examiner as symptomatic of labor. Added to this is the possibility of misinterpreting the frequency and urgency of urination associated with urinary tract infection as merely that experienced by the woman from pressure of the enlarged uterus on the bladder, especially if lightening has occurred. A urinary tract infection should be suspected in this situation in the absence of uterine contractions and cervical effacement and dilatation. This picture may be complicated in the presence of false labor contractions, and a diagnosis of urinary tract infection can be missed in the diagnosis of false labor.

When you suspect a urinary tract infection, you should take a careful history of any previous urinary tract infections, fever, chills, nausea and vomiting, frequency, urgency, dysuria, suprapubic pain, flank pain, lower back pain, and hematuria; you should conduct a physical examination for temperature, suprapubic pain, and CVA tenderness; and you should collect a urine specimen for routine analysis, culture, and sensitivity. These steps provide the necessary database from which to confirm or rule out the infection. In the meantime, true labor is ruled out in the absence of cervical change and false labor is ruled out in the absence of irregular uterine contractions that are relieved by walking.

The general miseries of the end of pregnancy are frequently seen in, but not limited to, women who have been having periodic episodes of false

labor. These women are terribly uncomfortable; have muscular aches and pains, particularly in the back, abdomen, and legs; walk and move with great lassitude and difficulty; haven't been eating well; are somewhat emotionally depressed because they are tired of being pregnant; are physically tired; are not sleeping well; and generally "just don't feel good." Labor is absent, as is any causative disease process for these symptoms.

Management of False Labor and of Early Labor

The management of care of the woman with false labor and of the woman with the general miseries of the end of pregnancy is the same. Both require a large dose of patience, understanding, explanations, and tender, loving care. These requirements also extend into the home, and family members need to offer support and patience.

Once fetal well-being is assured and labor is ruled out, send the woman home with some suggested comfort measures. Instruct her to soak in a tub of warm water, filled enough to cover her abdomen; then, after getting out of the tub, to drink a hot drink of her preference (tea, coffee, milk, chocolate) with sugar, or a glass of wine; and then to go to bed to sleep. (If a family member can give her a backrub before she sleeps, it will also help her feel more comfortable.) The tub bath relaxes and soothes her aching muscles by dilating the blood vessels, thus increasing blood flow and oxygenation to the area, and the motion of the water is psychologically soothing. She will need help from family members to get in and out of the tub. The hot drink, made for her by a family member, is the time-honored method for facilitating sleep. The addition of sugar to the drink provides needed calories and energy to the body's cells. A glass of wine or sherry also is often used to promote relaxation. The back rub given by a family member again gives relief to aching muscles and bespeaks tender loving care. If a woman is unable to sleep with nonmedicinal methods, 25 to 50 mg of diphenhydramine (Benadryl), available over-the-counter, may be used to promote sleep.

It is frequently difficult to differentiate between false labor and the early latent phase of labor. The management of care of such a woman, in the absence of any complications, will vary according to the setting in which she will labor and deliver. If she plans to deliver in a hospital, the plan will vary according to hospital policies and facilities, distance the woman lives from the hospital, availability of transportation, her and her family's coping abilities, and the woman's preference. If, for example, the hospital has a unit for labor observation or early labor, admission to this unit is appropriate. If, however, the hospital does not have such a unit and has a policy that patients are not to be admitted to the labor and delivery suite until in active labor, unless the membranes are ruptured, or except with complications, then you must decide whether to keep the woman in the hospital emergency room or area where you examined her or to send her home until labor is more definitively established. In such a situation, a compromise is generally struck between realities and the philosophy that a woman will probably feel and cope better in the more pleasant, familiar surroundings of her home.

Since walking may stimulate true labor or relieve false labor, the woman is usually asked to walk outside or in designated areas of the hospital and return to be rechecked in 1 to 2 hours. If no change in the cervix is noted during this repeat examination and if the woman lives nearby, has no transportation problems, and wants to go home, she is managed for false labor and sent home. If, however, the woman lives a great distance away and you are still unable to make a diagnosis of false labor or early latent phase labor, the woman may be asked to walk for another couple of hours and again be rechecked before a final decision is made to send her home. A woman who lives many miles from the hospital may prefer to walk for hours in the hospital until she is convinced that this is false labor rather than have the worry that she might not return in time and might deliver either at home or en route. A combination of lack of cervical progress and exhaustion will often make the woman decide to go home; she should be encouraged to follow the regimen for false labor so that she can get some much-needed rest.

Management of the woman in the early latent phase of labor again varies according to the setting in which she will labor and give birth. If she plans to deliver in a hospital, the management of care varies according to hospital policies, hospital facilities, distance the woman lives from the hospital, availability of transportation, the coping abilities of the woman and her family, and the woman's preference. If the hospital has an early labor unit, admission to it is appropriate. This enables the woman to undergo routine admission procedures and spend her early labor in a more homelike atmosphere. Comfortable chairs for her and her significant other; materials and personnel to explain the progress of labor and helpful breathing and re-

laxation techniques; diversions to help pass the time, such as playing cards, books, television, and magazines; and freedom to walk and move around are basics in such a unit. If the hospital does not have such a unit, a woman who lives nearby and has ready access to transportation may prefer to go home and return to the hospital when her labor is more active. A woman who lives some distance from the hospital may have friends or relatives with whom she would prefer to spend this period of early labor. Even if a hospital does not have a 4-centimeter dilatation admission requirement, some women who live too far away to return home for early labor prefer to walk outside or in designated areas of the hospital; the midwife may recommend that she visit the cafeteria or snack shop for tea or coffee with sugar or fruit juice before being admitted to the labor and delivery suite. Any time a woman in early labor who plans to deliver in the hospital enters the active phase of the first stage of labor, ruptures her membranes, or develops signs and symptoms of a complication, she is admitted to the labor and delivery suite.

Admission When a woman is admitted to the labor and birth suite she undergoes an admission procedure. This procedure varies from hospital to hospital but generally includes the following:

1. Having the woman change from street clothing to a hospital gown
2. Tagging and marking of the woman's personal belongings
3. Putting an identification band on the woman
4. Filling out of chart forms and signing of necessary permission forms
5. Admission orders
6. Initial evaluation of the woman and fetus in labor—history, physical and pelvic examinations, and laboratory tests

The admission orders include not only the routine laboratory tests but also your initial management decisions.

In an out-of-hospital setting the woman wears her own clothing and institutional procedures are unnecessary. In the home setting the word "admission" takes on a different meaning, as the woman and whomever she wants with her admit *you* into *her* environment.

Initial Evaluation of the Mother and Fetus in Labor

When a woman presents herself for examination thinking that she is in labor, you need to evaluate her possible labor status, assess her well-being and that of the baby, screen for immediate complications, and, on the basis of these findings and other factors, make a decision as to whether the woman is in labor or needs any medical help or intervention.

Labor status refers to just that information needed to determine where a woman is in the progress of her labor and to anticipate her continued progress. It has nothing to do with the well-being of either the mother or the baby. The items in Table 26-6 that pertain to evaluation of labor status are indicated with an asterisk (*).

If you determine that the woman is in labor—whether at home, in a freestanding out-of-hospital birth center, an in-hospital birth center, or the labor and delivery suite of a hospital—a complete evaluation of her condition and the condition of her baby, including a history, physical and pelvic examinations, and laboratory tests, is conducted. This evaluation is more comprehensive when done in a hospital, where the midwife may not have seen the woman before or the woman may not have had any prenatal care. A woman in a home birth practice or an out-of-hospital birth center is more apt to have been closely followed antepartally by the midwife who is with her in labor. This woman would be well known to the midwife and would not require such an extensive history and examination, but the midwife should completely review the same information and evaluate her and her baby's current condition and status of labor.

History The history is similar to the history outlined in Chapter 2, with the additions outlined for history in Chapter 22 and in Table 26-6.

If the woman's prenatal record is available, it is often used as the source of information for the history, with the exception of the labor history. Specifically, identifying information, present pregnancy history, past obstetric history, past medical and primary health care history, and family history can be reviewed from the woman's prenatal record. This spares the woman from having to reiterate history she has given before, from being disturbed at a time when she is coping with the demands and stresses placed upon her by her labor condition and situation, and from being disrupted while concentrating on her breathing during contractions. However, a few critical items of history should be double-checked, specifically, the existence of any of the following: drug allergies, blood transfusions and reactions, and major obstetrical or medical complications.

TABLE 26-6 Database for Diagnosis of Labor and Initial Evaluation of the Mother and Fetus in Labor

Item	Significance
History	
*Age	An age of under 16 or over 35 predisposes the woman to a number of complications. Under 16 increases the incidence of preeclampsia. Over 35 increases the incidence of chronic hypertension (which underlies an increased incidence of preeclampsia and abruptio placentae); Type II diabetes (which underlies an increased incidence of gestational diabetes as well as diagnosed Type II diabetes); prolonged nulliparous labor; cesarean section; preterm delivery; IUGR; chromosomal anomalies; and fetal death.
*Gravida and para	Need explanation of gravida and para numbers for this woman to identify potential problems with this birth and postpartum. Parity has an effect both on the duration of labor and on the incidence of complications. A cervix that has been completely dilated in a previous labor offers less resistance to being dilated again, thereby shortening the length of labor. In addition, multiparas have more pronounced fundal dominance with their contractions and more relaxed pelvic floors, which offer less resistance to the passage of the baby and decrease the length of labor. However, the duration of labor in grand multiparas may progressively increase with greater numbers of babies, presumably as a result of changes in the uterine musculature—a condition that is often referred to as "exhaustion of the uterine muscle." It is not uncommon to see a woman having a longer labor with her eighth full-term baby than she had with her first baby. Increased parity increases the incidence of abruptio placentae, placenta previa, uterine hemorrhage, maternal mortality, and perinatal mortality. Double ovum twinning increases in Gravida 5 and above.
*Time of onset of contractions and the frequency and duration of the contractions from onset to present	This information is necessary in order to establish the start of labor, usually timed from when the contractions became regular, and to differentiate between true and false labor contractions. False labor contractions do not increase in frequency, duration, and intensity; are irregular; and are of short duration. True labor contractions may start as irregular and of short duration but then become regular with increased frequency, duration, and intensity.
*Intensity of the contractions when lying down contrasted to when walking around	This information helps to differentiate between true and false labor contractions. True labor contractions are intensified by walking, whereas false labor contractions are rarely intensified by walking and may actually be relieved.
*Descriptions of the location of discomfort or pain felt with contractions	This information also helps to differentiate between true and false labor contractions. False labor contractions are usually felt in the lower abdomen and groin. True labor contractions are usually felt as radiating across the uterus from the fundus to the back.
Fetal movement	To assess fetal well-being.
*Length of previous labor	The length of a previous labor is a good indication of the potential length of this labor, allowing for the differences between a primigravid and secundigravid labor and the labor of increasing great parity.
AP, IP, PP complications during previous childbearing experiences	To identify potential problems with this birth and postpartum.
Delivery method of previous deliveries	To identify previous cesarean section or operative vaginal deliveries.
Size of largest and smallest previous babies	The size of the largest baby delivered vaginally ensures the adequacy of the woman's pelvis for up to that size baby. It also provides baseline information for anticipating possible complications when compared with the estimated fetal weight of this baby and is important for decision-making concerning the route of delivery in breech presentations. A woman who has a history of small babies by the same father will tend to have a small baby this time. This may, however, be affected by nutrition, hypertension, or diabetes.
EDB and present weeks of gestation	These are baseline data for evaluating gestational size, whether labor is at term or premature, and possible complications for the weeks of gestation.
*Absence, presence, or increase in bloody show	Bloody show is a premonitory sign of labor. An increase in bloody show is indicative of impending second stage of labor.

Starred items pertain to evaluation of labor status.

TABLE 26-6 Database for Diagnosis of Labor and Initial Evaluation of the Mother and Fetus in Labor (*continued*)

Item	Significance
Absence or presence of vaginal bleeding	Bleeding is abnormal. Since vaginal examination is almost always contraindicated in the presence of bleeding, the midwife must ask the woman if she has had any vaginal bleeding prior to doing a vaginal examination. Frank bleeding requires physician consultation and collaboration or referral.
*Status of membranes	Ruptured membranes are a premonitory sign of labor. Because ruptured membranes predispose both mother and baby to increased risk of intrauterine infection, a history of ruptured membranes demands determining by examination whether they have indeed ruptured. Women are not always clear as to whether their membranes have ruptured because a slow leak can easily be confused with incontinence of urine. A report of a sudden gush of water that ran down her legs and filled her shoes and subsequently necessitated her wearing a sanitary pad, or of wetting of clothes, is a good indication that the membranes have ruptured.
Any prenatal problems	It is essential to screen the woman quickly for antepartal complications that may affect the intrapartal period (e.g., preeclampsia, anemia) or masquerade as signs of labor (e.g., urinary tract infection).
When she last ate	Information will be wanted by anesthesiologist in the event of surgery. Also useful for assessing energy reserve and fluid status.
Physical Examination	
Vital signs: BP, T, P, R	An elevated or lowered blood pressure is indicative of the hypertensive disorders of pregnancy or shock, respectively. An elevated systolic but normal diastolic blood pressure may indicate anxiety or pain. An elevated temperature is indicative of an infectious process or dehydration. An elevated pulse may indicate infection, shock, anxiety, or dehydration. An elevated respiratory rate may indicate shock or anxiety.
Weight	Weight is taken to obtain the total weight gain for pregnancy.
FHT	To assess the status of the baby. A fetal heart rate below 120 or above 160 may be indicative of fetal distress and warrants immediate evaluation.
Fetal movement	To assess fetal well-being.
*Contraction pattern	The frequency, duration, and intensity of the contractions must be accurately assessed to determine labor status.
*Engagement	Determined by abdominal palpation. An unengaged or unfixed head on a primigravida in labor is indicative of possible cephalopelvic disproportion. Such a finding requires repeating clinical pelvimetry during the vaginal examination and evaluation in relation to the estimated fetal weight.
*Estimated fetal weight and fundal height, and abdominal girth when indicated	In relation to the weeks of gestation. A smaller than expected estimated fetal weight (EFW) and fundal height indicate either that the woman's dates are in error, a small-for-dates baby, or oligohydramnios. A larger than expected EFW and fundal height indicate that the woman's dates are in error, a large baby (indicative of diabetes), multiple gestation, or polyhydramnios. A large baby also forewarns you of (1) the possibility of postpartum uterine atony producing hemorrhage or (2) possible shoulder dystocia. An EFW 1 or more pounds larger than the woman's preceding babies, even though not excessive in size, also alerts you to the possibility of difficulty with delivery of the shoulders. Abdominal girth is indicated if you suspect multiple gestation or polyhydramnios.
*Lie, presentation, position, and variety	To ascertain an abnormal lie (i.e., transverse), presentation (i.e., breech), or position (i.e., mentum, brow, sinciput). Also to determine variety, as a posterior variety may lengthen or increase the discomfort of the first stage of labor. A woman in even very early labor must be admitted to the hospital if she has a transverse lie. A primigravida with a breech presentation is at risk and should also be admitted.
Abdominal scars	Obtain explanation to ascertain integrity of her uterus.
Edema of the extremities	This is one of the classic signs of preeclampsia. The midwife should check for and evaluate any ankle, pretibial, finger, or facial edema. Edema of the feet and ankles alone may simply be dependent edema resulting from the decrease in venous blood flow caused by pressure from the enlarged uterus.

TABLE 26-6 Database for Diagnosis of Labor and Initial Evaluation of the Mother and Fetus in Labor (*continued*)

Item	Significance
Reflexes and clonus	Hyperreflexia (3+, 4+) is one of the signs of severe preeclampsia. Clonus is usually seen with impending or actual eclampsia.
Pelvic Examination	
*Effacement and dilatation	To determine whether progressive cervical change has occurred and diagnose labor. Also to determine what stage and phase of labor the woman is in, if in labor.
*Position of the cervix	The cervix is usually far back and directed posterior prior to labor. Movement of the cervix so it is directed forward in a midline position indicates readiness for, or entry into, labor.
*Bloody show	Increased bloody show is a sign of impending second stage.
*Station	To determine descent of the fetal head. Descent of the fetal head is one of the mechanisms of labor and is indicative of progress and pelvic adequacy.
Molding and caput succedaneum	To ascertain fetal adaptation to the mother's pelvis.
*Lie, presentation, position, and variety	To confirm abdominal findings. Sometimes it is easier to obtain these findings on vaginal examination because the presenting part—suture lines, fontanels, skull bones (if a cephalic presentation), a hand, or a foot—can be felt directly.
Synclitism/Asynclitism	To ascertain fetal adaptation to the mother's pelvis.
*Status of membranes	To confirm or rule out a history of ruptured membranes or detect a rupture of membranes not reported for reasons stated under *History*.
Vaginal orifice and perineal body	To evaluate thickness, length, and stretchability to ascertain possible need for an episiotomy.
Clinical pelvimetry	To assess pelvic adequacy.

If the woman is being admitted for a reason other than labor—such as premature rupture of the membranes, vaginal bleeding, or a medical complication—or if any finding during the examination is indicative of a complication, then the appropriate related history needs to be taken (see the section on Chief Complaint and History of Present Illness in Chapter 2).

Physical and Pelvic Examination A screening physical examination is done on all women admitted to the hospital. This not only provides up-to-date baseline data but also screens for any infectious disease and for major medical problems that might affect a safe intrapartum period for the women.

If the woman's prenatal record is available, the physical examination that was done during her initial antepartal visit is reviewed for any medical abnormalities or disease (see Chapters 2 and 22). If the woman has been closely followed throughout her antepartal course by a consistent care provider, a repeat of the total gross screening physical examination is not necessary. If the woman entered the labor and birth suite in late active labor without prenatal care, an abbreviated gross screening examination is done and a more comprehensive review of systems and physical examination can be performed postpartally.

A finding indicative of a complication requires further physical examination pertaining to that complication. For example, an elevated blood pressure, with or without the presence of edema, is an indication for eliciting and evaluating deep tendon reflexes as well as taking a history for symptoms of preeclampsia.

In addition to the screening physical examination, thorough abdominal and pelvic examinations are essential for evaluation of labor status and the well-being of the fetus. These are detailed in Table 26-6. Other vaginal findings may be ascertained while following a woman's progress during labor. If, however, there is any reason to question the adequacy of a woman's pelvis at this time—because of a larger baby than she previously had, or a large baby in a primigravida, or a small body frame, or an unengaged head in a primigrvida—now is the time to do clinical pelvimetry. It is easier to perform clinical pelvimetry with the woman on an examining table than in a bed.

Laboratory Tests The laboratory tests ordered on a woman's admission to a hospital may vary by pol-

icy from setting to setting, but generally include the following:

Hematocrit—ordered or done *stat* by the midwife
VDRL
Urinalysis—minimum of dipstick test for protein, glucose, and acetone; in some settings a urine specimen is collected and sent to the laboratory for routine microscopic examination or done *stat* by the midwife.

In addition, a type and antibody screen may be drawn, even, by hospital policy, as a repeat of prenatal determination, or if the woman had no prenatal care. A blood sample for cross-match may also be drawn and held for use if the woman's clinical situation requires a blood transfusion.

The blood for the laboratory tests may be drawn by the midwife (see Chapter 47). If the woman will be having an intravenous infusion, the blood specimens are obtained at the same time the IV is started (see Chapter 48).

The woman's prenatal record is reviewed for the results of the following laboratory tests and adjunctive studies done during pregnancy. Results are recorded in the admission note.

Blood group (ABO)
Rh factor
Antibody screen
Serology
GC and chlamydia culture
Hepatitis screen (HBsAg)
HIV screen
Pap smear
Group B Streptococcus (GBS) status
Last hemoglobin and hematocrit
Last urinalysis
Glucose screen
Rubella titer
Varicella antibody screen
Sickle cell screen
Tuberculin screen
Any special tests

The Twelve Basic Management of Care Decisions

The 12 basic management decisions are the decisions that routinely may be made about each woman in labor and individualized for that woman. Some of these decisions are relevant only to a hospital setting and are not an issue if the woman is giving birth at home or in a freestanding out-of-hospital birth center. Some of these decisions may be predetermined by existing policies in the particular hospital setting where labor and birth is taking place. Other management decisions besides these may need to be made, depending on the woman, her condition, her situation, and the setting. The following 12 decisions are the most common management decisions made in a hospital after a woman is admitted to the labor and delivery unit. Their applicability (if any) to the home or birth center settings is included in the discussion of each.

1. Whether the woman may have food or fluids by mouth and, if so, precisely what is allowed
2. Whether the woman is to have IV access
3. Whether the woman has any position or ambulation limitations and, if so, what these are
4. Whether to give the woman oral/IM/IV medication and, if so, what, how much, and when
5. Whether the woman is to have epidural analgesia/anesthesia
6. The frequency with which the woman's vital signs (blood pressure, pulse, and temperature) are to be checked
7. The frequency with which the fetal heart tones are to be checked and how this will be done
8. The frequency with which vaginal examinations are done
9. Identification of the woman's significant others and their roles
10. Whether to artificially rupture the membranes and, if so, when
11. Determination of whether there is a need for physician consultation or collaboration
12. When to prepare for birth

Many of these decisions are made over again several times during the course of labor as the woman's condition changes and labor progresses. Each must be considered in relation to the individual woman at a given time. However, there are specific factors to consider in making each decision. The management decisions are made in the course of carrying out the various management responsibilities identified at the beginning of this section and depend on evaluation of the information in the database described at the beginning of this chapter. The first five decisions are discussed separately. Decisions 1 through 3 and 6 through 8 are usually included in the admission orders. Decisions 6 through 12 are discussed within the context of the management responsibilities for continuing evaluation of maternal and fetal well-being, continuing evaluation and facilitation of the progress of labor,

and bodily and supportive care of the mother and her significant other/family/friends.

Foods and Fluids by Mouth The provision of foods and fluids by mouth during labor is a subject of long-standing controversy. The general standard for the past 40 or 50 years has been for the woman to have no food or fluids by mouth (NPO), the rationale being that having an empty stomach reduces the risk of aspiration pneumonia in the event of need for general anesthesia. There are several flaws in this thinking, however; the research it is based on is also flawed [12].

There has been some loosening of the NPO standard. The thinking promulgated by those brave enough to challenge the standard was that solid food was the real problem, as it would remain in the stomach throughout labor because of decreased gastric motility, gastric absorption, and secretion of gastric juice during labor, but that liquids were not affected and left the stomach in the usual amount of time. Liquids, therefore, were acceptable intake for women during labor in the hospital and the woman could have sips of water, tea with sugar (for energy), or athletic drinks. The liquids would supplement what few calories the woman could get from her carefully packed bag of hard candies (or lollipops to avoid aspiration). Eating and drinking have always been self-determined by women who labor and give birth at home and birth centers have always been less restrictive than hospitals.

The facts are that fasting increases the concentration of hydrochloric acid, which is the dangerous substance in aspirate; women have more energy and are better hydrated when they have eaten; women who are in a situation in which they can eat as they wish, often eat early in labor but generally don't want much other than liquids during active labor; the volume of stomach contents and gastric juice varies widely regardless of the interval since the last intake; when there is pulmonary aspiration there is likely to have been difficult or failed intubation; and the few statistics for anesthesia-related maternal morbidity and mortality are often not specific as to the cause [12–14].

Women having their babies at home eat at will. Freestanding out-of-hospital birth centers have kitchens for the woman and her family to use (see Figure 26-10). Providing sustenance during labor in the hospital is reasonable. A standard of eating and drinking at will for women in normal labor is warranted. Women need to be warned that excessive fluids may produce nausea and discomfort. Large quantities of chilled, sweetened fruit juices can produce gas and possibly cause nausea and vomiting.

FIGURE 26-10 Kitchen in the Family Childbirth Center, New Haven, Connecticut.

Intravenous Access The purposes of intravenous access are twofold: (1) as a lifeline for medications, fluid, or blood in the event of an obstetric disaster and (2) as a means of maintaining maternal hydration. Intravenous access is mandatory if any of the following conditions are present; some of which require continuing infusion:

1. Gravida 5 or greater
2. An overdistended uterus for any reason, including
   a. multiple gestation
   b. polyhydramnios
   c. an excessively large baby (estimated at 9 pounds or more)
3. A pitocin induction or augmentation
4. History of previous postpartum hemorrhage
5. History or presence of any other condition that predisposes the woman to immediate postpartal hemorrhage
6. Maternal dehydration or exhaustion
7. Positive maternal Group B Streptococcus status requiring IV antibiotics in labor

8. Maternal temperature greater than 100.4° F in labor
9. Any obstetric or medical condition that is life threatening, such as abruptio placentae, placenta previa, ruptured uterus, preeclampsia, or eclampsia
10. Epidural analgesia/anesthesia

The decision of whether to start an intravenous infusion on a woman other than one for whom it is mandatory becomes, in practice, largely a matter of what the individual clinician believes and is comfortable with in consultation with the woman. Some clinicians believe "it is better to be safe than sorry" and want all of their clients to have an IV. Most midwives believe it is unnecessary to subject all women to the pain, bother, and restrictions of an IV and want none of their clients to have an IV unless there is an indication for it. These midwives, however, reserve the right to start an IV in the event the woman's condition changes such that either maternal hydration cannot be maintained with oral fluids (e.g., too much nausea and vomiting for retention of oral fluids) or complications are now an anticipated possibility.

A compromise used by some midwives is to insert a "heparin lock" (a capped intravenous catheter). This may be used to draw the admission lab work and then left in the vein without attaching IV fluids and tubing. Thus, only a single needle stick needs to be done, minimizing discomfort for the woman. If there is no indication for IV hydration in labor, it does not interfere with the mother's ability to move about. If IV antibiotics are needed, they can be administered over a brief period of time, after which the tubing is disconnected. If IV access becomes necessary, administration of fluids or blood can be done quickly with minimal discomfort to the woman and maximal efficiency for the midwife or nursing staff.

The usual intravenous solution for a woman in labor consists of 1000 cc D_5W or D_5RL given at 125 cc per hour. This may vary if the woman is mildly dehydrated, in which case approximately 300 cc may be run in and then the IV slowed to 125 cc per hour. IVs for women in labor should always be started with an intravenous catheter (see Chapter 48). In contrast to a butterfly needle or a straight needle, an intravenous catheter permits the woman to more freely move her arm without trauma to the involved blood vessel and has the best chance of staying in the vein should she become physically active during labor. It also allows easier administration of large amounts of fluids or a blood transfusion.

Position and Ambulation A woman in labor should assume a position that is comfortable for her, provided that there are no contraindications to it. Positions may include supine (with the head of the bed at any angle of inclination, or flat), lateral recumbent, knee-chest, all-fours (hands-knees), sitting, standing, walking, and squatting.

The position a woman assumes may aid the rotation of the fetus from a posterior position to an anterior position. Any position that directs the uterus forward (anterior) helps gravity bring the heavier back side of the fetus forward toward the lower side of the woman's abdomen. Such positions include leaning forward over a birthing ball or, if in bed, over an overhead table; leaning forward against a support person while standing; the hands-knees position; and the knee-chest position. If a woman is in bed, lying in a left lateral recumbent/Sims'/semiprone position will help her fetus rotate anteriorly from a right occipital posterior position; lying in a right lateral recumbent/Sim's/semiprone position will help her fetus rotate anteriorly from a left occipital posterior position.

A woman in labor should be able to ambulate when and for as long as she desires, provided there are no contraindications. Walking in early labor may stimulate labor. Many women experience relief and cope with their labor better when they can walk. Being free to walk, sit in a chair, use the toilet, and so forth is certainly more conducive to a comfortable and progressive labor oriented to normal processes than is the sickness orientation of being confined to bed.

There are, however, times when the woman should not be out of bed or ambulating, among them the following:

1. When the membranes are ruptured and the fetus is either small (under 2000 grams) and unengaged or in a footling or ill-fitting breech presentation, or in a transverse lie. In such events there is a risk of cord prolapse, which is increased if the woman is upright. Even a supine position with the head of the bed, including pillows, elevated higher than 20 to 30 degrees further increases the risk of prolapsed cord. The lateral recumbent position and the knee-chest position are good alternatives to the supine position in this situation.
2. When the woman has been medicated with any drug that might make her lightheaded, dizzy, or unsteady on her feet.
3. During rapidly progressive labor, late first stage labor in multiparas, or second stage labor in primigravidas, unless the woman and you have

planned for her to give birth squatting or standing.

4. When a woman has any obstetric or medical complications requiring that the woman remain in bed, (e.g., abruptio placentae, placenta previa, severe preeclampsia).

The lateral recumbent position (Figure 26-11) has several beneficial effects:

1. Better coordination and greater efficiency of uterine contractions because they are stronger and less frequent than when the woman is in a supine position
2. Facilitation of kidney function (urine flow is decreased in the supine position)
3. Facilitation of fetal rotation in posterior positions
4. Relief of uterine pressure on, and compression of, the major maternal blood vessels (the inferior vena cava and the aorta), which may result when the woman is supine

FIGURE 26-11 Father/husband supporting woman in active labor. The woman is in the left lateral recumbent position.

These beneficial effects can be used to good advantage and the woman should assume the lateral recumbent position in the following situations:

1. Maternal supine hypotensive syndrome
2. Fetal distress (to reduce uterine activity, relieve pressure on the umbilical cord, or eliminate hypoxia resulting from maternal supine hypotensive syndrome)
3. ROP or LOP fetal positions if long arc rotation is slow; if the fetal position is ROP the woman should be on her right side, if the fetal position is LOP the woman should be on her left side
4. Severe preeclampsia (for best urine flow)
5. Mild uterine hypertonicity or ineffectual uterine contractions

Medication (Oral, IM, IV) *Commonly Used Drugs and Practices.* Medication may be used during labor for one or all of the following purposes: pain relief, decrease of anxiety and apprehension, sedation, and control of vomiting. The drugs most commonly used by midwives and the purposes they serve are listed in Table 26-7.

The midwife must make several decisions regarding medication during labor:

1. Whether to give a medication
2. Which medication to give
3. Dosage of the medication to be given
4. Route to use in giving the medication, if there is a choice
5. When to give how much of what medication by what route

This final decision summarizes the other decisions and emphasizes the importance of the timing in giving the medication in relation to the status and progress of labor.

The midwife is not limited to a single dose of a single medication. She or he may mix drugs (adding them together), divide doses, and repeat doses in accord with the midwife's prescriptive authority or

TABLE 26-7 Medications Commonly Given During Labor

Trade Name (Generic Name)	Classification	Pain Relief	Decrease Anxiety and Apprehension	Sedation	Antiemetic
Demerol (meperidine)	Narcotic analgesic	X		X (mild)	
Nubain (nalbuphine)	Narcotic analgesic	X		X (mild)	
Phenergan (promethazine)	Ataractic		X	X (moderate)	X (moderate)
Stadol (butorphanol)	Narcotic analgesic	X		X (moderate)	
Vistaril (hydroxyzine)	Ataractic		X	X (moderate)	
Seconal (secobarbital)	Barbiturate sedative		X (mild)	X	X (mild)

practice guidelines without consulting a physician. Remember that the ataractics (tranquilizers) potentiate the action of the narcotic analgesics. The most common medication practices of midwives are summarized in Table 26-8.

Factors Affecting Medication Decisions. What the midwife decides to do regarding medications will be based on consideration of the following factors.

Woman's Desire for Medication. Some women want as much medication as they can get. Usually such women do not understand why you cannot give them enough to take the pain away, even after you explain several times. Generally such women are having a difficult time coping with their labor, are quite frightened, and have had little to no education or preparation regarding childbirth.

In contrast are the women who have read extensively, attended preparation for childbirth classes, practiced breathing and muscle techniques for labor, and want to experience as much of the labor as they can without medication. Some of them are adamantly opposed to any medication. However, "prepared childbirth" means the woman's knowledgeable, active participation in the natural, normal processes of childbearing—it does *not* mean childbirth without medication. Women who are natural childbirth devotees who have lost sight of the meaning of prepared childbirth and have distorted it to mean childbirth without medication may suffer tremendous and damaging feelings of failure and guilt if they "succumb" and express a need for medication during labor. Such women need help in revising their definitions and expectations of themselves and in accepting their own behavior. Medication that takes the edge off the pain but leaves the woman fully aware and still able to participate actively in her experience not only can contribute to a successful birth experience but also is desirable for a woman who needs it, because it may be just what enables her to stay in control of herself and to continue coping with the demands of her condition and situation.

TABLE 26-8 Common Practices in Medication Administration During Labor

Drug	Single Dose and Route	General Timing
Demerol	50 mg IM	Active labor
	12.5–25 mg IV	Active labor
Nubain	10–20 mg SQ or IM or IV	Active labor
Morphine	10–15 mg IM or IV	Prodromal labor or prolonged latent phase Hypertonic uterine dysfunction
Phenergan	25–50 mg IM or IV	Early or active labor, or both
Stadol	1–2 mg IM or IV	Active labor
Vistaril	50 mg IM	Early or active labor, or both
Seconal/ Nembutal	100 mg po	False labor
	100 mg IM	Early labor

The art of medication during labor comprises achieving a balance between the woman's desire and need for medication and your own need, as her midwife, to facilitate her coping abilities within the parameters of safety. In order to do this you must know the woman's viewpoints and preferences regarding medication during labor. Ideally the two of you have discussed this prior to labor as part of providing continuity of care; however, this is not always the situation. You must be careful not to assume or impose your own values and beliefs regarding medication. Ask the woman what she wants and then strive to practice the art of medication within the limits of safety and her desire.

Labor Status. When the medication is given is vitally important. The midwife should observe the following principles:

1. Evaluate the progress of labor carefully and time the medication so it will *not* be at its peak action at the time the baby is born. Otherwise the baby might be sleepy and have some respiratory depression. This principle does not apply to very small doses of medication (e.g., 25 mg of Demerol) as long as this dose is not the last of a series of doses but is rather a single and only dose for the total of labor, as might occur if the woman arrives in the labor and delivery suite far advanced in labor.
2. Do not give a narcotic analgesic until the woman is in active labor. If given before the contractions are well established, as in the latent phase of labor, the drug will most likely render the contractions ineffectual by diminishing their frequency, duration, and intensity. In effect, although you have made the woman extremely comfortable, you have lengthened the total labor by several hours (for which she would probably not thank you if she knew). If the membranes are ruptured, lengthening labor could be dangerous. After the woman is in well-

established active labor, a narcotic analgesic will not affect the contraction pattern.

3. The ataractics do not affect uterine contractions and will not slow down or delay the progress of labor. In fact, because ataractics have a calming effect, progress of labor is often facilitated as the woman relaxes and begins to work with rather than against her labor.
4. Sedatives should be used in specific circumstances:
   a. when the woman is in false labor
   b. when the woman is in early labor and is exhausted and needs a rest
   c. as part of the treatment for hypertonic uterine dysfunction, to stop the present labor with its abnormal gradient contraction pattern

Fetal Size. Because of developmental immaturity and a high risk of respiratory distress in a preterm (premature) or small-for-gestational-age fetus, all medications may be withheld during labor from a woman carrying a preterm or small baby, in order not to depress the baby. Unlike full-term babies, small or premature babies may not be able to tolerate depressing drugs crossing the placental barrier.

Fetal Condition. If there is any evidence of fetal distress, regardless of fetal age or size, all medications are withheld from the woman in order not to further stress the fetus. Epidural analgesia/anesthesia may be the best maternal pain management option for a woman with a high-risk fetus. Continuous electronic fetal monitoring is always indicated for the high-risk fetus.

For any fetus at risk—such as those of diabetic mothers, severely preeclamptic mothers, or those who are postterm—judicious, very small dosages might be tried and the fetus carefully monitored for the drug's effect. Further medication is based on this trial and on the status of the condition that is placing the fetus at risk. In such cases internal fetal monitors will probably be used, permitting comprehensive monitoring of the fetal response.

Maternal Size. The amount of medication is limited by the fact that the fetus cannot tolerate the levels it would take to totally alleviate the woman's pain. Thus, if the woman is large, you cannot give additional medication in accord with her increased body size. On the other hand, you still need to consider the body size of the small, petite woman in determining the amount of medication within the limits imposed by the fetus.

Woman's Response to Support in Labor. Support for women in labor is discussed in detail later in this chapter. It has been said that effective supportive care in labor is worth 100 to 200 mg of Demerol. If the woman is responding well to support, there is a corresponding decrease in the amount of medication she needs. This is typical of women who have undergone preparation for childbearing. It can also be true for unprepared women, depending on a number of variables, such as the woman's pain threshold, how early in labor you establish contact with her, how much education and breathing preparation you can give her during early labor, the presence and help of her significant other, her previous experience and what she has heard from others regarding labor, and the amount of continuing constant supportive care that can be given her. There are circumstances, however, in which the woman is unable to cooperate with and respond well to the support; these women will need more medication, within the limits of safety.

Need for Medication. The woman's need for medication encompasses her desire or preference regarding medication, her labor status, and her response to support in labor. In addition to and underlying these factors is the amount of real pain she is feeling. This varies for each woman, depending on her pain threshold and on the amount of anxiety and tension she has and their effect on intensifying the amount of pain.

It is not uncommon to see women in early normal labor complaining of great pain as evidenced by thrashing about, doubling up, and much vocal expression—yet you palpate only mild, brief contractions. You can bring about a dramatic change in behavior by paying attention to what the woman is feeling physically and experiencing psychologically. Most likely she is frightened. Supportive care alone or in conjunction with a little ataractic often changes her into a smiling, coping woman rapidly progressing into active labor who has no need for a narcotic analgesic at this time.

On the other hand, in medicating a woman, you should always anticipate when she is really going to need it most—which is during transition—and plan accordingly. A woman's pain in labor, as she is experiencing it, should never be scoffed at regardless of your findings—she is feeling it and her experience must be respected. Again, the art of medicating involves a total plan of supportive care, including medication, throughout labor, designed for each woman within the limits of safety.

Epidural Analgesia/Anesthesia Over the past three decades, the use of epidural analgesia/anesthesia for control of pain in labor, spontaneous vaginal births and operative births, has dramatically increased due to improvement in the techniques and access to the procedure. In addition, women are increasingly demanding use of epidurals to diminish the pain of childbirth. In the 1960s women demanded greater participation in the birth of their babies by avoiding mind altering drugs and interventive medical technology. A societal shift has occurred in which women seem more willing to relinquish control of their bodies in favor of decreasing pain. Technology is revered, and epidurals are perceived by many to be very safe. Midwives have long been the advocates of non-interventive means of labor and birth, and have worked hard to keep the use of technology, including epidurals to a minimum.

Some midwives may still have limited use of epidurals in their practice. However, for those midwives who are serving women who will give birth in hospitals and who have midwifery care either for the supportive nature of midwifery or because they are the designated providers, epidurals may be commonplace. Midwives working in out-of-hospital birth sites and those who have a population of women who are seeking low tech, normal birth also must have an understanding of the use of epidurals as women in their care who develop complications may require more medicalized care and use of an epidural.

It is important to remember that the goal of midwifery care is a safe, satisfying birth experience for each woman, based on her own perceptions of birth. As Burst stated in an editorial on "real" midwifery:

> If we believe that every woman has the right to receive care from a midwife [sic], then the practice of midwifery [sic] must encompass all women regardless of their normalcy or risk status, the setting in which they receive their care, or the practices within that setting. We must recognize that, as individuals, each of us differs in what we choose to do and that it is acceptable to differ. . . . *Real* midwifery is "with woman," wherever she may be, in whatever circumstances she may be in, in whatever condition her pregnancy, in whatever health care system. [15]

Using an epidural should not be considered an impediment to quality midwifery care. It should not keep women from midwifery care, nor should midwives shun women because of their preference for a medicalized birth.

Indications and Contraindications. Relief of pain in labor is the obvious indication for use of an epidural. Women come to the decision to rely on epidural when other means of coping with labor have been ineffective or because they are fearful of pain associated with childbirth. Some have experienced birth previously with or without medication and are basing decisions on their own experience, while many hear tales of birthing that lead them to decide that the pain is not manageable without the epidural. There are also women who do not wish to use analgesic methods for the birth of their baby, but due to medical complications, require anesthesia for abnormally painful labor or for operative births.

Overall, epidurals provide the most complete relief of pain in labor and childbirth of any other method. Research has found that women using epidurals had lower pain scores and were more satisfied with their analgesia than women using parenteral opioids when simply evaluating the experience of pain [16, 17]. They are, however, the most invasive pain relief method. Nor can the positive sense of empowerment attained by women who labor and give birth without medical intervention be overestimated.

In July 2002, the American College of Obstetricians and Gynecologists (ACOG) released a Practice Bulletin in which the following statement was made:

> Labor results in severe pain for many women. There is no other circumstance where it is considered acceptable for a person to experience untreated severe pain, amenable to safe intervention, while under a physician's care. In the absence of a medical contraindication, maternal request is a sufficient medical indication for pain relief during labor. [18]

Indications for the use of epidural anesthesia include the following:

1. Relief of pain in active labor and for spontaneous or operative vaginal birth
2. Cesarean section
3. Decreases need for general anesthesia for operative deliveries
4. Need to diminish maternal expulsive efforts (e.g., maternal cardiac or ophthalmologic disease)

5. Decreases fear of pain and birth for some women
6. Provides opportunity for rest in the midst of a protracted, exhaustive labor

In some cases when an emergent cesarean birth may be required, an epidural may be recommended in order to avoid any loss of time if the emergency in fact occurs. This would be the situation when a "double set-up" is done for rupture of membranes with a floating head, for a vaginal breech birth or for a twin birth. It may also be the case when a forceps birth is to be attempted with strong anticipation of the need for a cesarean section. If a woman requires a forceps delivery and does not have an epidural, it may be initiated prior to the forceps delivery if there is time and the fetus is stable, in order to assist her in relaxation and to spare her the intense pain that can accompany forceps application and extraction.

A less common but important consideration is for women with a history of sexual trauma. For some, labor brings great anxiety about painful stimuli in the vaginal/rectal area, flashbacks of the abusive events, and uncertainty about letting their baby pass through the vagina, which may have very negative connotations for them. Assurance of analgesia may be very helpful to abused women planning for their births.

Many medical disorders can impact the choice of medications for pain relief and management of labor and birth. Evaluation of the woman for any medical risk factors that would be contraindications to an epidural or where special circumstances may be encountered is critical. Absolute contraindication to epidural or spinal anesthesia include the following:

1. Patient refusal or inability to cooperate
2. Skin or soft tissue infection at the site of needle placement
3. Frank coagulopathy
4. Uncorrected maternal hypovolemia (e.g., hemorrhage)
5. Inadequate training or experience in the technique

Under the following circumstances, women may be best served by a consultation with an anesthesiologist prior to labor:

1. Scoliosis, spina bifida, or other spinal column abnormalities
2. Previous back surgery
3. Preexisting arthritides
4. Preexisting tracheostomy
5. Preexisting neurologic or neuromuscular disease (e.g., multiple sclerosis or muscular dystrophy)
6. Preexisting cardiac disease
7. Preexisting pulmonary disease other than mild asthma
8. Low platelet counts (<100,000), or use of heparin in pregnancy
9. Preexisting coagulopathies
10. Any history of complications with an epidural or other anesthetic
11. Family history of major anesthesia complications
12. Allergy to anesthetics
13. Morbid obesity; BMI >30
14. Suspected difficult airway
15. Severe anxiety regarding regional analgesia

Anatomy/Physiology. During the first stage of labor, pain is experienced from cervical dilatation and uterine contractions. The pain sensations travel via sympathetic nerves that enter the spinal cord through the posterior segments of thoracic spinal nerves 10, 11, and 12 [19]. During the second stage, pain primarily comes from distention of the pelvic floor, vagina, and perineum stimulating sensory fibers of the sacral nerves 2, 3, and 4 (pudendal nerve) [19].

Local anesthetics, deposited in the epidural space, interrupt sensations of pain, touch, movement, and temperature in the nerves as they enter and leave the spinal cord. The degree to which these sensations are blocked is related to the dose of medication.

Epidural or intrathecal (spinal) opioids have a different mechanism of action than the local anesthetics. They do not "block" transmission of all sensation by the nerves. Instead, they work specifically to mediate pain and therefore do not cause muscle weakness. The combination of a local anesthetic and opioid injected into the epidural space is found to offer excellent pain relief with less of a motor block, and a smaller overall dose of medication.

The duration of pain relief from a single dose of local anesthetic is one to two hours. If the epidural is being used for an operative procedure only—e.g., cesarean section or forceps delivery—one dose is all that may be needed. More commonly, the method is used for longer duration of pain relief. Additional medication can then be given through the epidural

catheter in intermittent boluses or "top-offs," in a continuous small dose by pump, or it can be done by patient-controlled epidural analgesia (PCEA).

Description of Lumbar Epidural Procedure. A lumbar epidural is placed by either a nurse anesthetist or an anesthesiologist. A 16- to 18-gauge needle is used to identify the epidural space (see Figure 26-12). Then, a catheter is threaded through the needle and left in the epidural space when the needle is removed. The external portion of the catheter is then stabilized by taping it to the mother's back. Once the insertion and stabilization of the catheter are complete, a local anesthetic is injected through the catheter. A test dose of anesthetic is given to ensure that the catheter was not inadvertently placed in the spinal canal or in a blood vessel. With the catheter in place, additional anesthetic may be added by anesthesia personnel throughout the course of labor and birth.

A segmental lumbar epidural, placed via the L2-3, L3-4, or L4-5 interspace, will allow the use of a dilute anesthetic solution that will block the sympathetic nerves that carry painful impulses in the first stage of labor. During this time, sensation and motor function of the perineum and lower extremities remain mostly intact [19]. With minimal doses of anesthetic, some centers will allow women to be ambulatory during this phase of the epidural. When the fetal head causes more pressure and stimuli in the perineal region, a larger and more concentrated dose of anesthetic may be given to provide perineal anesthesia for the birth and/or repair if necessary. This increased dose of medication will cause more of a motor block, and women will no longer be able to ambulate safely.

A newer technique for management of labor pain is the use of intrathecal (spinal) opioids. This is usually done as a combined spinal/epidural procedure. Once the larger (16–18 gauge) epidural needle is placed, a small spinal needle (25–27 gauge) is introduced through the epidural needle, through the dura, and into the subarachnoid space. Very small doses of opioid (usually fentanyl or sufentanil) are needed and produce almost immediate relief of pain. The spinal needle is then removed, and the epidural catheter is threaded through the epidural needle. The epidural needle is then withdrawn and the catheter secured to the woman's back. If the woman wishes to be ambulatory, this method can be used prior to injecting local anesthetic into the epidural space. The spinal analgesia has little or no interference with motor function [19], and it does not have the side effect of hypotension [20]. The duration of the single spinal injection is limited to 1 to 2 hours. At that time, if the woman requires continued pain relief, the epidural route is available through the previously placed catheter. More commonly, the combined, spinal-epidural is used to provide rapid relief of labor pain while awaiting onset of the epidural block.

Intrathecal opioids enhance the local anesthetic in addition to providing immediate pain relief and the ability to ambulate. With very small doses of opioids, the overall dose of local anesthetics can be decreased. The results with intrathecal opioids give bilateral relief and the chance of systemic drug toxicity is reduced, and the method is reversible with a narcotic antagonist [21].

Epidural/Spinal Associated Risks. There are potential side effects related to each procedure and medication used. Most of the common side effects are not serious. Others are rare, but potentially severe or life threatening. Side effects related to local anesthetics include hypotension, bladder distension, and leg numbness and weakness, all caused by relaxation of muscle tone. Side effects related to performance of the procedure are postdural puncture headaches, back pain, and, very rarely, spinal cord injury.

Hypotension (systolic blood pressure <100) is noted in up to 50 percent of women following administration of epidural analgesics [22]. The effect of local anesthetics on the large spinal nerves is to decrease the tone of muscles, including those in the walls of blood vessels. Blood then pools in the lower extremities and there is a decrease in the return of the blood to the right side of the heart [19]. Cardiac output decreases and hypotension results. This transient side effect is treated with changing maternal positioning to avert aortal/vena caval hypotensive syndrome, and increased intravenous hydration. Significant complications are uncommon, but blood flow to the uterus diminishes, which can affect the fetus, and blood flow to the maternal cerebrum can also be diminished. If hypotension is prolonged, it can be treated with a vasopressor, most commonly ephedrine, by anesthesia personnel.

Bladder distension occurs when there is loss of the sensation to void, relaxation of overall bladder tone, and loss of control of the urinary sphincter. As always, attention must be paid to the bladder to prevent interference with fetal descent and overdistension, which could contribute to postpartum

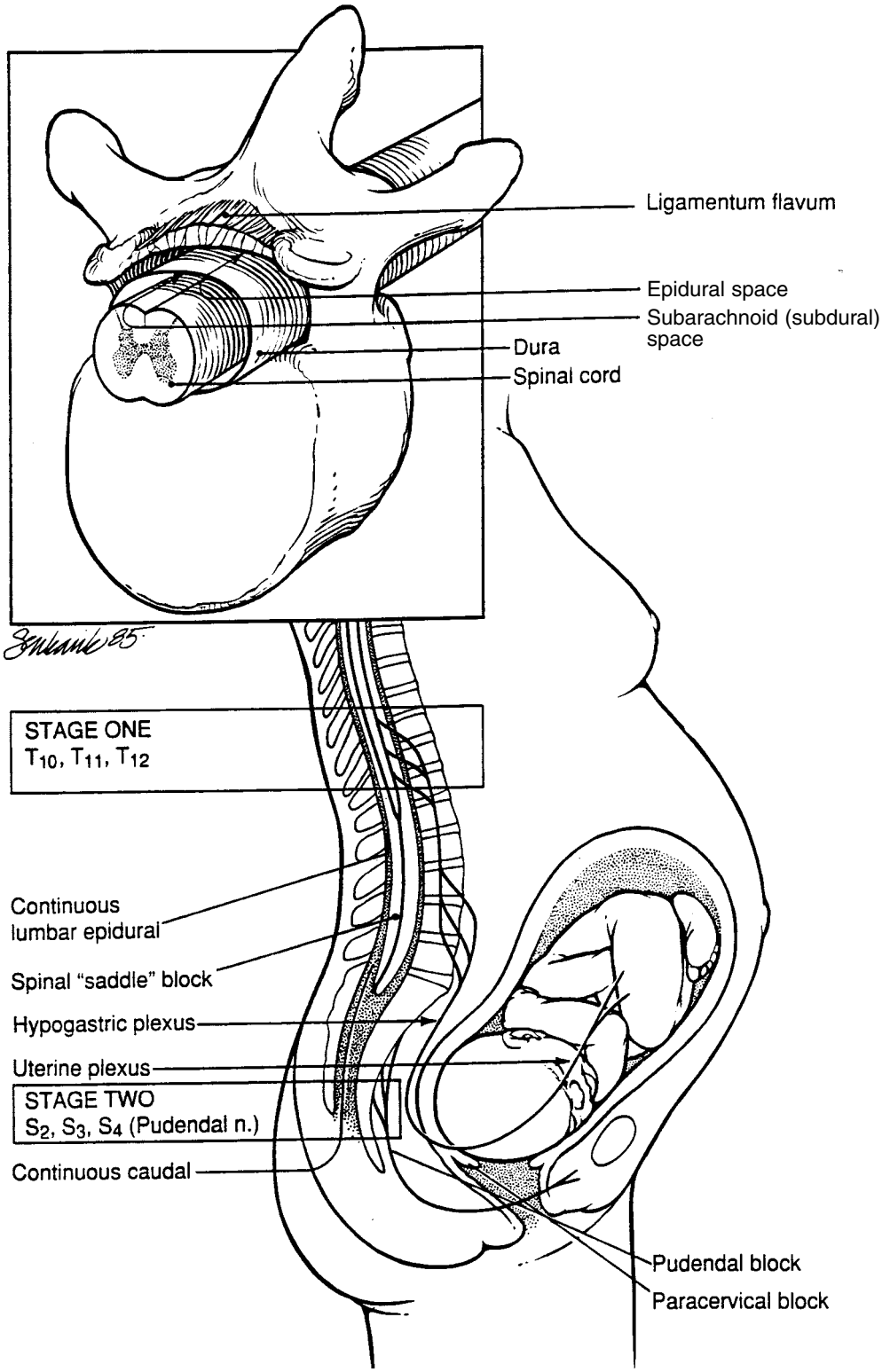


FIGURE 26-12 Pain pathways of labor and delivery and nerves blocked by various anesthetic techniques.

Source: Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, p. 432. Reproduced by permission.

hemorrhage and voiding difficulties. Women are encouraged to attempt spontaneous voiding after an epidural, but often are unable to electively control the urinary sphincter. If the bladder is empty when the epidural is begun, and the woman gives birth within a short period of time, catheterization may not be required. However, large volumes of intravenous fluids are used to maintain blood pressure and the bladder may fill quickly. Straight catheterization during labor and/or at the time of birth is common. If many hours will elapse between initiation of an epidural and birth, and the woman is unable to void on her own, then an indwelling catheter should be considered to keep the bladder empty and decrease the risk of urinary tract infection. The catheter should be discontinued by the time the fetal head is nearing the perineum. Urinary incontinence related to epidurals has been demonstrated in the immediate postpartum period only.

Postdural puncture headaches occur in about 1 percent of women with an epidural or combined spinal epidural (CSE) [20]. If the epidural needle is inadvertently pushed a little too far and pierces the dura, cerebrospinal fluid may be allowed to leak out of the spinal space, into the epidural space. This causes low pressure in the spinal canal. The spinal needle used for the CSE is very small gauge and has not been shown to increase the likelihood of postdural headache over epidural alone [23]. When the woman is in an upright position, the brain can "sag," pulling on sensitive structures. If the woman remains supine, these symptoms will resolve. However, this is not a good remedy for most women who are recovering from birth and caring for a newborn. Resolution of the headache will occur when the CSF stops leaking and is replenished. In most cases this will happen spontaneously within 4 to 5 days with rest, increased oral hydration, caffeine, and simple analgesics such as acetaminophen (Tylenol) or ibuprofen (Motrin, Advil). If the headache is severe and/or prolonged, it can be treated with a "blood patch." This is done by an epidural injection of the mother's blood which then seals the leaking membrane and results in nearly immediate relief in 80 percent of cases [20].

Back pain is a common side effect of labor and birth, with or without an epidural. When lower back pain occurs following regional analgesia, the epidural is often felt to be the causative factor. General tenderness at the site of the epidural injection may be present for several days; however, long-term back pain is present in similar numbers of women regardless of anesthesia method [16, 20, 22, 24–26].

Permanent injury to the spinal cord is extraordinarily rare, occurring in 1/500,000 to 1/1,000,000 women postepidural [20]. These rare cases are related to either epidural hemorrhage resulting from a coagulation disorder or from development of an infected spinal abscess. Evaluation of maternal medical history and current platelet counts prior to placing an epidural and use of sterile technique should decrease this risk [19].

In 0.01 percent of cases [19], systemic local anesthetic toxicity may occur from IV injection of the anesthetic. This may result in seizures, cardiac arrest, or death of the mother and/or fetus.

Total spinal anesthesia occurs in 0.03 percent of cases when the level of the anesthesia rises dangerously high, resulting in paralysis of the respiratory muscles including the diaphragm [19]. This is due to an unintentional spinal injection after an epidural placement or an excessive dose of medication for a spinal block. When this occurs, the woman will suffer anxiety, numbness of the hands and fingers, and dyspnea. Treatment is accomplished with assisted respiration until the block resolves.

Side effects of the spinal analgesia, apart from the epidural, are most commonly itching, nausea, and vomiting. Pruritis (skin itching) is the most common, occurring in varying degrees in 50 percent to 90 percent of patients. Diphenhydramine (Benadryl; 25 mg IV) can be of value, or in severe cases, naloxone (Narcan) can be administered [21]. Less common is urinary retention and respiratory depression.

An increase in the incidence of maternal fever (>100.4° F) has been demonstrated in women with epidurals [16, 22, 24, 27]. This has not, however, been associated with an increased incidence of infectious processes. Most likely, the cause of epidural-related fever is from thermoregulatory alterations [24, 28]. Unfortunately, during the course of labor it is not possible to distinguish fever of benign versus infectious origin. Therefore, an increased number of women receive intravenous antibiotics and more women have cesarean or instrumented vaginal deliveries with the potential risk of chorioamnionitis as an indication [24]. Infants of mothers with fever are more likely to be subjected to sepsis workups in the nursey.

Neonatal outcomes of fetal heart rate abnormalities, intrapartum meconium, poor 5-minute Apgar scores, and low umbilical artery pH have not been shown to be significantly different between women using epidurals and those using IV opioids

or no medications [16, 24]. A meta-analysis comparing intrathecal opioids with traditional epidurals identified an increase in fetal bradycardia within one hour of dosing. This effect was transient, and it was not associated with an increase in cesarean, or operative vaginal birth, or poor neonatal outcomes [21, 29]. Maternal fever was increased with epidurals as was the incidence of infant sepsis workups; however, the incidence of neonatal sepsis was not increased in the infants of mothers with epidurals [16, 22, 24, 28, 30]. Neurological studies of epidural-exposed infants, opioid-exposed infants, and nonmedicated infants did not find large differences in performance between any of these groups [24]. Breastfeeding initiation and continuation through 6 weeks postpartum were shown not to be influenced by the method of analgesia [16].

Outcomes of Labor. Throughout the years that epidurals have been in use, there has been concern as well as disagreement regarding the adverse effects of epidurals on the course and outcomes of labor and birth for both mother and fetus. Leighton and Halpern published a meta-analysis of epidural effects on labor, and maternal and neonatal outcomes that evaluated four studies including a total of 4324 women [16]. Lieberman and O'Donoghue reviewed the literature regarding use of epidurals with low-risk pregnant women and the unintended effects for the mother, fetus, and neonate [24]. Epidural analgesia side effects and co-interventions were reviewed by Mayberry et al. [22]. The findings of all of these studies demonstrate inconsistencies in the literature and difficulties encountered in attempting to identify specific outcomes of research with differing definitions of practice.

Length of labor and the effects of epidural anesthesia are very difficult to determine due to many confounding variables. In general, it is felt that epidurals can slow the rate of cervical dilatation in the first stage of labor [24, 31], especially if it is given during the latent phase of labor [31]. Some studies have shown no difference in the length of first stage of labor, [16, 22]. This may have been affected by the increased use of oxytocin after initiation of analgesia in the women with epidurals.

Conversely, some women have an accelerated course of labor following epidural analgesia [31]. This may be due to increased fundal dominance after epidural anesthesia [31]. In addition, it is not uncommon to see women relax with the relief of pain, to demonstrate a decreased sense of fear, and to progress rapidly to second stage and birth. All of these factors must be taken into consideration when counseling women regarding the use of epidurals. "Prolonged duration of labor is often quoted as an adverse maternal event; however, duration alone is of little significance if labor pain is adequately controlled and fetal/neonatal well-being is preserved" [25].

Use of epidurals early in labor relaxes the pelvic floor and may contribute to malpositions before the fetal head is flexed into a normal position for descent and rotation. Subsequently, the rates of oxytocin use and instrumented vaginal deliveries is increased [32]. The second stage has been shown to be significantly lengthened in epidural study groups [4, 16, 20, 22, 24, 27, 31]. The incidence of operative vaginal deliveries is consistently higher with epidurals [16, 22, 33, 34]. This is very important as both forceps and vacuum-assisted births are associated with major perineal lacerations and neonatal birth injury [24].

When epidural blocks are very dense in the pelvic floor region, the normal mechanisms of labor may be interfered with. When the fetal head descends and hits the pelvic floor, there is normally strong muscle tone that guides the fetal head into the path for birth. However, when the pelvic floor is very relaxed, the head may remain in a posterior presentation or may be compacted into the posterior pelvis, resulting in asynclitism. At the least, the length of second stage is extended while the mother is unaware of the normal stimulus to push and the fetus may not rotate and extend its head in the usual fashion.

Some practitioners have advocated cessation of epidural analgesia for the second stage to enable the woman to experience the urge to push and to be able to actively participate in expulsive efforts. For a few mothers, this is a successful approach, but for many, severe pain and anxiety ensue making this a traumatic event and often decreasing the woman's ability to cooperate in pushing. According to Chestnut, the length of the second stage as well as the incidence of malpresentation and of instrumented deliveries can be reduced with the use of a more dilute solution of local anesthetic in the second stage [31]. "Maintenance of total anesthesia likely prolongs the second stage of labor, and it may increase the incidence of instrumental vaginal delivery" [31, p. 423].

Whether epidurals influence the cesarean birth rate is controversial. Cesarean delivery rates were not different between the study groups with epidural use and those with parenteral opioids or

no medication [16, 24, 27, 31]. Most studies found no increase in the rate of cesarean births for an indication of nonreassuring fetal status [22]. Some authors feel that there is a clinically significant, if not statistical, increase in the incidence of cesarean deliveries for women with epidurals [22, 24, 27, 31]. This may be due to a predisposition to abnormal presentation and asynclitism, or it may be related to the fact that women with dysfunctional labors have increased length of labor and increased intensity of pain, therefore increasing their likelihood of electing regional analgesia.

Another factor that seems to contribute to increased cesarean rates is the arbitrary termination of the second stage. For women with regional analgesia, a 3-hour second stage can be considered normal if there is progressive descent of the presenting part [35]. If the fetal heart rate status is reassuring, and progress is continuing, there should be no arbitrary time to abandon vaginal birth for women with or without epidurals. Delaying the onset of pushing until the fetal head spontaneously descends has been suggested as a means of decreasing the cesarean rates with epidurals [36].

Medical risks are not the only consideration with epidural anesthesia [37]. Less measurable and often overlooked psychosocial side effects also must be considered. When a woman has an epidural, she is usually confined to bed. The aura of normalcy of the labor and birth process, strength and health of the woman, and the sense of a woman being in control of her body and its functioning are shifted to a "sick role" requiring specific medical attention. For the woman who is highly invested in an unmedicated birth but requires an epidural for pain management, there may be a strong sense of failure. Preparation prior to labor should help women to have realistic attitudes toward prepared childbirth, but this disappointment may occur in any event.

Having an epidural does indeed relieve a woman of a great deal of the discomfort of labor and birth. However, many women are unprepared for the lack of control they feel physically. Some women are disconcerted by the extreme lack of sensation and inability to move their lower extremities, the lack of bladder control, and need for attachment to multiple machines and electrical and IV leads.

Preparation of the Woman. All women requiring epidural analgesia/anesthesia will have intravenous fluids in order to ensure maternal hydration, manage hypotension, and administer medications such as ephedrine. Assessment of maternal vital signs will allow for determination of baseline blood pressure and pulse prior to initiating medications that can alter these. Fetal assessment with continuous electronic fetal monitoring allows reassurance of fetal well-being or identification of a fetus who may not tolerate an episode of maternal hypotension. Asking the woman to empty her bladder prior to the start of an epidural ensures at least an initial period when the maternal bladder will not overdistend or require catheterization.

The epidural catheter can be placed with the mother in either a side-lying position or sitting at the side of the bed. This will be determined by the anesthetist at the time of the procedure. In any case, the woman should be assisted with getting into the required position, and assisted with staying as still as possible in this position throughout the procedure. This is usually done by the L&D nurse but could also be done by the midwife. The woman should be informed about each step of the procedure as it is about to happen. Usually the nurse anesthetist or anesthesiologist will keep the woman informed, but this may become a nursing role.

Her back will be cleansed with an antibacterial solution and covered with a sterile drape, and a local anesthetic will be injected at the site of the lumbar vertebrae to be used. Once local anesthesia is in effect, the epidural needle will be guided slowly through the vertebrae and into the epidural space. After ensuring the correct needle placement, the anesthetist will thread the epidural catheter into place, remove the needle, and secure the catheter to the mother's back. At that time, the mother will be assisted to lie in a semi-Fowler's position with the uterus laterally displaced with a towel roll or pillow under one hip. A test dose will be given followed by the full dosage of local anesthesia. Performance of frequent blood pressures is critical at this time and for the duration of the use of the epidural. Initially, blood pressures are taken every 5 minutes, then every 15 minutes until the epidural is discontinued.

Particular attention should also be paid to the fetal response to the epidural immediately and over the 30 minutes following a dose of medication. Local anesthetics cause a relaxation of maternal musculature, including the vascular walls. This will result in lowering maternal blood pressure. Even when the maternal blood pressure remains within normal range, blood flow to the uterus and therefore placenta and fetus will be diminished at least transiently. This commonly results in a drop of the fetal heart rate 10 to 20 minutes after the local anesthetic is given. The usual fetal heart rate pat-

tern is variable deceleration (can be to the 80 bpm rate) for 1 to 3 minutes. Most of the time this is quickly resolved with an increase in maternal IV fluids, and turning the mother to her side. In rare cases, ephedrine is required to elevate maternal blood pressure and restore blood flow to the fetus.

Informed Consent. Pain relief during labor is ideally discussed during prenatal care [30, 38, 39]. True informed consent is difficult to obtain by a woman in the throes of active labor or transition, or under the influence of intravenous narcotics. Women should be informed of the range of risks as well as benefits associated with epidural administration [39]. All midwives, regardless of their site of births, should have a firm knowledge of this frequently requested technology. Information can be shared verbally during pregnancy, and, ideally, a woman would be given written information regarding risks and benefits of all methods of pain relief including epidurals. A survey of women who used epidural analgesia in labor revealed very poor recall of the risks of epidural [38]. Participation in prenatal classes demonstrated an improvement of recall of risks, supporting the concept that the prenatal period is the most advantageous time to give women information regarding risks and benefits of pain relief methods. Documentation of this discussion is advised [38].

During the course of prenatal care, the midwife will explore with each woman what her anticipated choices for pain relief will be in labor. As in all other areas of childbirth, women should understand the full implications of their choices. This includes that having an epidural requires the use of other medical technology: IV fluids, frequent vital sign monitoring, usually with a blood pressure cuff and pulse oximeter attached for the duration of labor and birth, and continuous electronic fetal heart rate monitoring.

It is important for women and midwives to understand that there will be a time delay between request for epidural analgesia and actual relief of pain. At least 30 minutes must be allowed to pass for the nurse anesthetist or anesthesiologist to come to the labor and delivery unit, to review the medical record and assess the woman, and to prepare equipment, scrub, position the woman, prepare a sterile field, and place the needle and catheter, and then another 10 minutes must be allowed for the local anesthetic to work effectively. The woman should also be aware that if she has a rapid or precipitous labor, an epidural may not be indicated or possible.

Midwifery Management. When midwives use epidurals as a part of their management of labor and birth, there are a variety of logistical issues to consider. These include the availability of anesthesia personnel with the expertise to perform epidurals. In some hospitals, the consulting obstetrician is required to be "in house." Clinical practice guidelines that are agreed upon by the midwife and the consulting physician should address use of epidurals, indications for their use, and what special circumstances require additional assistance, if any.

When to initiate epidural analgesia is a common dilemma for the midwife. It has long been felt that epidurals given during the latent phase of labor were more highly associated with prolonged labor, need for oxytocin administration, and higher rates of operative births. Therefore, withholding epidurals until active labor is well established—at least 4 centimeters dilated and progressing—has become a more common practice. Use of relaxation, breathing and distraction techniques, water, and a birthing ball during this period is the most accepted approach for most women. Narcotic pain relief may also provide the relaxation needed to decrease the pain and fear cycle the mother is experiencing. The most important consideration is individualization of care. For some, latent phase labor is very painful, stressful, and exhausting. In this case, early epidural followed by rest may be the best approach. For those women who have decided prenatally to have an epidural but who are coping well through progressive labor, supportive methods and encouragement may be the best approach.

Supportive care during labor is a hallmark of midwifery care. For women who give birth without epidural anesthesia, the supportive techniques and attitude of midwifery care cannot be too highly valued. But for those women who elect epidural anesthesia for their labor and birth experience, midwifery management has the same strong role. Attention to the personal needs of a woman and her family and focus on the woman and the birth remains the central point of care. Too often, technology is allowed to take center stage. Women are strapped into stirrups, draped as if they were having major surgery, and attached to automatic blood pressure monitors, pulse oximeters, continuous electronic fetal monitors, IV fluids, and sometimes pitocin pumps and even cardiac monitors. How easy it is to lose sight of the birth of a child and a family. The midwife's role in de-emphasizing the technology and centering the focus of the birth environment on the mother cannot be understated.

Klein et al. found that practitioners who use fewer epidurals for their patients also are more likely to spend more time with women in labor and to use intermittent fetal monitoring than those practitioners who used epidurals for a higher percentage of women they cared for in labor. When using epidurals, the practitioners with the lowest use started epidurals at a more advanced cervical dilatation, had shorter labors, fewer forceps and cesarean births, and fewer admissions to newborn special care units [32].

While the mechanics of technology may be required when epidurals are used, it is not necessary to routinely use stirrups for birth. A semi-Fowler's position with the mother grasping her knees or supported by her partner works very well. Draping is only necessary under the buttocks for the purpose of maintaining a clean field for the birth. A quiet, low-light environment can easily be created where the woman and the newborn are the focal point with the technology in the shadows.

The midwife must set this tone with the nursing staff, anesthesia personnel, and other medical providers as well as with the woman and her family. Speaking in a low voice, dimming bright lights, and turning off the blaring television can all assist in setting the mood for birth. When the women you are serving have not sought out midwifery care and have not participated in shaping their own birth environment, the midwife has a special opportunity to make each birth experience one that shows respect for human birth, even in the midst of a highly medicalized system.

Continuing Evaluation of Maternal and Fetal Well-Being

Continuing evaluation of maternal and fetal well-being includes monitoring the following:

Maternal

1. Vital signs
   a. blood pressure
   b. temperature
   c. pulse
   d. respirations
2. Bladder distention
3. Urine
   a. protein
   b. ketones
4. Hydration
   a. fluids
   b. nausea/vomiting
5. General condition
   a. fatigue and physical depletion
   b. behavior and response to labor
   c. pain and coping ability

Fetal

1. Normality of the fetal lie, presentation, attitude, position, and variety
2. Fetal adaptation to the pelvis
3. The fetal heart rate and pattern

An inherent part of this continuing evaluation is determination of your need to consult a physician in the event your evaluation reveals deviation from normal. The need for consultation with a physician is determined by the midwife while evaluating the normality of the woman, fetus, and progress of labor; screening for medical and obstetrical abnormality; and anticipating possible potential problems. The parameters of normal were covered earlier in this chapter. Screening for and disposition of complications, including when to consult with the physician, are covered in Chapters 29 and 30.

Maternal Well-Being *Vital Signs.* The parameters of normal and their significance for all the maternal vital signs were detailed earlier in this chapter in the discussion of the database for the first stage of labor (Table 26-6). All of the vital signs are checked every time the woman is seen for diagnosis of labor and again during the initial evaluation when she is in labor. Thereafter, the frequency with which vital signs are checked may vary with the setting. Hospitals and birth centers usually have a policy regarding the frequency with which vital signs should be checked to ensure adherence to a minimum standard. Any desired or indicated frequency greater or lesser than that stated by policy requires a specific order in the hospital. The following schedule for checking vital signs reflects generally accepted norms of frequency for a normal woman during the active phase of the first stage of labor, regardless of setting:

1. Blood pressure: every hour
2. Temperature, pulse, and respirations:
   a. every 2 hours (or every 4 hours) when the temperature is normal and the membranes are intact
   b. every hour (or every 2 hours) after the membranes have ruptured

Bladder. The woman's bladder should be evaluated for distention at least every 2 hours during the ac-

tive phase of the first stage of labor. The bladder needs this attention because it is a pelvic organ. With the descent of the fetal presenting part into the true pelvis, the bladder is compressed so that distention occurs with only approximately 100 cc of urine in the bladder. If the bladder is not carefully attended to and emptied, but instead allowed to become more distended, the following may result:

1. Obstructed labor: An overdistended bladder can impede the progress of labor by preventing fetal descent.
2. Discomfort: A distended bladder increases the discomfort or pain in the lower abdomen that women frequently experience during labor.
3. Difficulty in management of shoulder dystocia: An overdistended bladder interferes with descent of the shoulders and decreases the amount of room in the true pelvis.
4. Difficulty in management of an immediate postpartal hemorrhage resulting from uterine atony: An overdistended bladder displaces the postpartal uterus, thereby inhibiting its ability to contract and effect uterine hemostasis.
5. Bladder hypotonicity, urine stasis, and infection during the postpartal period: This can result from trauma from pressure exerted on the distended bladder during labor

Routine assessment of the bladder is done every 2 hours to be sure distention does not go undetected. However, every time the woman's abdomen is bared for abdominal examination or to take the fetal heart tones, the contour of her abdomen should be noted for bladder distention. A distended bladder appears as a bulge above the symphysis pubis and, in severe cases, may extend as high as the umbilicus. When the fetus is in a posterior position the contour of the woman's abdomen may look as though she has a full bladder; distention must then be ruled out.

In the event of bladder distention all measures must be taken to facilitate the woman's efforts to urinate. The best method is for her to walk to the toilet if there are no contraindications to her ambulating. If she is unable to be out of bed and if the usual methods (having her listen to the sound of running water; running warm water over her perineum; applying light suprapubic pressure; and having her practice perineal relaxation) do not cause her to urinate, then the midwife must decide for or against catheterization. This decision is based on weighing the risk of infection from catheterization against the risk of postpartal infection plus the other possible problems and sequelae if the woman is not catheterized. This latter risk is evaluated on the basis of the severity of the distention, the woman's labor status, and her progress in labor.

Urine. In addition to the initial specimen collected at the time of admission for routine microscopic examination, the urine should be examined by dipstick for protein and ketones when a woman urinates during labor.

The results of examination of the urine for protein should be evaluated in relation to the type of urine specimen it was and the contaminants it might have in it. This is important because the urine is examined for protein as a routine screening for one of the signs of preeclampsia. If there is protein in the specimen, it is vital to know whether the woman is evidencing proteinuria. If the specimen was a voided specimen and the woman has a copious amount of bloody show, the specimen will be contaminated with blood. The results are thereby rendered worthless because the positive protein results may be due to the contamination by blood protein. If, however, the specimen was obtained during catheterization, the results may be considered valid. The results from carefully collected clean-catch specimens under favorable conditions (i.e., without contamination from vaginal discharges) may also be considered valid.

The urine is examined for ketones to screen the woman for maternal exhaustion and distress inclusive of dehydration, electrolyte imbalance, and nutritional deficiency during labor. Since most of the other signs and symptoms of maternal exhaustion and distress are difficult to differentiate from normal physiological changes and physical manifestations during labor, the presence or absence of ketonuria is essential for establishing a differential diagnosis and instituting corrective treatment (see Chapter 29). It is most important to use dipstick testing of the urine for ketones to evaluate the laboring woman for the adequacy of her oral intake of liquids for maintenance of hydration. Good oral fluid intake is not usually possible in prolonged labor or when there has been uterine inertia. Ketonuria would indicate the need for an IV.

Hydration (see also pp. 761–762). The maintenance of hydration throughout labor is essential for the woman's well-being. The time span of labor does not lend itself to evaluation of hydration on the basis of such signs as skin turgor. On the other hand, signs of dehydration such as dry or cracked lips, a dry mouth, or a parched throat may not be

due to dehydration at all in a woman in labor but may instead be due to the type of breathing she is doing with her contractions. Evaluation thus is based on screening for ketonuria and on a knowledge of the woman's fluid intake (by whatever route) and loss. Concentration of the urine should also be noted.

Not only the woman's fluid intake but also any loss of fluids affects the maintenance of hydration. Excessive nausea or vomiting in a woman without an IV will decrease her desire for fluids and her ability to take fluids by mouth. Excessive vomiting in a woman with an IV must be counterbalanced by an increase in her IV fluids. Although you need not keep a strict intake and output record on a normal laboring woman, her labor record should reflect her fluid intake, urinary output, and the amount of any emesis.

General Condition. Evaluation of the well-being of the woman necessarily includes evaluation of several areas that interrelate and overlap: her state of fatigue and physical depletion, her behavior and responses to labor, and her perception of pain and ability to cope with labor.

Her state of fatigue and physical depletion is affected by her state of fatigue on entering labor, maintenance of hydration during labor, length of labor, and her ability to cope with the demands placed upon her by her condition and situation. These may be part of a vicious cycle: a lack of ability to cope may increase fatigue and fatigue may decrease her ability to cope; or the longer the labor, the greater the fatigue, but fatigue may also cause labor to be longer. Occasionally a woman enters labor truly exhausted and dehydrated from days of the general miseries of the end of pregnancy or from false labor. A management plan for such a woman should include helping her rest during early labor with 100 mg of secobarbital (Seconal) intramuscularly while hydrating her with intravenous fluids.

A woman's behavior normally changes throughout labor, as described earlier in this chapter. These changes can be used in evaluating her response to labor. Her behavior is also affected by her degree of self-confidence, her anxiety and fear, and the amount of pain she is experiencing. In another cycle of interplay, these in turn affect her coping ability, and her ability to cope affects her self-confidence, anxieties, and fears. Intervention during labor is most effective with women who have been prepared for childbearing during pregnancy. With or without this preparation, evaluation of behavior during labor will aid in determining a number of the support and comfort measures needed, including the need for medication.

Fetal Well-Being Evaluation of the fetal lie, presentation, attitude, position, and variety is done first by abdominal palpation (see "Abdominal Palpation and Leopold's Maneuvers" in Chapter 53) and confirmed by vaginal examination as discussed in detail earlier in this chapter. The first part of this chapter also discussed the information needed to evaluate fetal adaptation to the pelvis: synclitism/asynclitism, molding of the fetal skull, the formation of caput succedaneum, and the parameters of normal for each.

All the information on fetal well-being is obtained whenever the woman is evaluated for diagnosis of labor, during the initial evaluation when she is in labor, and any other time a vaginal examination is done during labor, whether for purposes of updating this information or to evaluate the progress of labor by cervical change and fetal descent.

One of the management decisions a midwife makes is to determine the frequency with which the fetal heart tones are to be checked and how this will be done. The frequency is standard regardless of setting; the how will vary by setting, as no homes and very few birth centers have electronic fetal monitors. In the hospital the possible methods include intermittent auscultation of the fetal heart; intermittent external fetal monitoring; continuous external fetal monitoring; and continuous internal fetal monitoring. This management decision should be based on indicated need. If the woman is healthy and has had an uncomplicated pregnancy, there is no need for electronic fetal monitoring.

The fetal heart rate and pattern should be evaluated using auscultation with a fetoscope or an ultrasonic method (e.g., Doptone) every 30 minutes during active labor. In addition, the fetal heart is checked at other times during the course of a normal labor:

1. When the membranes rupture
2. After expulsion of an enema
3. Whenever there is any sudden change in the contraction or labor pattern
4. After giving the woman medication and again at its peak action time
5. Whenever there is any indication that an obstetric or medical complication is developing

The methods of assessing the fetal heart rate and pattern, and the parameters of normal for the baseline fetal heart rate, irregularity, and periodic fetal heart rate changes are discussed in Chapter 27. See also "Location of Fetal Heart Tones" in Chapter 53.

Continuing Evaluation and Facilitation of the Progress of Labor

Information on the following items is used in the continuing evaluation of the progress of labor:

1. Effacement
2. Dilatation
3. Station
4. Contraction pattern
   a. frequency
   b. duration
   c. intensity
5. Maternal behavior changes
6. Signs and symptoms of transition and impending second stage
7. Position of low back pain
8. Position of location of maximum intensity of fetal heart tones

All eight of the above items were discussed and their parameters of normal for the phases of the first stage of labor were given earlier in this chapter. The findings obtained from examination and/or observation of these eight items are evaluated in relation to information obtained from the woman when she was initially evaluated for labor:

Age
Gravida and para
Time of onset of true labor
Length of previous labor
Number of years since last baby
Size of largest previous baby
EDB and present week of gestation

and in relation to the following information obtained in continuing evaluation of the fetus:

Estimated fetal weight
Presentation, position, and variety
Synclitism/asynclitism
Molding
Caput succedaneum

and in relation to the following information obtained in continuing evaluation of the woman:

Bladder status
General condition including her state of hydration, fatigue, and physical depletion

and, finally, in relation to whether the woman has had any medication, and if so, what, how much, by what route, and when.

Management decisions relating to the continuing evaluation of progress in the first stage of labor include the following:

1. The frequency of vaginal examinations
2. Whether to artificially rupture the membranes
3. Management of an anterior cervical lip
4. When to prepare for birth
5. Whether the need to consult with the physician is inherent in your evaluation and interpretation of findings

Frequency of Vaginal Examinations The frequency with which vaginal examinations are done depends on the woman's condition and on the midwife's ability to use other parameters for evaluating progress in labor. It is not always necessary to do a vaginal examination in order to evaluate the progress of labor. The practice of vaginal examinations every 1 to 2 hours only subjects the woman to unnecessary discomfort, intrusion, and increased risk of infection. Astute observation of the woman (possible only if the observer stays in the room)—her behavior, contraction pattern, the signs and symptoms of transition, and changing location of back pain and fetal heart tones—should give the midwife a good idea of whether the woman's labor is progressive. This does not negate performance of a vaginal examination either if there is a question of progress or if you are not sure of your observations and interpretation of them.

For the normal intrapartal woman there are five times when a vaginal examination is indicated:

1. On admission, to establish an informational baseline
2. Before deciding on the kind, amount, and route of any medication
3. To verify complete dilatation in order to either encourage or discourage maternal pushing effort
4. After spontaneous rupture of the membranes if a prolapsed cord is suspected or is a possibility
5. To check for a prolapsed cord when fetal heart rate decelerations are not improved with the usual maneuvers

Other than these five times, vaginal examinations serve no function in normally progressive labor other than to reassure the insecure clinician.

If the membranes have ruptured prematurely, no vaginal examinations should be done except by permission of the person responsible for the obstetric management of the woman. This person may be you—and it is up to you to both restrict vaginal examinations and determine when one may be done. The restriction on vaginal examinations is imposed because of the increased risk of introducing contaminants and the development of intrauterine infection without the protective barrier of the membranes (see Chapter 29). If you determine that a vaginal examination is to be done for carefully considered, unavoidable, and urgent reasons (e.g., to check for a prolapsed cord), then it should be a sterile vaginal examination. A sterile vaginal examination involves cleaning the perineum (quickly) and using sterile examination gloves.

Artificial Rupture of the Membranes (see also Chapter 25, page 728) Whether to artificially rupture the membranes (perform an amniotomy) depends on the indications for amniotomy as weighed against possible undesirable effects and potential hazards of the procedure if conditions do not meet certain criteria. Indications for artificial rupture of the membranes include the following:

1. To attach an internal fetal monitor electrode
2. Baby about to be born with the membranes intact at the time of birth
3. Need to stimulate labor—for example, in hypotonic uterine dysfunction
4. To facilitate fetal descent and reduce the possibility that the force of the pushing contractions will lead to sudden and vigorous rupture of the membranes that will cause the cord to prolapse

Possible undesirable effects of artificial rupture of the membranes include the following:

1. Cord compression
2. Uneven head compression with more extensive molding and caput succedaneum may increase the risk of intravascular hemorrhage, especially if membranes are ruptured early in labor

Potential hazards include the following:

1. Potential prolapse of the umbilical cord if membranes are ruptured with the fetal head unengaged or with a compound presentation, an ill-fitting breech presentation, or a small baby (less than 2000 grams)
2. Potential intrauterine infection if the membranes are ruptured before labor is established and rupture of the membranes is prolonged

Because of the potential hazards of amniotomy, midwives artificially rupture the membranes only if the following criteria are met:

1. The woman is in active labor with a well-established contraction pattern and cervix dilated 4 to 5 centimeters.
2. The baby has a cephalic vertex presentation with the head engaged.

Consultation with the physician is indicated if the midwife decides that the membranes need to be needled to facilitate descent of a floating fetal head. Artificial rupture of the membranes (AROM) in this situation is done either by the physician or by a highly experienced and skilled midwife who has extended her or his boundary of safety to include this. AROM in these circumstances is done between contractions to avoid a sudden rupture with a gush of fluid that might result if the membranes were torn by the force of a contraction. Such a sudden rupture may bring a prolapsed cord with the gush of fluid.

In the past it was not uncommon management of a normal labor to rupture the membranes at 4 to 5 centimeters of dilatation, in order to "speed up labor" for no reason other than to shorten the whole process for the mother and the attendants. Now that possible undesirable effects on the fetus from early rupture of the membranes have been identified, most midwives will not perform an amniotomy on a normal woman until late in labor, and then only if there is an indication (even if criteria are met much earlier in labor).

In performing an amniotomy the midwife should observe the following principles:

1. Do the amniotomy between contractions so that
   a. the force behind the rupture is reduced
   b. the membranes are not stretched tightly against the fetal head (which leaves too little room in which to safely grasp the membranes in order to tear them)
2. Use an instrument that will be effective quickly and easily, such as an Allis clamp or various hooks manufactured for this purpose. An instrument that simply glides and slips along the membranes frustrates the clinician and prolongs the discomfort of a vaginal examination for the woman.
3. After rupturing the membranes, leave your fingers in the vagina through the next contraction in order to

   a. evaluate the effect of the amniotomy on the cervix (dilatation) and on the fetus (descent and rotation)
   b. assure that there was no prolapse of the umbilical cord
4. Have the fetal heart tones evaluated during and after artificial rupture of the membranes to assess the immediate effect of the amniotomy on the well-being of the fetus.

Management of an Anterior Cervical Lip Sometimes progress at the end of the first stage of labor is impeded by the development of an anterior lip of cervix. In other words, the cervix may be completely dilated with the exception of this anterior lip, which may become increasingly edematous. Occasionally, an anterior lip of cervix starts developing earlier in the first stage of labor and may be felt when cervical dilatation is only 6 centimeters. If the cervical lip becomes extremely edematous it is a matter of concern not only because it impedes the progress of labor but also because there is greater potential for damage to the cervix as it is caught between the fetal head and the symphysis pubis. In extreme cases the cervical lip can become separated from the cervix, if the condition is ignored.

An edematous anterior cervical lip rarely develops early in labor. Watchful waiting and noninterference are usually sufficient until dilatation reaches the point where the anterior lip is all that remains and it can be managed as described below. If the anterior cervical lip becomes so edematous before the end of dilatation that the condition is of serious concern and further waiting is questionable practice, the edema can be reduced by positioning the woman for a speculum examination, visualizing the cervix, and puncturing the edematous lip of the cervix multiple times and places with a needle [40].

Management of an anterior lip when dilatation is otherwise complete or nearly complete is as follows:

1. Do a vaginal examination and place your fingers on the anterior lip where it touches the fetal head.
2. During a contraction, run your fingers back and forth the distance of the junction of the anterior cervical lip with the fetal head and push the cervical lip backwards until it slips over the fetal head and above the inferior border of the symphysis pubis.
3. Hold the cervical lip in this position while waiting for the next contraction.
4. Continue to hold it in position and ask the woman to push down during the next contraction.
5. Allow your fingers, but not the cervix, to be pushed downwards and out as the fetal head fills the space and presses against the inferior border of the symphysis pubis.
6. Do not remove your fingers from the vagina until you are sure that the cervical lip will remain in its new position both during and between contractions.

The second stage of labor has now begun. You will need to examine the cervix for lacerations after delivery of the placenta.

Preparation for Birth Preparation for birth varies considerably from setting to setting. In the home the woman may have prepared a special place where she wants to give birth. At home or in a birth center, women may give birth in a regular bed in a variety of possible positions or on a birthing stool, or squatting, or standing. Many hospitals have instituted birth rooms, in-hospital alternative birth centers, or combination labor/delivery/recovery (LDR) or labor/delivery/recovery/postpartum (LDRP) rooms. One outcome of this development is that women do not have to move from bed to table at the critical moment of giving birth. Since there often is now an option, the midwife in the hospital must make a management decision as to whether to move the woman to the delivery room. This decision, however, may be predetermined by a hospital policy that specifies who can give birth in a birth room and who must be delivered in the delivery room. These criteria are generally designed to take into account any developing or potential complications (e.g., meconium stained fluid, anticipated shoulder dystocia) or procedures that may need to be done (e.g., forceps delivery, newborn resuscitation). Some in-hospital birth rooms are designed so some procedures can take place in the birth room.

Regardless of where birth takes place, a number of preparations for the birth must be properly timed or the midwife will not be ready. In all settings this involves getting out whatever instruments and supplies the midwife uses and making sure they are ready and accessible. (At a minimum a midwife uses sterile gloves, a bulb syringe, two clamps, a pair of scissors, a cord clamp or tie, something to catch the placenta in, a type of chux, 4×4 gauze squares, a receiving blanket, and a head cover for the baby.) Experience in refining observations and a

sixth sense are required in order to achieve proper timing. However, there are a few cardinal generalities that are valid enough of the time to be useful in timing preparation for birth in any setting.

1. Primigravidas: Preparations for birth should begin after complete dilatation, and, depending on the amount of descent, after some time of pushing or until the time-honored maxim of fifty cents—the size of a half-dollar—indicates the amount of fetal head visible at the vaginal introitus *between* contractions.
2. Multiparas: Preparations for birth should begin before complete dilatation, at approximately 8 centimeters during transition. If you wait longer you are inviting an uncontrolled delivery of the baby before you have finished preparations for the birth.
3. Progress of labor must be taken into account in making the decision of when to begin preparations. A rapidly progressive labor or a more desultory type of labor invalidates the above two statements and the timing of preparing for birth should be adjusted accordingly. The rapidity of second stage labor is also affected by the degree of relaxation, stretch, and give in the woman's vagina and perineum as well as by her parity.

Preparations for birth get more complex in the hospital, especially if the woman has to be moved to the delivery room. There are hospitals that still require that women be moved to the delivery room for birth. Deciding exactly when is the best time to do so is a refined art.

Ideally the woman should be moved in an unrushed fashion. She should have time to move from her bed to the delivery room table between contractions. Preparations (getting legs into stirrups or being positioned for dorsal delivery, perineal cleansing, draping) should be done at a steady, quiet, nonfrantic pace; there should be time for procedures that have been selected as part of the management plan (e.g., pudendal block). Birth should immediately follow completion of all preparations, thereby keeping at a minimum the amount of time the woman's legs are in stirrups. Again, ideally all this should be accomplished without having to tell the woman to pant in order to prevent her from pushing and having the baby before all is ready. What you want to avoid is a wild scene of a mad dash to the delivery room with personnel rushing around and yelling at the woman not to push while they don gloves and frantically pour some solution over her perineum so the delivery can be called "sterile."

Whatever the setting, if you find that you have mistimed your preparations, it is far better to stop everything, put on gloves, and calmly assist the mother in the birth of her baby. Equipment and supplies can be obtained by others as needed. It is up to the midwife to direct everyone else in the situation in what to do to be helpful to the mother, to you, and to the baby when born.

Bodily and Supportive Care of the Mother and Her Significant Other/Family/Friends

Purpose of Supportive Care One of the hallmarks of a midwife is the constant care she or he gives the woman throughout labor. This does not mean remote control management of the woman but, rather, being an active and participating presence in the room both to manage the care of the woman obstetrically and to provide or facilitate the provision of indicated supportive care. Women's horror stories of being left alone in fear and in pain without knowing what was going on, with only an hourly check of the blood pressure and fetal heart tone and a "mashing" of her abdomen for comfort and company, are anathema to the midwife. This sort of trauma experienced by a woman in labor may have a negative psychological effect on her for the rest of her life and on her relationship with the child, whom she may see as the cause of her trauma.

In order to provide supportive care one must know how to do so. Otherwise the caretaker becomes frustrated by not knowing how to help the woman and uncomfortable with the woman's suffering and ultimately removes herself or himself from the situation by leaving the room. From this scenario come the horror stories and the trauma experienced by women. Supportive care during labor miraculously changes this entire scenario. The dramatic effects relate not only to the woman's psyche but also to the physiological effects on the fetus, who benefits from less medication and a naturally shorter labor. As mentioned earlier, effective supportive care is worth 100 to 200 milligrams of Demerol—it can shorten labor by 2 to 3 hours and provides uncountable psychological benefits.

Lesser and Keane [41] identified five needs of a woman in labor:

1. Bodily or physical care
2. Sustaining human presence
3. Relief from pain
4. Acceptance of attitudes and behavior
5. Information and reassurance of a safe outcome for herself and her baby

The following discussion of support and comfort measures includes specific actions for meeting these five needs. By implementing these you become at least one sustaining human presence for the woman. The basis for deciding which support and comfort measures to implement, and when and where, is your observations of the woman, the agreement between you as to what might be helpful, and her description of the location of her discomfort or pain. Inherent throughout is the acceptance of the woman's attitudes and behavior and the belief that whatever she is doing is the best she is capable of at that moment. Supportive care requires patience and understanding on your part and perseverance in your efforts to help her. She desperately needs positive input—not negative reactions—in order to continue coping with her condition and situation and to have a sense of satisfaction afterward.

The support and comfort measures that emphasize explanations and teaching—meeting the woman's need for information—are means of breaking the fear-tension-pain syndrome described by Dick-Read [42]. This vicious cycle occurs when fear causes both mental and muscular tension, which in turn causes pain, which in turn increases fear, and so forth. Dick-Read advocated breaking this cycle with education to reduce fear, combined with exercises geared toward further facilitating muscular relaxation. Subsequent natural psychoprophylactic methods of childbearing vary in the emphasis they place on preparatory muscular and breathing exercises, but all educate the woman about the processes occurring within her body and means of coping with them, thereby reducing fear.

The support and comfort measures described in detail in the next section are the "what-to-dos." Of equal importance is determining *how* to do the what-to-dos in terms of purpose, approach, implementation, and expectations of results. Five "how-to-do" considerations are important:

1. The support and comfort measures that are listed constitute an armamentarium from which to choose. Not all women need all of these measures. Some women will not respond to any of them. Some women will find some measures helpful and others irritating—and which are considered helpful and which irritating will vary from woman to woman. You can but try each that may be indicated and seek validation from the woman as to its helpfulness. Ask—do not go strictly on the woman's behavior, especially if she is nonresponsive, as you can misinterpret her behavior. Ask her if a certain measure is helping or not and if she wants you to continue it. Use your knowledge of labor processes, combine this with the woman's need-for-help, learn from each experience with a laboring woman, and think up support and comfort measures other than those listed here. Do not be limited by books and articles; use your intelligence, ingenuity, and compassion.
2. Define your purpose—that is, what you are trying to accomplish with your support and comfort measures and care of a woman. One such statement of purpose would be to facilitate the efforts of the woman to cope effectively with, and function capably in response to, the demands being placed on her by her condition and situation.
3. How you talk with a woman in labor may determine your effectiveness. It does no good to give her instructions or coach her with her breathing if she can't hear you. The advent of a contraction causes the woman to direct her total mental concentration toward her response to that contraction. For the unprepared woman in particular the response may be fear and bodily tension and pain. You will need to break through this mind set. To do so requires your speaking with a degree of authority and firmness with enough vocal timbre and projection to be heard. Whispering, unless it is directly into her ear (which most women find irritating), is useless. Soft-spoken instructions from a distance (i.e., across the room, from the foot of the bed) are also a waste of breath. This does not mean, however, that you should shout or yell at the woman. This is equally useless—it only heightens the woman's sense of aloneness and pain and is not helpful. Shouting at a woman in labor is intolerable.
4. The key to success in supportive care is your own involvement. Involvement means facilitating others in their support as well as doing things yourself. There will be times when you are as exhausted, or more so, than the woman after the birth because you will have breathed, rubbed, and pushed with her throughout her labor in addition to carrying out all your other responsibilities. Supportive care demands your presence if you are the one giving it. You cannot simply make an hourly visit and then conduct supportive care from afar with a string of orders. This does not mean, however, that you are the only one capable of giving supportive care. Far from it. Use others—nursing staff and significant others (Figure 26-13). Involve them so that each feels the importance of his or her contribution to the care of the woman through childbirth.

FIGURE 26-13 Partner providing OB back rub (fetus in a posterior position) while the midwife listens to the fetal heart tones.

Source: Photo courtesy of the North Shore Birth Center, Beverly, Massachusetts.

5. Be realistic in your expectations of what you can accomplish with your support and comfort measures. It is unrealistic to think you can take away all the woman's discomfort and pain and make her fully capable and blissfully happy throughout her labor. Although it is true that some women, especially prepared women, cope effectively with their labor, are well in control of themselves and measures that relieve their discomfort, and respond with relief and gratitude to everything you do, there are other women, usually unprepared, who scream, thrash, and writhe their way painfully and miserably through labor and seem to get no relief from anything you do. Don't feel you have failed. If you talk with such a woman about her experience the next day she probably will tell you that your perseverance and your sustaining human presence meant everything to her.

Allow for individual attitudes and behavior. In some cultures women are supposed to scream during labor in order to atone for their sins. The more screaming there is, and the louder and longer the screaming, the more sins are atoned for. Other women try to be stoics when what they really need is to be encouraged to yell at the peak of hard contractions. Each woman comes into labor with her own expectations, fears, preparation, pain threshold, personality and behavioral makeup, and way of experiencing what is happening to her. You must adapt to her—not expect her to adapt to you—and quickly learn her individuality in order to facilitate her coping efforts as you manage her care for a safe outcome for herself and her baby.

Support and Comfort Measures *Positioning.* A woman should assume whatever position brings her some comfort. This position may change, sometimes frequently, and may be in bed or out-of-bed, standing, walking, sitting, on or over a birthing ball, rocking, squatting, kneeling, hands and knees, knee-chest, or in the supine or lateral (left or right) positions (see pages xxx–xxx). Positioning in bed involves placing pillows, rolled blankets or towels, or a combination of these in strategic spots to promote relaxation, reduce muscle tension, and eliminate pressure points. This can be done in any position the woman assumes.

At a minimum a laboring woman needs a pillow under her head. If there are no pillows, make one by stuffing two full sheets or two blankets into a pillow case. This pillow is more comfortable if the sheets or blankets are shaken out first rather than placed folded inside the pillow case. It takes only a few more seconds to do and the results are worth it.

To promote generalized relaxation, encourage the woman to assume a side or elevated supine position if in bed. Figures 22-3 and 26-14 illustrate the position of the pillows and rolled blankets and towels for those two positions.

Relaxation Exercises. There are three relaxation exercises that may help the woman in labor.

FIGURE 26-14 Midwife supporting woman in labor in elevated supine position.

1. *Progressive relaxation:* This type of relaxation should be practiced during the antepartal period so that a woman can quickly will herself to relax her muscles and, if needed, to catch catnaps between contractions. The exercise involves deliberately tightening a single muscle group (e.g., hand, arm, leg, face) as tight as possible and then letting it go as limp as possible. Muscles are tightened sequentially and progressively from one end of the body to the other. The exercise promotes total body relaxation and rest or sleep.
2. *Controlled relaxation:* This type of relaxation also should be practiced during the antepartal period so that the woman can make effective use of it during labor. The exercise involves having one muscle group contracted while keeping other muscle groups relaxed. This is akin to labor, in which the uterus is tightly contracted and it is desirable *not* to tense other muscle groups in response. The woman practices the exercise by tightening one muscle group while relaxing its counterpart. For example, in order of increasing difficulty:
   - Right arm tightened, left arm relaxed (and vice versa)
   - Left leg tightened, right leg relaxed (and vice versa)
   - Right arm and right leg tightened, left arm and left leg relaxed (and vice versa)
   - Left arm and right leg tightened, right arm and left leg relaxed (and vice versa)
3. *Deep breath and sigh after each contraction:* This relaxation can be taught when a woman is in active labor if she doesn't already know it. It consists simply of the woman's taking a deep breath and letting it all out in "a big heavy sigh" after the contraction is over. This serves a double function. It not only promotes relaxation but also acts as a cleansing breath to counteract any possible hyperventilation during the contraction or to break a pattern of rapid breathing at this time. Relaxation is further promoted if you give the woman a mental image of how you want her to look and feel after her sigh. For example: "Let yourself sink into the bed and go loose like a rag doll" (or a wet dishrag or a limp noodle).

Breathing Exercises. If you have not taught breathing exercises to the woman you are working with during labor, you must be knowledgeable about and able to adapt and facilitate her efforts in whatever breathing methodology she has learned and practiced and believes in. During labor is no time to teach her your way of doing it or even to hint that her way is anything but the best. For her, her way *is* the best. If you are unfamiliar with her technique, ask her to teach you how you can best help her.

If a woman enters active labor with no preparation in childbearing and no practice in breathing exercises, you are limited in what you will be able to teach her. If she is in active labor already, you probably will not be able to teach her the Lamaze breathing techniques and the Lamaze philosophy of active "working with" participation and concentration; this method requires training and practice. You might be able to teach her a basic pant-pant-blow rhythm, which she can do faster or slower as you direct her. This gives her something to concentrate on other than the contraction and its pain.

You might be able to teach her abdominal breathing; the advantage to this is that the woman feels relief when she is doing it. Abdominal breathing is effective for two reasons: Half of the benefit is psychological because the breathing provides distraction by giving her something else to concentrate on, and half of the benefit is physiological because the breathing lifts the abdominal wall up off the contracting uterus, thereby reducing pressure and thus reducing pain. However, during transition the woman is no longer able to do abdominal breathing, and you should teach her pant-pant-blow breathing or a superficial chest breathing to use at that time.

Which of the above you teach may depend on what the individual woman responds to and is able to do. At times you may be happy just to get the woman to breathe. Some very frightened, unprepared women may simply hold their breath and not breathe throughout a contraction. This causes a certain degree of tissue hypoxia, which increases pain. Your instruction may be limited in such situations to nothing more than repeated authoritative urgings: "Breathe!"

One essential form of breathing is panting. If the woman learns the panting technique during the antepartal period, she can do a controlled form of panting. However, panting in the form of a rapid, shallow, throat breathing, which you can demonstrate and describe as "panting like a dog" is a technique that a woman can learn instantly while in labor. It is used whenever you want to prevent the woman from pushing. It does no good to tell a woman "Don't push" (no matter how loudly and forcibly you say it) without showing her *how* not to push. It is impossible for anyone to pant and push at the same time. Panting is, however, a very ex-

hausting type of breathing. Therefore, it should be used only when indicated, as in the following situations:

1. If the woman is pushing prior to complete dilatation of the cervix. Constant pushing of the presenting part against an undilated cervix serves only to make the cervix edematous; if edema is severe enough it may impede labor or, at the very least, increase the chance of cervical laceration and hemorrhage as the congested cervix becomes friable.
2. In order to deliver the head of the baby between contractions. You may instruct a woman to pant through her contraction and then push without a contraction so the head will ease out without the combined force behind it of both the contraction and the push.
3. If you discover the cord wrapped tightly around the baby's neck after the head is born and you decide to clamp and cut the cord immediately. You don't want the mother to push until you have completed this action.

The other essential form of breathing, the form used for the maternal pushing effort, is described in Chapter 67.

In all teaching of breathing, you will get the idea across to the woman most quickly and effectively if you demonstrate it to her and then do it with her. If the woman does not learn a breathing exercise until she is in active labor and so has not previously practiced it, it may be necessary for you to breathe with her during every contraction. Prepared or unprepared, a woman needs reminding, encouragement, and positive reinforcement with *each* contraction. She will not remember what you say from contraction to contraction and will quickly exhaust herself if she has to rely on herself for coaching. You may think you sound like a broken record, but for her each contraction is a new experience to be coped with and gotten through.

Prevention of Exhaustion and Provision for Rest. Prevention of exhaustion and provision for rest between contractions are other support and comfort measures. Useless exhaustion can be prevented in four ways, the latter three also providing for rest between contractions:

1. Having the woman use the proper breathing at the proper time is basic to preventing useless exhaustion. As stated previously, panting is an exhausting type of breathing, to be used only when it is mandatory that the woman not push. Controlled types of breathing, whether Lamaze or abdominal, are also tiring if used in early, latent-phase labor before they are really needed. Natural, normal breathing should be encouraged during this time.
2. Organization of necessary procedures. Plan procedures so that as many as possible are done sequentially in the shortest possible time (or number of intervals between contractions). It is exhausting to the woman when there is always something to be done after every contraction.
3. Control the environment in accord with what is most restful to the individual woman (which may vary from your idea of what is restful). This includes controlling lighting, air, external noises, room arrangement, and so forth, as well as who is in the room doing and saying what.
4. Control of who is in the room doing and saying what affects exhaustion and provision for rest. (The woman's significant others and their involvement are discussed later in this chapter. The present discussion relates to professional and nonprofessional health care personnel.) All too frequently the people in the room talk (often over and across the woman in her bed) about subjects totally unrelated to her labor and not involving her. People may be so involved in the conversation that they do not notice the woman's entry into her next contraction and they ignore her needs-for-help. This not only constitutes extreme rudeness and reflects a lack of respect but also illustrates a total misplacing of focus, which should be on the woman. The room of a woman in active labor is no place for constant chatter, either among health care personnel or of a social nature with the woman or her significant others. The old maxim "Silence is golden" is most apropos between contractions unless the woman evinces need for a social exchange (extremely unlikely during active labor) or there is need to communicate instructions or explanations. During a contraction a quiet, firm voice giving encouragement, instruction, and praise is ideal. Afterward, silence. This makes the room quiet, devoid of distractions, and conducive to rest. The focus should be on the woman and anything that will facilitate her efforts to cope and work with her labor.

Assurance of Privacy and Prevention of Exposure. Assurance of privacy and prevention of exposure are not issues in the woman's home but are of particular importance in a teaching hospital. Professional faculty and staff in a teaching hospital often think that because a patient is in their hospital they can assume

the patient's willing submission to the learning needs of a large variety of professional students. Often this is not the case. Most patients are in teaching hospitals (generally university medical centers) because of their medical condition, because of their finances, or because it is the local hospital. They are likely to have no comprehension of the bewildering array of students seemingly affronting pieces of their minds and bodies.

Privacy refers not only to respecting the woman as a human being but also to respecting her body, which is her right as an individual. Imagine the shock a woman feels as she lifts up to push with a contraction, only to confront five to fifteen pairs of eyes all zeroed in on her perineum without her prior knowledge or informed permission! What a difference it would make to discuss this with her beforehand and to request her permission for any observers (much less an extraordinary number of observers). Furthermore, observers should be introduced to the woman personally, so that their first contact, *if* she grants permission, is person-to-person rather than eyes-to-body. Remember, it is the woman's right to say no and to know that this is an acceptable response. If the woman is assured by your actions that there will be no surprises, relaxation is promoted.

Privacy and prevention of exposure also pertain to respect for the woman's sense of modesty. Ideas of modesty vary widely today. Women who are knowledgeable about and feel good about their bodies may not feel the need to be carefully draped to prevent exposure of external genitals. Some women may believe this connotes a traditional attitude of shame regarding these areas—an attitude with which they completely disagree—and they are as apt to be insulted if you drape them as the traditionally modest woman is apt to be acutely embarrassed if you do not drape her. It is best to ask the woman her preferences concerning draping.

Explanation of the Process and Progress of Labor. Women who have been prepared for childbearing are knowledgeable about the processes of labor and want and need to be kept informed of their progress. Women who have not been prepared for childbearing usually want to know what is going on inside their bodies. If you are with an unprepared woman during the latent phase of labor, you will have the time and the woman's undivided attention, if she is interested, to explain briefly the processes of labor and what she will be experiencing in relation to them (Figure 26-15). The labor plates in the *Birth Atlas* [43] published by Maternity Center Association are a useful teaching aid for this purpose. If the unprepared woman is already into active labor, then the midwife is limited to giving the briefest of explanations about the essence of labor progress, such as cervical effacement and dilatation. A quick and graphic way of explaining cervical effacement and dilatation is to use your hands to show 0 percent, 50 percent, and 100 percent effacement; and 1 centimeters, 5 centimeters, and 10 centimeters dilatation. You can explain that it takes longer to get from 0 to 5 centimeters than it does to get from 5 to 10 centimeters dilatation. It is most useful to explain effacement when differentiating between true and false labor and explaining why you want the woman to walk for a while. It is not necessary to explain effacement to a woman in active labor. Explanation of dilatation is useful at both times.

FIGURE 26-15 During early labor is a good time for a midwife to review the processes of labor with a woman.
Source: Photograph by Patricia Urbanus, CNM.

In addition to their philosophical belief about the right of individuals to know what is occurring with their bodies, midwives explain the process and progress of labor in an effort to intervene in the aforementioned fear-tension-pain cycle. Explanation reduces fear of the unknown and alleviation of fear decreases the pain resulting from tension caused by fear.

Explanation of Procedures and Imposed Limitations. Each procedure should be explained and the woman's agreement should be obtained prior to doing the procedure. In order to cope effectively with it, the woman needs to perceive the procedure as one that she needs and one that will be helpful to her. The woman also needs to understand why any imposed limits (e.g., no ambulation if the membranes are ruptured and the presenting part is breech, unengaged, or ill-fitting) are helpful or necessary.

Keeping Clean and Dry. Cleanliness and dryness promote comfort and relaxation and decrease the risk of infection. A combination of bloody show, perspiration, amniotic fluid, solutions for vaginal examination, and feces can make a woman feel messy, uncomfortable, and generally miserable. A shower can change a woman's entire outlook and feeling to one of well-being if there are no contraindications to ambulation and facilities are available. If a shower or tub bath is not possible, a sponge bath or a bed bath is also refreshing.

Subsequent attention to perineal care and keeping dry continues the feeling of well-being. This is maintained by changing the woman's gown or her clothes if what she has on becomes damp with perspiration; changing sheets if they become wet; giving perineal care to remove any solutions or discharges, using careful front-to-back technique; and frequently changing the absorbent pad beneath her buttocks. Emphasis on cleanliness of the perineum and anything that comes close to the perineum, as well as scrupulous attention to handwashing by both the woman and all in contact with her, decreases the chance of intrauterine infection developing from contamination at the vaginal introitus.

Tub Bath. A tub bath can be the most relaxing and facilitative support and comfort measure you can give the woman. The tub needs to be deep enough for the water to cover her abdomen. This provides a form of hydrotherapy and buoyancy which are soothing and help her cope with the contractions. Better yet is a Jacuzzi or tubs designed for labor and birth. Midwives familiar with water labor and birth say that at first the water brings on relaxation and the cervix dilates quickly; but after a couple of hours the contractions may start to fade in frequency and intensity and the woman needs to get out of the tub to stimulate a return to active labor [44].

Mouth Care. A woman in labor will develop bad breath, a dry mouth, dry or cracked lips, a parched throat, and coated teeth, especially if she is in labor for a number of hours without oral fluids and without mouth care. These problems make the woman uncomfortable and they are unpleasant to those attending her. Some of this can be avoided if the woman is able to ingest liquids during her labor. Some of it results from mouth breathing, slight dehydration, lack of moisture in the mouth, or passage of time without mouth care. Mouth care consists of the following:

1. Brushing teeth. Women should be encouraged to bring their toothbrush and toothpaste with them to the hospital for use during labor.
2. Mouthwash—diluted or undiluted according to the woman's preference
3. Glycerin swabs for the lips
4. Vaseline for the lips
5. Sips of water or clear liquids with sugar added for hydration and moistening of the mouth and throat if in a setting that restricts food and liquids during labor
6. Hard candies or lollipops (to prevent aspiration) for moistening the mouth and throat. Women should be encouraged to bring these with them to the hospital.
7. A moist washcloth is invaluable if the woman's oral fluid intake is restricted. Wet a washcloth with cold water and squeeze out just the right amount of water so that when the woman chews and sucks on the cloth she will get enough moisture to moisten her mouth but not enough to swallow. As crude as this may sound, the vast majority of women in this situation find it one of the most helpful comfort measures.

Contrary to popular labor room practice, ice chips are *not* recommended because they have the opposite effect from that desired. Instead of providing moisture and relief, they actually have a drying effect. Use of ice chips simply increases the discomfort of a dry mouth and dry lips and causes an insatiable craving and need for more. Sips of water are far more satisfying and thirst quenching and also contribute to hydration. Better yet is unrestricted fluid intake.

Usefulness of a Washcloth. If you are ever asked to select one item to help you provide support and comfort to a woman in labor, a washcloth is the item to choose. A washcloth can be used in multitudinous ways. Here are a few examples:

1. To refresh by cleansing/washing
2. To wipe away facial perspiration. Wet the cloth with cold water; if there is no cold water, wet it

and then cool it with air breezes like those created when used as a fan. (See "Fanning" below.)
3. To serve as a moist warm or hot pack
4. To serve as a cold compress
5. To moisten dry lips and a dry mouth as described above
6. To use as a fan
7. To use as a "security blanket"—some women clutch their washcloths like Linus does his blanket.

Fanning. Women generate a lot of heat during labor. Even in labor rooms with the best of temperature control, they will perspire and complain at times of being warm. If the environment is not air-conditioned in the summer the stickiness becomes miserable. If there are no fans you need to create means of fanning the woman. The following are three possibilities:

1. Use a washcloth as a fan: Hold the washcloth by two adjacent corners with your two hands and then flip it around on itself, first going one way and then the other. It will flip more easily if it is damp. (However, this requires a lot of your energy to create only a little amount of breeze in a very circumscribed area.)
2. Better yet is the use of a glove package. This provides a fairly stiff expanse of paper which can be used as a fan with one hand. It has the advantage of mobility and can be directed at any part of the woman's body.
3. The best method for cooling the woman's upper body is simply to grasp the lower front hem of her gown, shirt, or dress; make sure it is loose from underneath the woman at the lower sides; and flap it. This creates a breeze over her entire body from the perineum up across her abdomen, breasts, and head. Hospital gowns are ideal for this.

Back Rub. Two types of back rubs can provide support and comfort to a woman in labor. One is the usual generalized, overall back rub, which is used to promote relaxation. The second is called the OB back rub. Both express caring for the woman and ensure a sustaining human presence for as long as the back rub is given. Lotion or powder should be used to reduce friction and prevent skin irritation.

The OB back rub consists of applying pressure to a specific spot on the woman's lower spine. The woman can tell you precisely where this spot is because it is a localized pain caused by the pressure of the fetal head against her spine. This pain is exaggerated if the fetus is in an occipital posterior position; thus low back pain is often the woman's primary complaint. You will need to check with the woman frequently about the proper location of the pressure you are applying, as the pain will move downward as the fetal head descends. The application of external pressure on the spine counteracts the internal pressure on the spine by the fetal head and thus reduces the pain.

You can massage the spot and adjacent area at the same time by moving your palm in a circle without lifting your palm or moving it off of the identified spot. The woman can also guide you as to the proper amount of pressure. Too much pressure is painful; too little pressure is ineffective. Bracing your elbow against your body or against the bed will enable you to achieve greater pressure if needed. It also will enable you to continue the back rub over a longer period of time because your muscles do not tire as easily if your arm is braced. The OB back rub generally is done only during contractions; this is usually when the woman experiences the greatest discomfort or pain in her lower back. Check with the woman before beginning an OB back rub. Some women don't have this pain, and your energy could be better spent where she is feeling a need for help.

It is difficult to do the OB back rub if the woman is in a supine position; it is hard for you to reach the right area and you have to lift up to apply pressure. If the woman is supine you can provide some degree of relief by folding a small towel and placing it at the specific spot so she lies on it; she can also lie on tennis balls, which provide counterpressure.

Sterile Water Papules (SWP). Sterile water papules are intradermal injections of sterile water administered in four places in the lower lumbosacral area of the back (see Chapter 63 for procedure). Women experience an intense stinging sensation for approximately 30 to 90 seconds during the injection and then many will experience immense relief from their back pain. The majority of women who have had SWP would use them again [45, 46]. Because of the pain of the SWP when first inserted, they should be offered after other methods (e.g., position changes, counterpressure such as the OB back rub, heat, cold) have been tried without relief, unless they are the first choice of a woman who has had them before. They are particularly effective for women with occiput posterior positions.

Heat/Cold to the Lower Back. Heat applied to the woman's lower back in the area where the fetal head presses against the spine will decrease the pain. The heat increases circulation to the area, thereby combating tissue anoxia caused by the pressure. Apply heat carefully; it is easy to burn the woman not only by the temperature of the application but also by putting heat on an area to which creams or ointments have already been applied.

Some midwives have found that the application of cold decreases the pain when heat does not. Supposedly the relief results from a numbing effect, probably due to superficial vasoconstriction. Some women find alternating heat and cold comforting.

Birthing Ball. A physiotherapy ball is the right size and sturdiness to withstand weight and use. Generally a 65-centimeter ball is the right size for women over 5 feet 5 inches tall and a 55-centimeter ball is the right size for women less than 5 feet 5 inches tall. The ball is then adjusted to individual "fit" by adding or letting out air so that it is firm but gives to touch, rolls easily, and the woman's legs are bent at a 90-degree angle when sitting on the ball. Women sit on the ball with their feet about two feet apart and flat on the floor. Good posture is necessary to maintain balance on the ball. This puts the woman in an upright position from which she can rotate her hips in a circular or figure-eight pattern that both relieves back pain and encourages fetal descent. A woman can also sit on the ball and lean forward or use a birthing ball to lean against either in a kneeling (ball on floor) or standing (ball on a bed or table) position. This supports the woman's body and provides a position in which the mother can rest. It also aligns the long axis of the uterus and the fetus with the mother's pelvis and facilitates occiput anterior positions.

Abdominal Rub. The abdominal rub is a *light* rubbing (massage) of the entire abdomen usually done in a circular fashion and often concentrating twice as much rubbing in the lower abdominal area if the woman is feeling pain there. It differs from effleurage in its technique, in its rationale, and in who does it. It is done by an attendant (e.g., significant other, nurse, or midwife) using one hand while the other hand is doing something else, such as feeling the contraction, doing the OB back rub, or holding the woman's hand.

A stomach rub can be very comforting and familiar in a strange environment, and it expresses caring to the woman. It also increases circulation to the area, thereby dilating blood vessels that have become constricted from contractions, causing tissue anoxia. The increased blood flow combats the tissue hypoxia and provides a physiological basis for a decrease in pain.

Effleurage. Effleurage is a technique used in the Lamaze and other psychoprophylactic methods of childbearing. Effleurage means "feather touch," which describes the amount of pressure to be used in doing it. It is usually done by the laboring woman, using both hands and following a definite pattern over primarily her lower abdomen (symphysis pubis to just above her umbilicus) as illustrated in Figure 26-16. Using all her fingers on both hands, with the fingers loosely separated, the woman covers the entire lower abdominal area with the two circular patterns: up and outward from her umbilicus, down and around, or in a reverse pattern. Its effectiveness is both psychological and physiological—psychological in that it is one more thing to concentrate on, along with her breathing, besides her discomfort, and physiological in that the action also increases circulation to the area, combating tissue hypoxia and thus decreasing pain.

Heat to the Lower Abdomen. The application of moist heat to the woman's lower abdomen decreases pain by virtue of the resulting increased circulation that reduces tissue anoxia caused by contraction and tension. However, in order to get enough heat to be effective you need to use a hot pack of bath towels. When these are wet, even when wrung out, they are

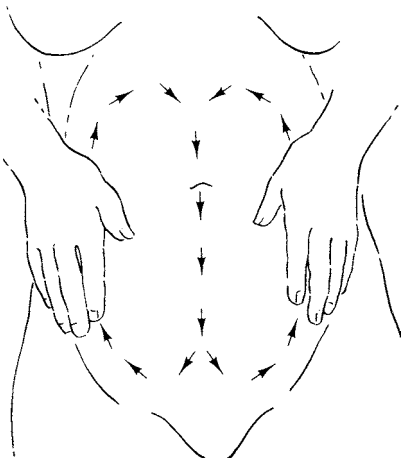


FIGURE 26-16 Effleurage pattern.

often too heavy for the woman to tolerate. They are, however, just the right relief measure for some women.

Empty Bladder. In addition to the effect of a full bladder on the progress of labor and possible later effects on bladder hypotonicity, urine stasis, and bladder infection, there is the very real fact that a full bladder accentuates, and in part creates, a woman's lower abdominal pain. This pain can be greatly relieved if the woman's bladder is emptied.

Medication. Medication was discussed as one of the midwife's management decisions earlier in this chapter. The judicious use of medication also constitutes a support and comfort measure.

Cold Compresses. Some midwives have found that if all else seems ineffective, cold compresses to the axilla and groin bring relief and calm some women.

Support During Vaginal Examinations. This subject is discussed in Chapter 56. You may not have time, or need, to go through all the components of support discussed there. At the very least, however, the following should be observed:

1. An empty bladder—desirable also for the other reasons discussed in this chapter
2. Explanation of why you are doing the examination
3. Positioning of the woman's arms beside her body
4. Help with relaxation breathing and encouragement throughout the examination
5. Super-gentle verbal and physical approach
6. Warning and explanation if what you are about to do will hurt her
7. Explanation of findings

Alleviation of Leg Cramps. Leg cramps during labor usually are so acute they capture the woman's total attention and demand immediate relief. Cramps probably are caused by pressure of the presenting part on the nerves to the extremities as they cross through the greater sciatic foramen in the pelvis.

The woman's legs must never be massaged because of the risk of unwittingly dislodging unknown thrombi developed during months of trouble with venous return and possible varicosities. There is a way of providing immediate relief for leg cramps without running this risk, which is to straighten the woman's leg and dorsiflex her foot. Alternating relaxation with dorsiflexion of her foot increases the speed of the relief. The dorsiflexion should be forcibly exaggerated to effect relief.

Use of Physical Touch. Touching the woman (e.g., on her leg, head, arm) for no other purpose than to touch her can convey caring, comfort, and understanding and can soothe, calm, dispel loneliness, and so forth. However, touching is effective only if you are comfortable touching others *and* if the woman is comfortable with being touched. Don't force yourself to touch a woman in labor if it is uncomfortable for you. The woman will sense your discomfort and the action will be rendered ineffective. On the other hand, if you are "a toucher" you must be acutely sensitive to the woman's response to your touch. If she withdraws or acts repelled, confirm her desire not to be touched and respect her wishes. Don't force touch on her. Even women who do not like to be touched, however, may find your hand better to grasp than the cold metal siderails on a hospital bed—so be sure to ask her if she wants a hand to hold. Touching can be extremely effective when both the toucher and the touched are comfortable with it.

Some women in labor are extreme touchers. Their use of touch is not the same as yours—it is more like a cry for help. Usually extreme touchers are extremely frightened younger girls, who may throw their arms around your neck and forcibly hang on to you during a contraction. It is imperative that you not reject the girl in this situation, even if you are a nontoucher. Hold her. Then, between contractions, ascertain the problems and location of pain and either find a significant other for her to hang on to or tell her you have to be free bodily to do other things to help her but that she can hang on to one of your hands.

Significant Others. The presence of significant others is the most important of all support and comfort measures. Significant others are discussed last because you need to know the other support and comfort measures in order to guide the significant others in providing them for the woman.

The first step is to identify the woman's significant other(s), those she wants with her during the childbirth process—spouse, father of the baby, partner, parent, grandparent, sibling, friend, children, other relative. In many hospital settings the woman has to identify one person who is designated and accepted as the person who will be with her in the labor room, because many hospital labor rooms cannot

philosophically or physically accommodate more than one significant other at a time. The second step is to determine whether the significant other chosen by the woman wishes to be with her during labor.

In a hospital setting the significant others may feel strange, frightened, intimidated, and insecure. They should be made to feel welcome and wanted in the labor room by the staff and viewed as important participants in the ongoing events. These persons should not be relegated to an outer corner of the room but should be given space by the side of the woman. Those significant others who are unprepared usually are glad to do anything you suggest and show them how to do. Those significant others who are prepared have probably planned beforehand with the woman what they will do. Inquire about their plans so you will facilitate rather than frustrate them.

And what do the significant others do? They do anything within their capability that is agreeable to the woman, themselves, and you. The woman will respond to the person with whom she has practiced and on whom she relies for coaching. Unprepared partners, mothers, and grandmothers learn quickly and do well in coaching breathing. The significant other can help by wiping the woman's face with a wet washcloth, hand holding, fanning, and abdominal rubbing. Men make the best back rubbers, especially for the OB back rub. It is helpful if you role model the support and comfort measures they are to provide. Lots of positive reinforcement is useful, particularly when they are learning and when labor goes on for a long period of time. You should also attend to the needs of the significant other(s) and discuss with them what would help them. You may need to suggest that they take breaks from their intense, emotionally involved supportive role. This enables them to continue to give the woman what she needs.

The fact that the midwife must carry out a procedure does not mean that the significant other has to leave the room. The decision of whether to stay in the room and support the woman during a vaginal examination is up to the woman and the significant other. Husbands in particular frequently resent being sent out of the room at this time. On the other hand, some women prefer that their husbands not be there, and some husbands prefer to leave. Determine the wishes of the woman and her significant other.

The most important thing in working with women and their significant others is to facilitate their relationship. Do not try to make yourself the most important person in the woman's eyes but rather foster the importance of the significant other (Figure 26-17). You are a vital, but transient, person in the woman's life. The relationship between the woman and her significant other involves a continuing commitment in daily life.

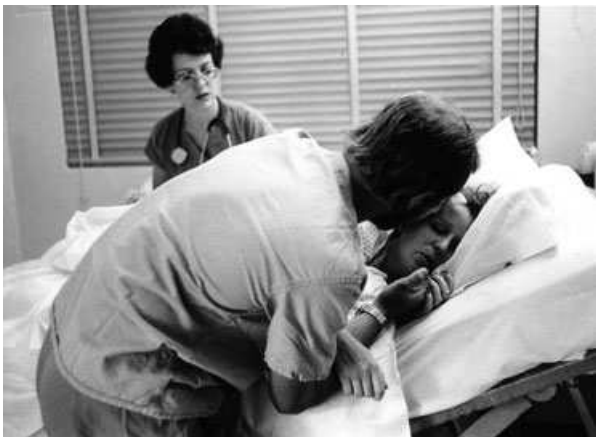


FIGURE 26-17 Partner supporting woman with midwife facilitating efforts of both.

References

1. Wiedenbach, E. *Family-Centered Maternity Nursing*. New York: G. P. Putnam, 1958.
2. Friedman, E. A. Primigravid labor: a graphicostatistical analysis. *Obstet. Gynecol.* 6:567, 1955.
3. Philpott, R. H., and Castle, W. M. Cervicographs in the management of labour in primigravidae: I. The alert line for detecting abnormal labour. *J. Obstet. Gynaecol. Br. Common*. 79:592–598 (July) 1972.
4. Kilpatrick, S. J., and Laros, R. K. Characteristics of normal labor. *Obstet. Gynecol.* 74:85–87, 1989.
5. Albers, L. L., Schiff, M., and Gorwoda, J. G. The length of active labor in normal pregnancies. *Obstet. Gynecol.* 87(3):355–359 (March) 1996.
6. Albers, L. L., for the CNM Data Group, 1996. The duration of labor in healthy women. *J. Perinatol.* 19(2):114–119, 1999.
7. Friedman, E. A. *Labor: Clinical Evaluation and Management*, 2nd ed. New York: Meredith, 1978.
8. Perl, F. M., and Hunter, D. J. S. What cervical dilatation rate during active labour should be considered abnormal? *Eur. J. Obstet. Gynecol. Reprod. Biol.* 45:89–92, 1992.

9. Friedman, E. A. Labor in multiparas: a graphicostatistical analysis. *Obstet. Gynecol.* 8(6): 691–703 (December) 1956.

10. Friedman, E. A. *Labor: Clinical Evaluation and Management*. New York: Appleton-Century-Crofts/Meredith Publishing, 1967.

11. England, P., and Horowitz, R. *Birthing from Within*. Albuquerque, NM: Patera Press, 1998.

12. Ludka, L. M., and Roberts, C. C. Eating and drinking in labor: a literature review. *J. Nurse-Midwifery* 38(4):199–207 (July/August) 1993.

13. ACNM Clinical Bulletin No. 3—December 1998. Intrapartum nutrition. *J. Nurse-Midwifery* 44(2):124–128 (March/April) 1999.

14. Hawkins, J. L., Koonin, L. M., Palmer, S. K., and Gibbs, C. P. Anesthesia-related deaths during obstetric delivery in the United States, 1979–1990. *Anesthesiology* 86(2):277–284 (February) 1997.

15. Burst, H. V. "Real" midwifery. *J. Nurse-Midwifery* 35(4):189–191 (July/August) 1990.

16. Leighton, B. L., and Halpern, S. H. The effects of epidural analgesia on labor, maternal, and neonatal outcomes: a systematic review. *Am. J. Obstet. Gynecol.* 186:S69–77, 2002.

17. Glosten, B. Epidural and spinal analgesia/anesthesia: local anesthetic techniques. In Chestnut, D. H. (ed.) *Obstetric Anesthesia: Principles and Practice*, 2nd ed. Baltimore, MD: Mosby, 1999, pp. 360–381.

18. ACOG Practice Bulletin No. 36. Obstetric analgesia and anesthesia. *Obstet. Gynecol.* 100(1):177–191 (July) 2002.

19. Hawkins, J. L., Chestnut, D. H., and Gibbs, C. P. Obstetric anesthesia. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002.

20. Gatt, S. P., and Pybus, A. *Hypertextbook of Regional Anesthesia for Obstetrics*. Australia: Manbit Anesthesia Software, 1999. Accessed online at http://www.manbit.com.

21. Arkoosh, V. A. Neuraxial analgesia techniques. In Norris, M. C. (ed.) *Obstetric Anesthesia*, 2nd ed. Baltimore, MD: Lippincott Williams and Wilkins, 1999, pp. 317–330.

22. Mayberry, L. J., Clemmens, D., and De, A. Epidural analgesia side effects, co-interventions, and care of women during childbirth: a systematic review, *Am. J. Obstet. Gynecol.* 186(5, pt. 2):S081–93 (May) 2002.

23. van de Velde, M., Teunkens, A., Hanssens, M., van Assche, F. A., and Vandermeersch, E. Postdural puncture headache following combined spinal epidural or epidural anesthesia in obstetric patients. *Anaesth. Intensive Care* 29(6):595–599 (December) 2001.

24. Lieberman, E., and O'Donoghue, C. Unintended effects of epidural analgesia during labor: a systematic review, *Am. J. Obstet. Gynecol.* 186(5, pt. 2):S031–68, 2002.

25. Thallon, A., and Shennan, A. Epidural and spinal analgesia and labour, *Curr. Opinion Obstet. Gynecol.* 13(6):583–587 (December) 2001.

26. Howell, C. J., Kidd, C., Roberts, W., et al. A randomized controlled trial of epidural compared with non-epidural analgesics in labor. *Br. J. Obstet. Gynaecol.* 108:27–33, 2001.

27. Eberle, R. L., and Norris, M. C. Effects on progress and outcome of labor. In Norris, M. C. (ed.) *Obstetric Anesthesia*, 2nd ed. Baltimore, MD: Lippincott Williams and Wilkins, 1999.

28. Yancey, M. K., Zhang, J., Schwarz, J., Dietrich, C. S. III, and Klebanoff, M. Labor, epidural analgesia, and intrapartum maternal hyperthermia. *Obstet. Gynecol.* 98(5, pt. 1):763–770 (November) 2001.

29. Mardirosoff, C., Dumont, L., Boulvain, M., and Tramer, M. R. Fetal bradycardia due to intrathecal opioids for labour analgesia: a systematic review. *Br. J. Obstet. Gynaecol.* 109(3):274–281 (March) 2002.

30. Goetzl, L., Cohen, A., Frigoletto, F. Jr., Ringe, S. A., Lang, J. M., and Lieberman, E. Maternal epidural use and neonatal sepsis evaluation in afebrile mothers. *Pediatrics* 108(5):1099–1102 (November) 2001.

31. Chestnut, D. H. (ed.). *Obstetric Anesthesia: Principles and Practice*, 2nd ed. Baltimore, MD: Mosby, 1999.

32. Klein, M. C., Grzybowski, S., Harris, S., et al. Epidural analgesia use as a marker for physician approach to birth: implications for maternal and newborn outcomes. *Birth* 28(4):243–248 (December) 2001.

33. Howell, C. J. Epidural versus non-epidural analgesia for pain relief in labor. *Cochrane Database Syst. Rev.* 2:CD000331, 2000.

34. Murphy, D. J. Failure to progress in the second stage of labour. *Curr. Opinion Obstet. Gynecol.* 13(6):557–561 (December) 2001.

35. American College of Obstetricians and Gynecologists. *Operative Vaginal Delivery*. Technical Bulletin No. 196. Washington, DC: ACOG, 1994.

36. Fraser, W. D., Marcoux, S., Krauss, I., et al. Multicenter randomized, controlled trial of delayed pushing for nulliparous women in the sec-

ond stage of labor with continuous epidural analgesia. *Am. J. Obstet. Gynecol.* 182:1165–1172, 2000.

37. King, T. Epidural anesthesia in labor: benefits versus risks. *J. Nurse-Midwifery* 42(5):377–388 (September/October) 1997.

38. Swan, H. D., and Borshoff, D. C. Informed consent: recall of risk information following epidural analgesia in labour. *Anesth. Intensive Care* 22(2):139–141 (April) 1994.

39. Mann, O. H., and Albers, L. L. Informed consent for epidural analgesia in labor. *J. Nurse-Midwifery* 42(5):389–392 (September/October) 1997.

40. Cavero, C. Personal communication, 1969.

41. Lesser, M. S., and Keane, V. R. *Nurse-Patient Relationships in a Hospital Maternity Service*. St. Louis, MO: Mosby, 1956.

42. Dick-Read, G. *Childbirth Without Fear*, 2nd ed. New York: Harper and Row, 1959.

43. Dickinson, R. L., Belskie, A., and Hoffman, M. *Birth Atlas*, 6th ed. New York: Maternity Center Association, 1968.

44. Bowman, T. A. Water babies. *Advance for Nurses* 1(1):12–14 (June 18) 2001.

45. Stensland, J. Sterile water papules for low back pain in labor. Accessed online at www2.coastalnet.com/~coyotemidwife/SWP_PAPE.htm.

46. Trolle, B., Moller, M., Kronborg, H., and Thomsen, S. The effect of sterile water blocks on low back labor pain. *Am. J. Obstet. Gynecol.* 164(5, pt. 1):1277–1281 (May) 1991.

A bibliography is at the end of Chapter 28.

CHAPTER

27

Fetal Assessment During Labor

Introduction and History

Throughout the course of labor and birth, the safe passage of the fetus is of paramount concern to all involved. Clearly, the goal of every parent and caregiver is to have a healthy newborn. Of question is what method is the most suited to assist in accomplishing this goal. Prior to methods of auscultation, assessment of fetal movement was the revered measurement of fetal well-being and was primarily the responsibility of the mother. Awareness of the fetal heart rate as a sign of fetal life and then of fetal well-being has been acknowledged for the past two centuries [1–5]. First heard by the listener's ear resting on the maternal abdomen, this required "intimate" contact with the pregnant woman [1, 2]. Then, a hollow tube was found to be useful to actually hear the baby's heartbeat and to allow the listener to maintain some distance from the woman's skin. This tube was fashioned into a Pinard fetoscope, and was eventually improved with use of a stethoscope-like listening tool. From the mid-1800s through the 1900s, it was recognized that normal ranges of a fetal heart rate were between 120 and 160 beats per minute (bpm), and that extremes above or below it were worrisome. Auscultation remained the primary means of assessment of fetal status in labor until the 1960s [1–3, 6].

Along with the development of the means of hearing the heart rate and appreciating normal and abnormal patterns of the heart, were the improvements represented by the use of forceps and by cesarean sections, making it possible to expedite the birth if the fetal heart tones were concerning. These advances along with recognition of the means of preventing puerperal fever, especially following cesarean section, allowed a major improvement in the number of infants who were born alive and healthy.

Recognition of the patterns of the fetal heart rate (FHR) in relationship to the uterine contractions led to a desire to record the heartbeat continuously through labor. Human rationale made it seem that if listening to the heart rate periodically could help identify babies who were stressed in utero, then listening through every minute of labor would clearly improve the potential to save unborn babies from hypoxia and asphyxia.

During the 1960s, the electronic fetal monitor was introduced as a tool for use with high-risk pregnancy. As soon as this new technology was utilized, the cesarean section rate increased dramatically. A decrease in perinatal mortality and morbidity were anticipated, but in fact have not materialized [4]. What seemed like such good rationale led to an increased dependence on technology, an increased operative delivery rate, and an increase in medical malpractice—without an improvement in the outcomes for babies and mothers. Introduction of continuous electronic fetal monitoring (EFM) on a widespread basis prior to scientific evidence of its effectiveness led to several generations of physicians, nurses, and women and their families who have become dependent upon this technology despite its lack of benefit [7]. Midwives have maintained use of auscultation as a primary means of assessing the fetus throughout this overwhelming trend toward use of EFM for nearly all laboring women.

With the apparent lack of impact by EFM, multiple randomized controlled trials (RCTs) have been performed to identify any differences in fetal and maternal outcomes related to the method of fetal

assessment used [8–13]. Neither these RCTs nor meta-analyses of many trials have demonstrated improved outcomes of one method of fetal heart rate assessment over the other [14–20]. Although one study indicated a decrease in neonatal seizures with EFM, there was no apparent difference in the childhood neurologic outcomes, making this difference questionable [8, 14, 17].

In 1995, ACOG published guidelines for intrapartum fetal assessment and issued the following statement: "Current data indicate that FHR monitoring is equally effective whether done electronically or by auscultation" [12]. The U.S. Preventive Services Task Force, in its 1996 evaluation of intrapartum electronic fetal monitoring, states that "electronic fetal monitoring for low-risk women in labor is not recommended. There is insufficient evidence to recommend for or against intrapartum electronic fetal monitoring for high-risk pregnant women" [20].

Midwives in the twenty-first century must use evidence-based care in an environment that reveres technology and is mistrusting of traditional noninterventional approaches to care. Assessment of the well-being of the fetus is a critical component of intrapartum management and must be considered individually for each laboring woman. Through knowledge of the various means of documenting fetal heart rate patterns and of measuring the acid-base balance of the fetus when indicated, the midwife will be able to pair the means of assessment with the pregnant woman and her fetus. Regardless of the site of birth, the information and the principles of assessing the fetus and documenting that process are the same.

Physiology and Scope of Problem

The goal of all fetal assessment in labor is to identify infants who are at risk for oxygen deprivation during labor and birth that would be significant enough to cause long-term neurologic damage to the child. Unfortunately, none of the fetal heart rate assessment tools in current use is able to give us this information directly. Thus, we use indicators that are known to be associated with untoward outcomes to guide our decision-making. Even the direct sampling of fetal blood from the scalp or cord blood is not an absolute predictor. It is thus important for clinicians to understand the incidence of intrapartum asphyxia, the major fetal and maternal indicators for depression of the neonate, and intrapartum evidence of potential risk. Consistent use of terms referring to the degrees of oxygen deprivation and signs of nonreassuring FHR patterns is important in communicating well with one's professional colleagues. Understanding the implications of decreased Apgar scores and cord pH and their relationship to neonatal outcome will help the midwife to understand the significance of an infant's condition and to assist the parents in understanding as well.

The term *fetal distress* is frequently used during the intrapartum period to describe anything from multiple mild variable decelerations through severe, prolonged bradycardia or persistent late decelerations with lack of variability. Unfortunately, this term has no specific correlation with fetal heart rate patterns or neonatal outcomes. It does, however, carry a negative connotation among staff and families, and certainly with lawyers. Therefore, the term should be avoided. Instead, specific description of the concerning changes in the fetal heart rate or specific pH values should be used.

According to Low and colleagues, "potentially significant intrapartum fetal asphyxia occurs in approximately 20 per 1000 births. Moderate and severe fetal asphyxia with newborn morbidity occurs in 3 to 4 per 1000 births, with brain damage and subsequent disability in at least 1 per 1000 births" [21, p. 735].

Apgar scores of 7 or greater at 5 minutes and normal fetal heart rate baselines with accelerations are virtually never associated with perinatal asphyxia or long-term neurologic dysfunction [21–23]. When an infant is born in a depressed state, it is commonly felt that there is a high risk of poor neurologic outcomes. In fact, this is rarely the case. In a study of 37,000 births, term infants with an Apgar score of 0 to 3 at 5 minutes had only a 1 percent incidence of cerebral palsy if the Apgar score was greater than 3 by 10 minutes [23].

Nelson et al. identified 78 children with cerebral palsy who had undergone EFM during a two-year period. Review of the fetal monitor strips found multiple late decelerations and decreased variability to have an association with an increased risk of cerebral palsy. However, the children who had late decelerations or diminished variability of the FHR "represented only 0.19 percent of singleton infants with birthweights of 2500 grams or more who had these fetal monitoring findings, for a false positive rate of 99.8 percent" [24].

Sampling of cord blood pH has been used widely to help identify acidotic fetuses. It has been strongly demonstrated that a cord pH >7.2 is invariably associated with well-being. The neonate with a cord pH <7.0 has severe acidosis and is at risk for perinatal asphyxia. In several studies of infants with cord pH <7.0, moderate to severe encephalopathy was identified in 10 percent or fewer [23].

In addition to the pH of the cord blood, metabolic acidosis is evaluated based on the umbilical artery base excess. The normal base excess ranges from –2.0 to –9.0. An increase in base excess to the range of 12 to 16 mmol/L was associated with a 10 percent incidence of moderate or severe newborn complications, while a base excess >16 mmol/L related to 40 percent of newborns with similar complications [19].

According to Goodwin, "intrapartum asphyxia is an uncommon cause of childhood neurologic dysfunction, the intrapartum insult necessary to cause long-term neurologic dysfunction is profound, and the child who does not manifest encephalopathy in the newborn period will not manifest long-term neurologic dysfunction that can be attributed to intrapartum asphyxia" [23, p. 721].

Using electronic fetal monitoring to identify symptoms of asphyxia in the fetus has been fraught with difficulty. Although decreased baseline variability, bradycardia, and late and prolonged variable decelerations are all associated with the diagnosis of perinatal asphyxia, the false-positive rate with these patterns is more than 99 percent. Only absent baseline variability *with* late or prolonged decelerations over a period of time are strongly associated with perinatal asphyxia. Of those infants, only a small percentage will sustain neurologic impairment. Because of the high false-positive rate, it is recommended that nonreassuring fetal heart rate patterns be followed by fetal scalp blood gas analysis or another means of determining fetal well-being (scalp stimulation, fetal pulseoximetry) prior to intervention in the labor [19].

Perinatal asphyxia is a progressive effect of inadequate oxygen availability to the fetus with a concomitant excess of hydrogen ions causing acidosis. Like other aspects of fetal assessment, terminology is often not well defined. The following definitions are presented by the ACOG in its 1995 Bulletin [12]:

Hypoxemia: Decreased oxygen content in blood.
Hypoxia: Decreased level of oxygen in tissue.
Acidemia: Increased concentration of hydrogen ions in the blood.
Acidosis: Increased concentration of hydrogen ions in tissue.
Asphyxia: Hypoxia with metabolic acidosis [12, p. 1].

A primary concern in monitoring fetal well-being is the prevention of hypoxic ischemic encephalopathy (HIE) in the neonate. This can occur from lack of oxygen from the maternal/placental circulation to the fetal brain and/or from a decrease in fetal blood flow to the brain, causing ischemia. The degree of damage to the fetal brain tissue depends on the gestational age, severity of the insult, and individual differences in the development of the fetal neurologic system. Most infants escape without long-term sequelae; however, for those who suffer injury, the most common outcome of HIE in term infants is spastic quadriplegic cerebral palsy [25].

Preterm Fetus

With immaturity of the fetal nervous system, the preterm fetus will demonstrate different patterns of the FHR than the term fetus. Specifically, the baseline heart rate may be in the higher ranges of normal, with an average of 155 bpm at 20 weeks. It is important to consider that the indications for prolonged monitoring of the FHR in the preterm fetus is often related to complications of pregnancy, such as preterm labor and chorioamnionitis as well as maternal hypertension, infection, or dehydration. Therefore, fetal tachycardia (still defined as FHR >160 bpm) may be related to tocolytics, maternal fever, or maternal dehydration. As always, the complete clinical scenario must be considered when evaluating fetal heart rate patterns by either EFM or auscultation.

Accelerations of the fetal heart rate, in association with fetal movement, are a developmental process. Each fetus matures at its own rate, but by 28 weeks approximately 80 percent of fetuses will have accelerations adequate to meet the standard nonstress test criteria of 15 beats in amplitude and at least 15 seconds off the baseline. Prior to 32 weeks, the amplitude of an acceleration may be only 10 bpm with a duration of 10 seconds [27], which satisfies the requirement for nonstress test reactivity in a preterm fetus. Baseline variability may be decreased in the very preterm fetus, but no standards have been determined in this regard.

It is also important to note that the preterm fetus may not tolerate nonreassuring patterns for

the same duration as the term fetus. There can be a more rapid transition from reassuring to nonreassuring tracings in the preterm infant. Twenty percent of term fetuses with a nonreassuring tracing actually have low Apgars and cord blood gases [28]. The preterm fetus however, has a 70 to 80 percent chance of having these signs of depression with a nonreassuring FHR pattern. In the case of a preterm fetus with a nonreassuring pattern, physician consultation is strongly advised [26].

One of the limitations of both auscultation of the FHR and continuous EFM is the diversity of interpretation criteria in the scientific literature as well as between professional clinicians [4, 12]. In an attempt to standardize interpretation criteria and nomenclature regarding fetal heart rate assessment, the National Institute of Child Health and Human Development (NICHD) staged a research planning workshop, reviewed a vast pool of literature, consulted current experts, and devised guidelines for the use and interpretation of intermittent auscultation and electronic fetal monitoring in future research [27]. These guidelines and those highlighted by the American College of Obstetricians and Gynecologists in their clinical guidelines [12] will be the basis of criteria used in this chapter. It is critical that all midwives be aware of the guidelines being used in their own practice setting.

Patient Education

Information regarding the use and quality of auscultation is limited to the lay public. It is the responsibility of the midwife to see that women in their care understand auscultation to be an equal option for assessment of the fetus in labor. The associated freedom of position and movement, the decreased need for analgesia, and the lower rate of operative births should be explained to all women. Withholding (or not offering) information regarding intermittent auscultation deprives women of the opportunity to make this informed choice [29, 30]. Each woman must consider all the options—including the clinical situation, risk factors, personal preferences, hospital or birth center guidelines, and the knowledge of the nursing and midwifery staff. Open discussion and planning prior to the onset of labor will allow women and their families to question their alternatives and make wise choices for themselves.

Intermittent Auscultation

Until the 1970s, auscultation was the standard means of assessment of fetal well-being in labor. As electronic fetal monitoring became more available and used more widely, auscultation diminished in use, nearly to its exclusion in many hospital settings. From the 1970s through the 1990s, nurses, physicians and midwives became less knowledgeable about intermittent auscultation (IA) and their skills with the fetoscope seriously decreased. In fact, today many obstetric providers have never seen or used a fetoscope, let alone learned to rely on the information obtained in managing the course of labor.

Sometimes in life, the "good news" and the "bad news" are the same. In the case of auscultation, skeptics of the equivalency of auscultation and EFM will cite the need for one-to-one nursing care as a drawback [31]. However, constant nursing care has been shown to improve the outcomes of labor and birth: labors are shorter and require less medication, infants have fewer low Apgar scores, and women report that the quality of their experience is better [7, 13]. Is the expense of fetal monitors, central monitoring systems, constant certification courses, increased liability costs, increased surgical fees and more anesthetic-related costs really more expensive than nursing care? What about the cost of loss of compassionate, supportive nursing care?

Auscultation of the fetal heart rate may be performed with a fetoscope, a Doppler device, or even the external ultrasound transducer of the fetal monitor. The use of a fetoscope produces quiet, muffled sounds of the fetal heart, analogous to using a stethoscope for cardiac auscultation. Fetal size, gestational age, position, quantity of amniotic fluid, uterine contractions, maternal habitus, and clinician experience and hearing are all factors involved in the potential for hearing fetal heart tones. The DeLee-Hillis and the Allen fetoscopes utilize bone conduction of the listener's cranium in order to amplify the sounds of the FHR. Because all fetoscopes require close proximity of the examiner's head to the pregnant abdomen, maternal position and activity may also be limitations to accurate assessment of the FHR with a fetoscope.

In recent years, the use of Doppler auscultation devices has made this an easier and often more predictable task. Doppler ultrasound technology works by creating a sound signal related to the movement of the fetal heart. Thus the signal produced by the Doppler is not the actual sound of the fetal heart, but an electronically created sound. Auditory counting of the fetal heart rate by Doppler and by fetoscope has been demonstrated to be equivalent [15, 32, 33]. In addition, auscultation

with a Doppler device has close similarity with the FHR documented by EFM [15, 32, 33].

Handheld Doppler devices have been designed to be used easily in small spaces and with great flexibility to accommodate the variations in fetal position, maternal abdomens, and maternal position. Digital displays of the FHR make manual counting unnecessary, and some models can be safely used underwater, allowing for use during hydrotherapy in labor and birth. The external fetal heart monitor of the EFM machine is actually a Doppler device, and so the audible sounds are the same as those emitted from handheld Doppler devices. Further information regarding the physics and safety of Doppler ultrasound can be found in Chapter 23.

Controversy exists regarding use of the EFM for intermittent documentation. Advocates find use of the EFM ultrasound transducer to be convenient, and with the associated tracing a hard copy can be made. Concern is raised, however, that when the recording is done by the EFM, data including not only the heart rate but the variability and possible accelerations or decelerations are recorded and then must be interpreted according to EFM guidelines [6, 15]. There is no standard in this regard, and the issue must be addressed by each institution and individual clinician.

When you first approach a pregnant woman with the intent of auscultation, it is important to consider the fetal lie in order to optimize the quality of the heart sounds. Listening through the fetal back gives the clearest sound. Leopold maneuvers are quite useful in determining the fetal lie in order to make the best estimate of the placement for the fetoscope or Doppler (see Chapter 53). If using a DeLee-Hillis or Allen fetoscope, the bell must be placed tightly against the maternal abdomen to have a good air seal, and the headpiece against the listener's forehead in order to utilize bone conduction. Similarly, the bell of a Pinard fetoscope is placed firmly on the mother's skin, ensuring contact with the entire rim of the bell; the listener then places an ear firmly against the earpiece for best transmission of sound. Doppler devices require use of a gel between the face of the transducer and the maternal skin in order to ensure transmission of sound without air interference.

Initial auscultation should be for a minimum of 1 minute, between contractions, to begin to determine the baseline heart rate and to listen for regularity of the rate. In order to determine a baseline heart rate, it is necessary to listen between contractions for several intervals within a 10-minute period to confirm consistency of the FHR and to identify the baseline. Then, the FHR should be auscultated following a contraction to determine if there is a significant change in the heart rate as a result of the contraction. Regularity of the rate should be listened for as well. Once a baseline regularity of the FHR and lack of significant decreases in the heart rate have been established, it is important to listen for at least 30 seconds during subsequent auscultation periods. If the woman is in active labor, the timing of auscultation should immediately follow a contraction.

Auscultation has been shown to be able to identify baseline FHRs and changes in the rhythm of the heart rate and to appreciate accelerations of the heart rate [32–34, 37]. It cannot identify long- or short-term variability [6, 12, 31]. Decelerations can be identified as a decrease of the heart rate, but specific timing of the decelerations in relationship to uterine contractions cannot be determined with assurance [6], nor can the degree of decline of the heart rate, such as sudden with a variable deceleration or gradual with an early or late deceleration. Thus decelerations cannot be categorized as early, variable, or late in character. Instead, auscultation of decreases in the FHR can be described as brief or prolonged by the auscultated duration and by the slowest rate counted or registered on the Doppler device.

The guidelines for minimal frequency of auscultation of the fetal heart arise from multiple research studies [8–10] as well as from the NICHD guidelines [27] and current ACOG guidelines [12]. Some authors advocate use of risk factors as a means of determining the frequency of auscultation [12]. Unfortunately, specific risk factors are not usually documented, and this area of the guidelines has been ambiguous. Risk factors should include any maternal or fetal indication of risk of decreased blood flow and oxygenation to the fetus during labor. This would include, but is not limited to, the following factors: maternal hypertension, insulin-dependent diabetes, IUGR, oligohydramnios, unexplained vaginal bleeding, multiple gestation, and oxytocin-induced labors. The suggested time frames for auscultation are noted in Table 27-1.

When auscultation is used as an assessment technique, then the uterine contractions must be assessed by palpation as well as by observation of the mother. The frequency, duration, and intensity of the contractions must be identified [6, 35, 37]. The frequency of this assessment is not necessarily done

TABLE 27-1 Guidelines for Intermittent Auscultation

Minimum Frequency of Auscultation
Without risk factors: q 30 min in active phase q 15 min in 2nd stage With risk factors: q 15 min in active phase after a contraction q 5 min in 2nd stage
After establishment of a baseline and regular rhythm, listen for 30 sec minimum after a contraction.
Also auscultate prior to: AROM ambulation immersion in water or shower administration of analgesics/anesthesia
Assess and document FHR following: ROM recognition of abnormal uterine contraction patterns expulsion of an enema vaginal examination ambulation evaluation of analgesia and/or anesthesia

or documented with every episode of auscultation. The midwife and nurse or labor assistant may individualize this for each woman. (See Chapter 26 for a detailed discussion of assessing contractions in labor.)

If changes in the baseline heart rate are identified, decelerations noted, or fetal arrhythmias heard, consideration must be given to closer assessment of the FHR pattern. A longer listening period may be initiated, or increased frequency of auscultation. If a deceleration is persistent, or the heart rate is bradycardic, the woman should be turned to her side and reevaluated, a different listening device may be used, or fetal scalp stimulation may be performed as a test of fetal oxygenation [6]. If a nonreassuring pattern persists, consultation should be sought, oxygen therapy considered, and intravenous fluids initiated or increased depending on the clinical situation. If concern for the fetus is such that delivery must be effected as soon as possible, frequent auscultation and documentation of results must continue while keeping the obstetric team apprised of the FHR pattern.

In some cases, an EFM tracing may be initiated to confirm fetal status. Explain the concern and reasons for changing monitoring methods to the laboring woman and her support persons. If the EFM strip confirms an abnormal FHR pattern, clinical management should progress as indicated. If, however, the strip is reassuring, then a return to auscultation may be considered. Documentation of the FHR findings as well as interpretation and management considerations are essential (see Figure 27-1). Tables 27-2 and 27-3 identify benefits and limitations of IA and EFM.

Documentation of IA is critical in management of the course of labor as well as for retrospective review of the chart to evaluate care of the fetus in labor. As with other vital signs, IA must be documented after each episode of auscultation as there is no hard copy being recorded as there is with a fetal monitor strip [15]. The graph for documentation of IA should be simple and straightforward, allowing for little extra time to be wasted with excess documentation. However, one of the biggest problems from a medical-legal point of view is the lack of timely documentation of IA according to the guidelines of the birth site.

Electronic Fetal Monitoring

The electronic fetal monitor allows for display of the fetal heart rate pattern and the uterine contraction pattern. It can be used with either external or internal devices, dependent on the clinical situation. For external fetal heart rate monitoring, an ultrasound transducer is secured to the maternal abdomen, over the area of the fetal heart, by an elastic strap. A uterine pressure tocodynamometer (toco) can be similarly secured, resting on the maternal fundus. External fetal monitoring is appropriate for the majority of women. In most situations, with careful placement of the abdominal transducer and toco, the FHR and contractions will print out adequately for interpretation. The equipment and its electrical cords limit the distance a woman can move about. In addition, maternal movement can cause interference in the signal, sometimes obscuring or making unreadable the data being collected.

In the event that the fetal heart rate or the contractions are not being adequately displayed, then internal monitoring of one or both components may be considered. Particularly if the fetal heart rate pattern is nonreassuring, an internal fetal electrode may be desirable in order to collect the most accurate information. With earlier fetal monitors (first generation), external monitoring displayed too much interference to allow accurate interpretation of baseline variability. External fetal monitoring with autocorrelation (all current instrumentation) can be used with nearly the same reliability as internal monitoring [27]. Therefore, only if there were minimal to

Birth Center USA

Labor Flow Sheet

Name _____

Date _____

Date	Time	FHR	Rhythm	Accel Decel	Ctx Freq	Ctx Dur	Ctx Inten	Comments

FIGURE 27-1 Graph for Documentation of Intermittent Auscultation (IA).

absent variability would internal monitoring be indicated for the purpose of evaluating baseline variability. If the fetus is very active or the mother is obese or unable to remain relatively still, or if there are multiple decelerations rendering the strip difficult to interpret with external monitoring, then internal monitoring should be considered to optimize documentation of the data being interpreted.

Internal monitoring can be accomplished, after rupture of the membranes, by means of a fetal scalp electrode, which is a curved wire that is placed on the fetal scalp and secured by twisting the electrode until the fetal scalp is pierced and the electrode is secured superficially under the skin (see Chapter 65). The wires extending from the electrode are entrapped in an electronic transmission device that is then secured to the maternal thigh with an elastic or Velcro belt. The fetal scalp electrode then transmits the fetal electrocardiogram to the monitor, which displays a digital signal of the FHR as well as a continuous graph of the heart rate.

Documentation of contractions by the external tocodynamometer allows for the tracing to demonstrate the onset, peak, and resolution of contractions as well as the time between them. It also provides the information against which to determine the periodicity of any decelerations of the fetal heart rate. However, the external toco cannot determine the actual strength of contractions. Tightening the monitor straps or changing the posi-

TABLE 27-2 Benefits and Limitations of Intermittent Auscultation

Benefits
Neonatal outcomes are comparable to those with EFM.
Cesarean birth rates are lower.
Technique is noninvasive.
Woman's freedom of movement is not impaired.
The FHR can be assessed if the woman is immersed in water.
The equipment is less costly than EFM equipment.
Hands-on, individualized care must be provided.
Limitations
The use of a fetoscope may limit the ability to hear the FHR (e.g., in cases of maternal obesity or increased amniotic fluid).
FHR variability cannot be detected.
Periodicity of FHR decelerations (variable, late, early) cannot be determined.
There is no permanent visual record of the data.
There is a potential need to increase or to realign staff to meet the 1:1 nurse-to-patient ratio that is recommended based on RCTs that compare auscultation and EFM.
Some women may feel auscultation is more intrusive.

TABLE 27-3 Benefits and Limitations of EFM

Benefits
Recorded data provide for collaborative decision-making and education.
Continuous recording is perceived by nursing administrators to decrease need for 1:1 nursing care.
It is an excellent predictor of fetal well-being.
Recorded strip demonstrates FHR and contractions simultaneously.
Some women are reassured with use of high tech.
May offer assistance with coaching to identify onset of contractions.
Limitations
Increased cesarean sections (which then includes increased rates of general anesthesia and infection).
Interrater reliability is poor.
Prevents normal movement, walking during labor.
Creates false sense of security.
There is no consensus on guidelines for interpretation of FHRs.
There is no agreement regarding need for or timing of intervention.
Terminology is varied and not precise.
Cannot be used in water.
There is increased operative vaginal delivery (forceps and vacuum assist).
Uses expensive equipment.
There is a high false-positive rate for suspected fetal compromise.

Source: Adapted from Schmidt, J. V. History and development of fetal heart rate assessment: a composite. *JOGGN* 29(3):295–305 (May/June) 2000.

tion of the toco can show very different apparent intensity of contractions. Internal uterine monitoring is accomplished by placing an intrauterine pressure catheter (IUPC) through the cervix and into the uterine cavity (see Chapter 64). The IUPC has the advantage of providing specific information about the resting tone of the uterus, the actual pressure generated by the contractions, and very accurate timing of the onset, peak, and completion of the contraction. In the event of induction of labor, especially if the progress of labor is slower than expected, an IUPC may be indicated. If amnioinfusion is needed, it will be done through the same catheter as the IUPC (see Chapter 64).

The fetal monitor strip has an upper and lower display area on the paper. The upper portion will display the fetal heart rate pattern with increments of 10 bpm graphed on the vertical axis. The lower

portion displays the uterine contractions with gradations for 0 to 100 Montevideo units on the vertical axis (only for interpretation with an IUPC). The horizontal is marked into 10-second and 1-minute segments. Therefore, the FHR pattern, the contraction pattern, and the timing and relationship of each are displayed.

Interpretation of a fetal monitor strip should progress in a predictable fashion, using standardized nomenclature. The definitions used in this chapter are from research guidelines for interpretation issued in 1997 by the NICHD [27] (see Table 27-4). A lack of standardized language, definitions, and interpretation has been identified as a major concern with EFM.

TABLE 27-4 Definitions for Interpretation of Fetal Heart Rate Patterns

The individual components of the FHR patterns that are defined do not occur alone and generally evolve over time. Therefore a full description of FHR tracing requires a qualitative and quantitative description of the following:

1. Baseline rate
2. Baseline FHR variability
3. Presence of accelerations
4. Periodic or episodic decelerations
5. Changes or trends of FHR patterns over time

Definitions of FHR Patterns

Periodic patterns: Those patterns associated with uterine contractions.

Episodic patterns: Those patterns not associated with uterine contractions. To determine uterine activity, a tocodynamometer tracing of good quality is required.

Recurrent decelerations: Tentatively defined as those decelerations that occur with > or = to 50% of uterine contractions in any 20 minute segment.

Baseline FHR: The approximate mean FHR rounded to increments of 5 beats per minute (bpm) during a 10 minute segment, excluding the following:

1. Periodic or episodic changes
2. Periods of marked FHR variability
3. Segments of the baseline that differ by >25 bpm

In any 10 minute window, the minimum baseline duration must be at least 2 minutes or the baseline for that period is indeterminate. In this case it may be necessary to refer to the previous 10 minute segment(s) for determination of the baseline.

If the baseline FHR is <110 bpm, it is termed *bradycardia*; if the baseline FHR is >160 bpm, it is termed *tachycardia*. Bradycardia and tachycardia are quantitated by the actual FHR in beats per minute, or the visually determined range if the FHR is not stable at one rate.

Baseline FHR variability: Deemed as fluctuations in the baseline FHR of two cycles per minute or greater. These fluctuations are irregular in amplitude and frequency and are visually quantitated as the amplitude of the peak-to-trough in beats per minute as follows:

1. Amplitude range undetectable: absent FHR variability
2. Amplitude range > undetectable < or = to 5 bpm: minimal FHR variability
3. Amplitude range 6 to 25 bpm: moderate FHR variability
4. Amplitude range >25 bpm: marked FHR variability

No distinction is made between short-term variability (or beat-to-beat variability or R-R wave period differences in the electrocardiogram) and long-term variability because in actual practice they are visually determined as a unit. Hence the definition of variability is based visually on the amplitude of the complexes, with exclusion of the regular, smooth sinusoidal pattern.

Acceleration: A visually apparent abrupt increase (defined as onset of acceleration to peak in <30 seconds) in FHR above the baseline. The increase is calculated from the most recently determined portion of the baseline. The acme is > or = to 15 bpm above the baseline, and the acceleration lasts > or = to 15 seconds and <2 minutes from the onset to return to baseline. Before 32 weeks of gestation, accelerations are defined as having an acme > or = to 10 bpm above the baseline and a duration of > or = to 10 seconds.

Prolonged acceleration: More than or equal to 2 minutes and <10 minutes in duration. Acceleration of > or = to 10 minutes is a baseline change.

TABLE 27-4 Definitions for Interpretation of Fetal Heart Rate Patterns (*continued*)

Late deceleration of the FHR: A visually apparent gradual (defined as onset of deceleration to nadir > or = to 30 seconds) decrease and return to baseline FHR associated with a uterine contraction. The decrease is calculated from the most recently determined portion of the baseline. The deceleration is delayed in timing, with the nadir of the deceleration occurring after the peak of the contraction. In most cases the onset, nadir, and recovery of the deceleration occur after the beginning, peak, and ending of the contraction, respectively.

Early deceleration of the FHR: A visually apparent gradual decrease (defined as onset of deceleration to nadir > or = to 30 seconds) and return to baseline FHR associated with a uterine contraction. The decrease is calculated from the most recently determined portion of the baseline. It is coincident in timing, with the nadir of the deceleration occurring at the same time as the peak of the contraction. In most cases the onset, nadir, and recovery of the deceleration are coincident with the beginning, peak, and ending of the contraction, respectively.

Variable deceleration of the FHR: A visually apparent abrupt decrease (defined as onset of deceleration to beginning of nadir <30 seconds) in FHR below the baseline. The decrease is calculated from the most recently determined portion of the baseline. The decrease in FHR below the baseline is > or = to 15 bpm, lasting > or = to 15 seconds, and <2 minutes from onset to return to baseline. When variable decelerations are associated with uterine contractions, their onset, depth, and duration commonly vary with successive uterine contractions.

Prolonged deceleration of the FHR: A visually apparent decrease in FHR below the baseline. The decrease is calculated from the most recently determined portion of the baseline. The decrease from the baseline is > or = to 15 bpm, lasting > or = to 2 minutes, but <10 minutes from onset to return to baseline. Prolonged deceleration of > or = to 10 minutes is a baseline change.

Any deceleration is quantitated by the depth of the nadir in beats per minute below the baseline (excluding transient spikes or electronic artifact). The duration is quantitated in minutes and seconds from the beginning to the end of the deceleration. Accelerations are quantitated similarly.

Source: From National Institute of Child Health and Human Development, Research Planning Workshop. Electronic fetal heart rate monitoring: research guidelines for interpretation. *Am. J. Obstet. Gynecol.* 77(6):1385–1390, 1997.

Fetal heart rate patterns are caused by or associated with many clinical situations. It is important for the midwife to understand the range of influences that can effect changes in the FHR. Identification of the cause of the abnormal FHR patterns, when possible, allows the midwife to implement corrective measures and further develop the management plan.

In the term fetus, fetal tachycardia alone is not usually associated with poor outcomes. Fetal tachycardia—combined with either late decelerations or prolonged variable decelerations, and absent variability, with or without meconium—is indicative of fetal hypoxia. The preterm fetus, whose organ systems are immature, and the postterm fetus, in whom the placenta has begun aging, may not tolerate these changes as effectively as the term fetus. Every effort should be made to identify the cause of fetal tachycardia, alleviate the problem when possible, and obtain other measures of fetal well-being such as scalp stimulation or scalp blood sampling.

Tachycardia without other fetal heart rate changes may indicate the following:

1. Prematurity (<28 weeks gestation); sympathetic tone develops in the autonomic nervous system before parasympathetic tone.
2. Maternal hyperthermia, either systemic or from chorioamnionitis.
3. Fetal hypoxia; decelerations are an early sign of hypoxia, but, severe, prolonged hypoxia may result in baseline tachycardia [12].
4. Administration of drugs, including beta sympathomimetics such as terbutaline (Brethine); drugs used to treat asthma such as theophylline (Slo-Bid, Theo-Dur, Uniphyl); and drugs used to treat hypertension such as hydralazine (Apresoline) and atenolol (Tenormin).
5. Congenital anomalies, especially those that are cardiac in origin.
6. Maternal dehydration, with or without hyperthermia, such as that precipitated by heat stroke, diabetic ketoacidosis.
7. Fetal anemia; related to Rh sensitization, nonimmune hydrops, fetal-maternal bleed, abruptio placentae.
8. Hyperthyroidism, especially if it is poorly controlled or leads to the development of thyroid storm.

Fetal bradycardia >80 bpm, that is accompanied by adequate variability, is rarely associated with fetal acidemia. However, bradycardia without variability, in the presence of prolonged or late decelera-

tions is often related to hypoxia and metabolic acidosis. Bradycardias that result from severe hypoxia have absent variability and will not return to the baseline. Instead, they will progressively worsen with increasing acidosis and may be seen immediately prior to intrauterine fetal death.

A low baseline FHR of 100 to 120 bpm alone may indicate the following:

1. Maternal hypothermia
2. Prolapsed cord: occult, complete, or intermittent cord compression
3. Fetal hypoxemia or asphyxia (acute or chronic)
4. Vagal stimulation resulting from maternal Valsalva, vaginal exam, rapid descent, or posterior or transverse position of the fetal head in a vertex presentation
5. Cardiac anomalies; sustained fetal bradycardia with positive fetal movement is associated with complete or incomplete atrioventricular heart block
6. Administration of drugs such as propranolol, local anesthetics

In the presence of fetal bradycardia (<110 bpm) the midwife should assess for the following:

1. Presence of prolapsed cord
2. Duration of bradycardia
3. Presence or absence of variability
4. Late or prolonged variable decelerations
5. Expected length of time until delivery

Minimal or Absent Variability

Since the advent of internal fetal heart rate monitoring, heart rate variability has become the most significant indicator used by the experienced clinician to evaluate neurological status and normal cardiac response (see Figure 27-2). Average variability in the fetal heart rate indicates that the fetus's autonomic nervous system, which controls the fetal heart rate, is mature and well oxygenated [35]. Diminished variability (minimal or absent) can be due to a variety of causes such as fetal sleep, drugs, anemia, or hypoxia. When variability is minimal, without the presence of decelerations, it is rarely caused by asphyxia [35]. However, when the variability is absent, especially with associated periodic decelerations, the risk of asphyxia acidosis is high [27]. The following are the most common causes of decreased or absent variability:

1. Fetal sleep cycles, which should persist no longer than 80 minutes in the average fetus
2. Prematurity (<28 weeks gestation)
3. Administration of drugs such as analgesics/narcotics, barbiturates, tranquilizers, phenothiazines (Phenergan), beta adrenergic agents (terbutaline), and anesthetics
4. Congenital neurological anomalies such as anencephaly or cardiac anomalies with conduction system defects
5. Fetal hypoxia and acidosis—the most ominous explanation for decreased variability

Accelerations

Acceleration patterns are transient increases of the fetal heart rate above the baseline (see Figure 27-3). Accelerations are associated with fetal movement. Accelerations in the antepartum and intrapartum period are a reassuring indicator of fetal well-being and are associated with a normal pH. In addition to spontaneous fetal movement, events that may trigger accelerations include fetal scalp stimulation and acoustic stimulation.

Deceleration Patterns

Early Deceleration Early deceleration is thought to be caused by head compression (see Figure 27-4). It is associated with cervical dilatation of 4 to 7 centimeters and is thought to be initiated by the pressure of the dilating cervix across the posterior fontanel in a normal presentation. The pattern may return shortly before delivery when the head receives pressure from the perineal floor during contractions. Early decelerations are not considered to be a pattern that requires treatment or intervention as long as they are carefully differentiated from a late deceleration pattern.

Variable Deceleration Variable decelerations are thought to be caused by umbilical cord compression. A variety of causes of umbilical cord compression have been postulated. In vertex presentations these include positioning of the cord around the neck and body, true knots in the cord, frank and occult prolapse of the cord, and compression due to decreased amniotic fluid. Variable decelerations vary both in duration and in shape from occurrence to occurrence in relation to uterine contractions. They have been described variously as V-shaped, U-shaped, and W-shaped. Thus the pattern is one of variable shape (see Figure 27-5). The onset of variable decelerations is unpredictable and occurs at different times in relation to the onset and duration of the uterine contractions.

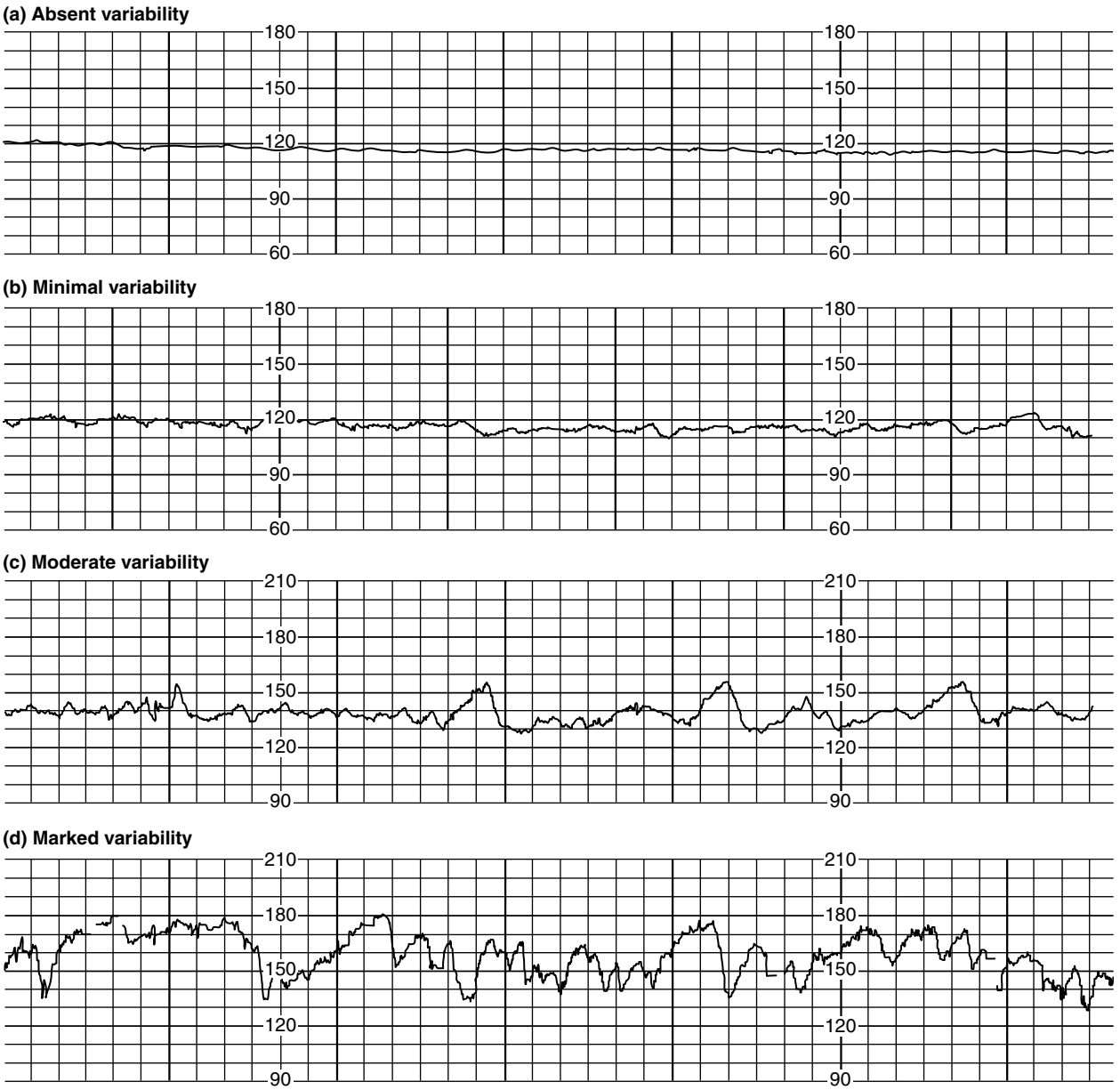


FIGURE 27-2 Range of FHR variability.

Variable decelerations are the most common FHR changes seen in labor and are not usually associated with abnormal outcomes. The seriousness of variable decelerations depends on their frequency, depth, rate of return, effect on baseline fetal heart rate, and variability. Variable decelerations that quickly return to a normal baseline with average variability are not associated with hypoxemia and acidosis. Variables are considered to be nonreassuring when they become progressively repetitive and deeper, last longer, and are associated with tachycardia and/or diminished variability. Variable decelerations that drop to less than 70 bpm for more than 60 seconds and those which have a slow return to the baseline are considered nonreassuring. When nonreassuring variable decelerations are accompanied by a diminished variability or tachycardia, they are more frequently associated with fetal acidosis [12].

Late Deceleration A pattern of late decelerations is thought to be due to uteroplacental insufficiency and a subsequent decrease in oxygen availability to the fetus. Late decelerations are caused by decreased pla-

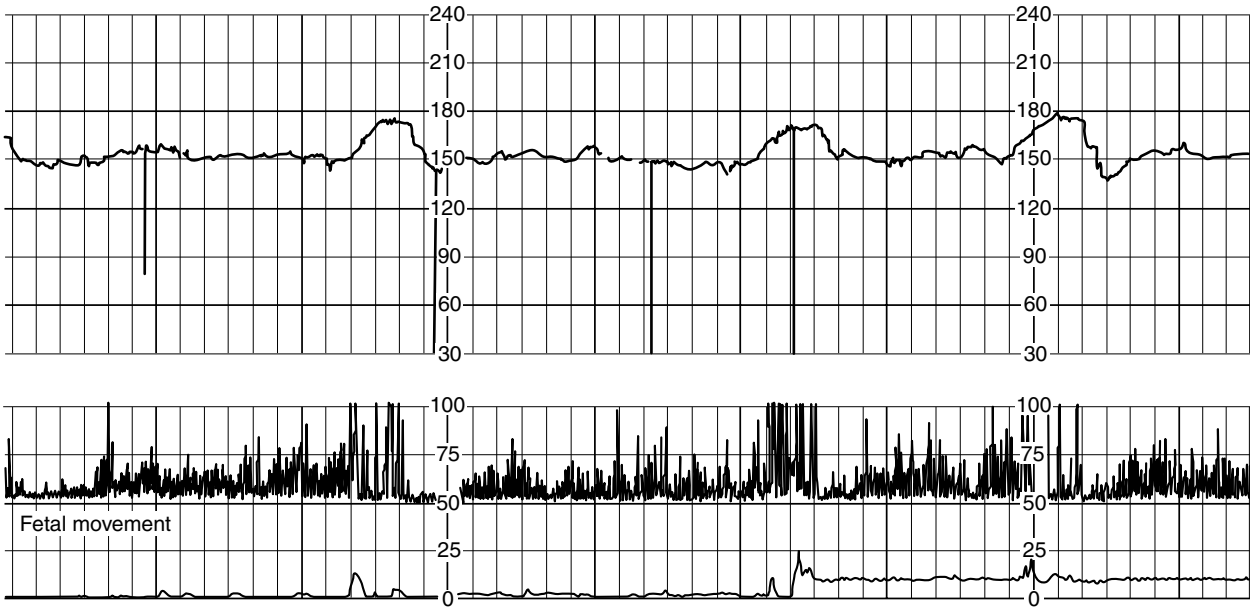


FIGURE 27-3 Accelerations of the fetal heart rate. Note the correlation with fetal movement.

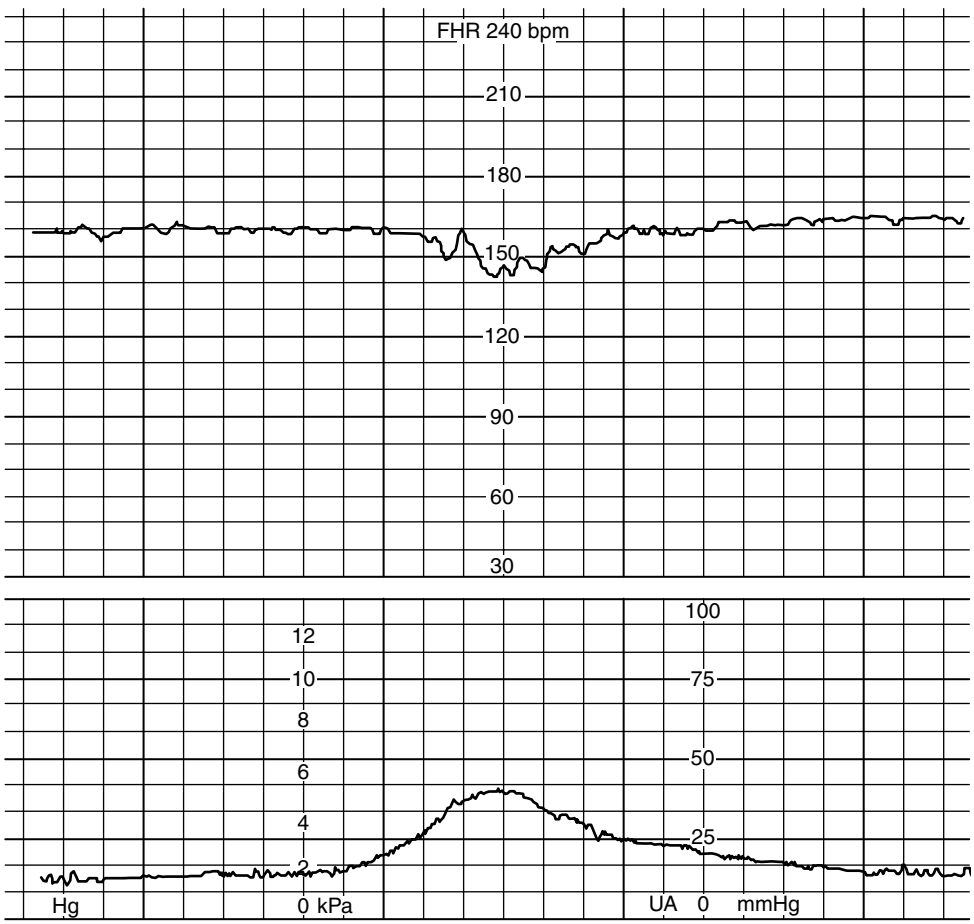


FIGURE 27-4 Early decelerations. Note that the onset and nadir are consistent with the peak of the contraction.

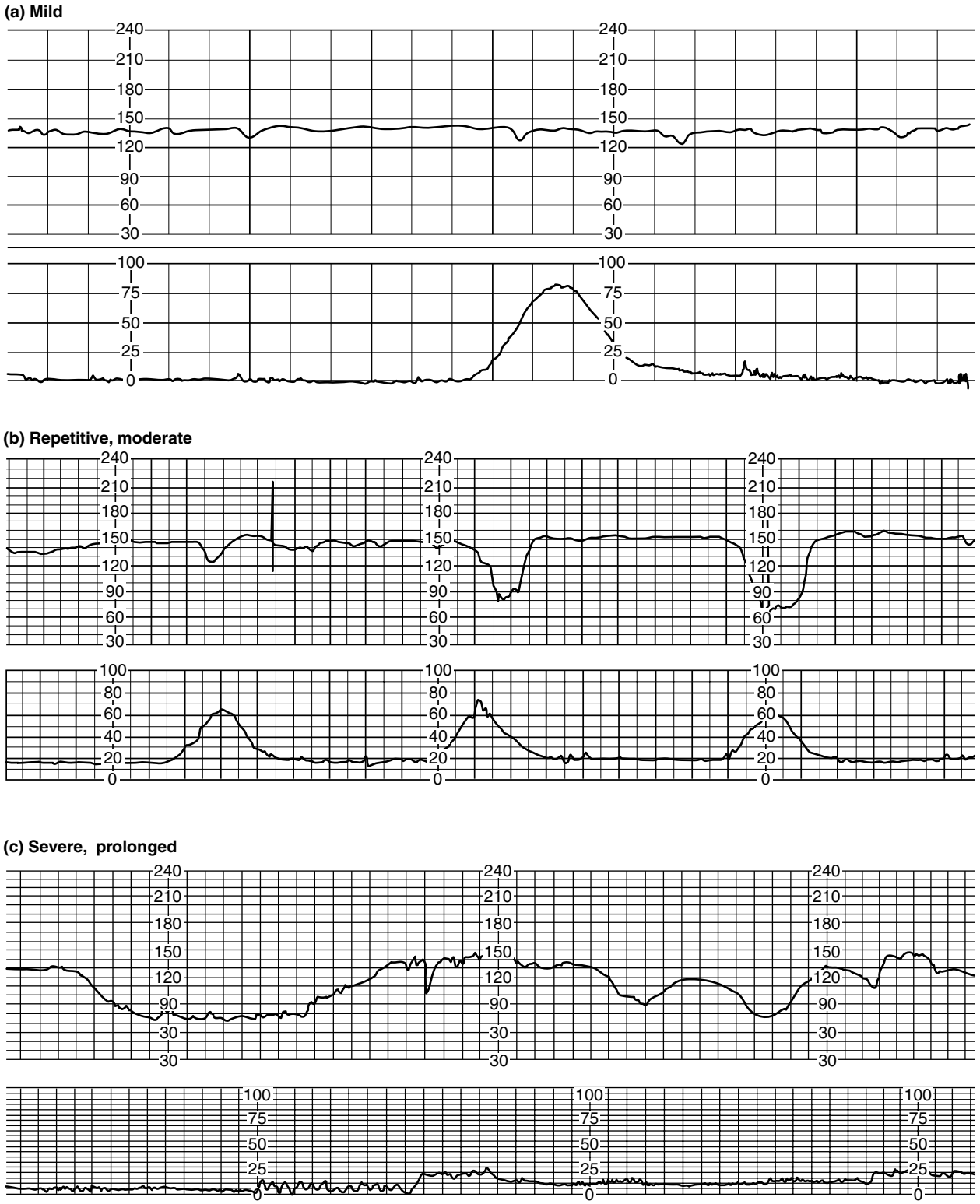


FIGURE 27-5 Variable decelerations.

cental perfusion caused by uterine contractions. As the contraction strengthens, the blood supply diminishes and the fetal heart rate decelerates until the contraction has peaked and blood flow again improves, allowing adequate oxygenation of the fetus with a resultant increase in the FHR. Thus the deceleration is uniform in shape with the drop in FHR beginning near or after the peak of the contraction and resolution of the deceleration occurring after the contraction has subsided (see Figure 27-6). In the absence of

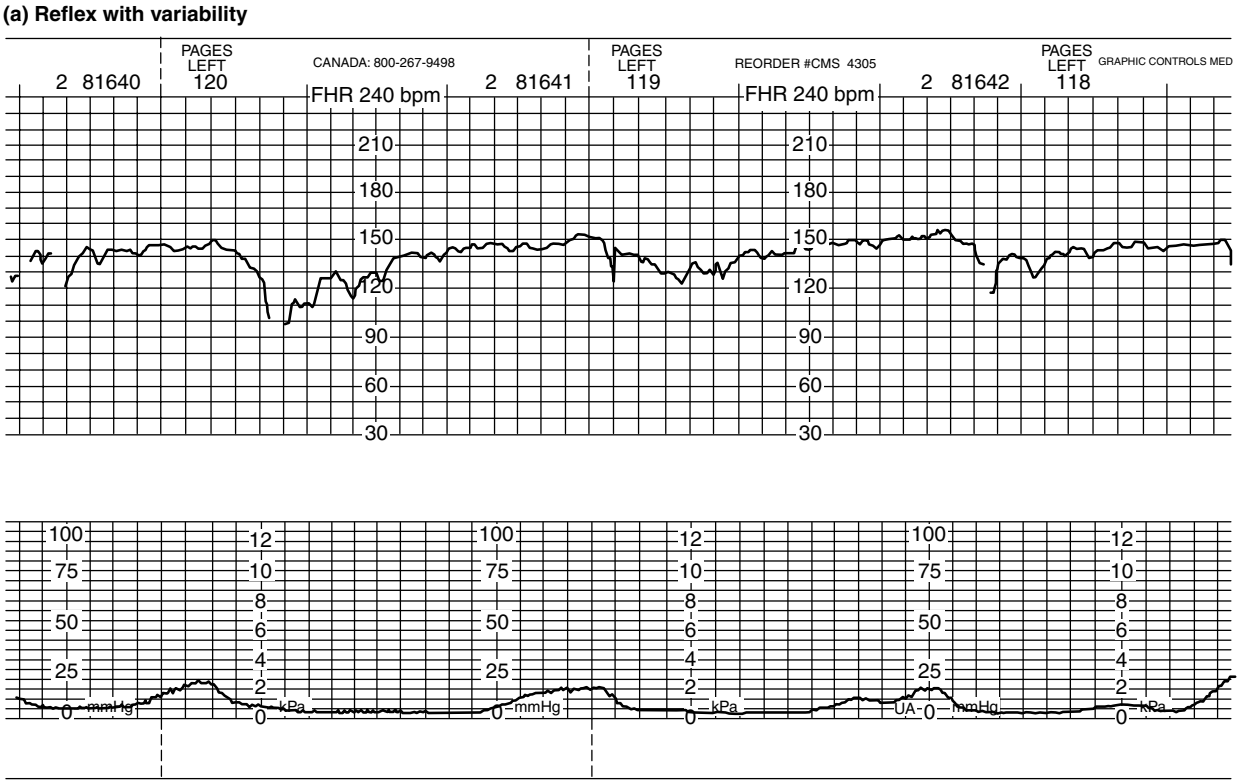


FIGURE 27-6 Late decelerations.

acidemia, this is a reflex mechanism only and may occur intermittently, which is not considered to be nonreassuring. With prolonged hypoxic events, metabolic acidosis develops and myocardial depression begins to occur; the decelerations are persistent, occurring with a majority of contractions, and they are considered to be nonreassuring. Uncorrected uteroplacental insufficiency is a life-threatening condition and always requires intervention to correct it or expeditious delivery must ensue. The fetal heart rate in a late deceleration will usually be within the normal range and can be as shallow as 10 bpm below the baseline rate. The severity of the fetal hypoxia cannot be measured by the depth of the deceleration.

The causes of chronic and acute uteroplacental insufficiency include the following:

1. Intrauterine growth retardation associated with maternal chronic hypertension, lupus erythematosus, poorly controlled diabetes, hyperthyroidism, or intrauterine infection
2. Hypertensive disorders (pregnancy-induced hypertension, chronic hypertension, chronic hypertension with superimposed PIH)
3. Maternal hypotension syndrome associated with supine positioning, conduction anesthesia, severe dehydration, or septic shock
4. Hypertonic uterine contractions such as those caused by administration of oxytocin or prostaglandins
5. Postmaturity
6. Abnormal placentation (placenta previa, vasa previa, infarction of one or more lobes)
7. Fetal anemia associated with RH sensitization, nonimmune hydrops, or fetal-maternal hemorrhage

Prolonged Deceleration Pattern Prolonged decelerations are defined as decelerations of the fetal heart rate lasting longer than 60 to 90 seconds and usually occurring as isolated events (see Figure 27-7).

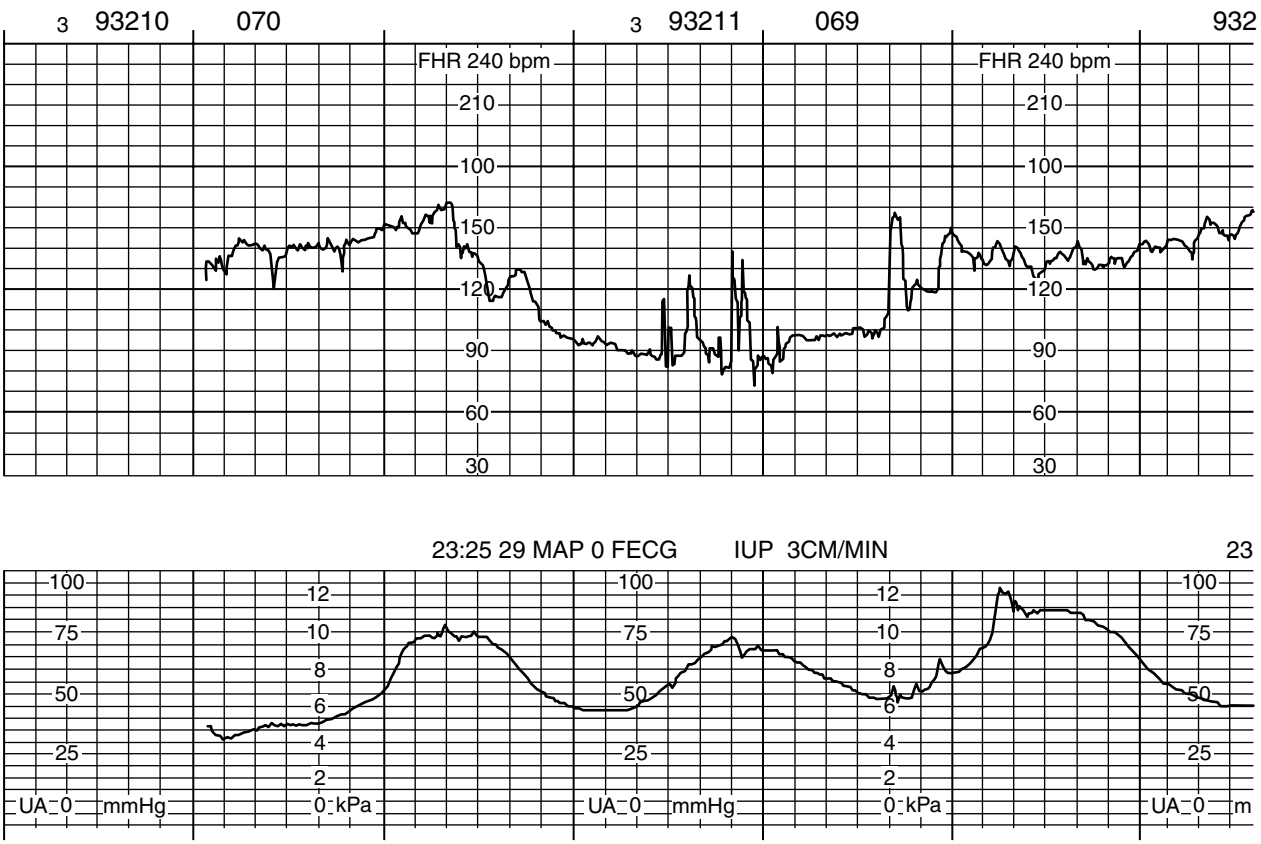


FIGURE 27-7 Prolonged deceleration pattern.

They have a variety of mechanisms and therefore have multiple pathophysiological causes. Known precipitating factors associated with prolonged decelerations include the following:

1. Umbilical cord compression
2. Profound uteroplacental insufficiency
3. Hypotension related to supine positioning or epidural or spinal anesthesia
4. Paracervical anesthesia, which can cause decelerations by one of three mechanisms (direct fetal uptake of local anesthetic, maternal hypotension, and uterine hypertonus)
5. Hypertonic or tetanic uterine contractions
6. Administration/ingestion of drugs such as Dramamine or Demerol when combined with Phenergan and cocaine
7. Maternal hypoxia associated with seizures or acute respiratory depression
8. Pelvic exam
9. Maternal Valsalva
10. Rapid descent of the fetal head

Management of prolonged decelerations depends on the cause, length of deceleration, and recovery of the fetus following the pattern. It is common for the fetus to recover with a period of tachycardia, decreased variability, and occasionally late decelerations. If the precipitating cause is alleviated, the fetus will usually recover spontaneously. Occasionally the decelerations become protracted and may precede fetal death. If prolonged decelerations recur, the midwife should notify the consulting physician and prepare the woman for cesarean birth.

Sinusoidal Pattern A sinusoidal pattern is one in which there is an undulating, repetitive, uniform fetal heart rate equally distributed 5 to 15 bpm above and below the baseline for at least 10 minutes (see Figure 27-8). The undulation has no relationship to either the contraction pattern or fetal movement. It occurs at a rate of 2 to 6 cycles per

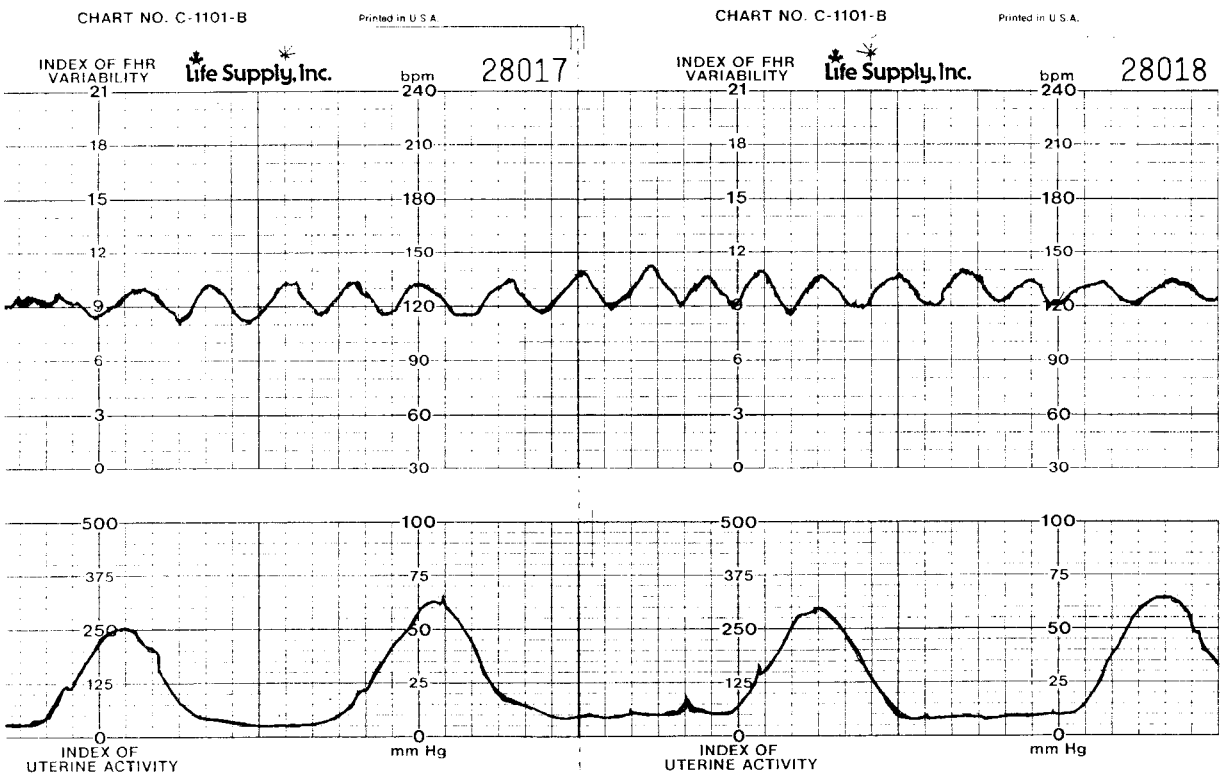


FIGURE 27-8 Sinusoidal pattern. (Courtesy of Nancy McCluggage, CNM, MA)

minute and is identified by an absence of short-term variability and no fetal heart rate accelerations following its occurrence. True sinusoidal patterns are extremely rare.

Significant sinusoidal fetal heart rate patterns are associated with chronic fetal anemia, as seen in isoimmunization and abruptio placentae and severe hypoxia with acidosis. Under these conditions, a sinusoidal heart rate pattern is always an ominous fetal heart rate pattern, and immediate intervention must occur if fetal death is to be prevented. The midwife should notify the consulting physician immediately and prepare the woman for emergency cesarean birth. The neonatal team should be notified to prepare for a potentially severely anemic, hypoxic, or acidotic newborn.

Wandering Baseline The wandering baseline appears to be a very late development in the progression of fetal deterioration (see Figure 27-9). It is an extremely rare finding diagnosed when the midwife has been unable to establish a baseline fetal heart rate. The wandering baseline is usually within the normal baseline parameters of 120 to 160 bpm but is identifiable by its total absence of short-term variability. This is an ominous indicator of fetal distress and requires immediate notification of the consulting physician and preparation for emergency cesarean birth.

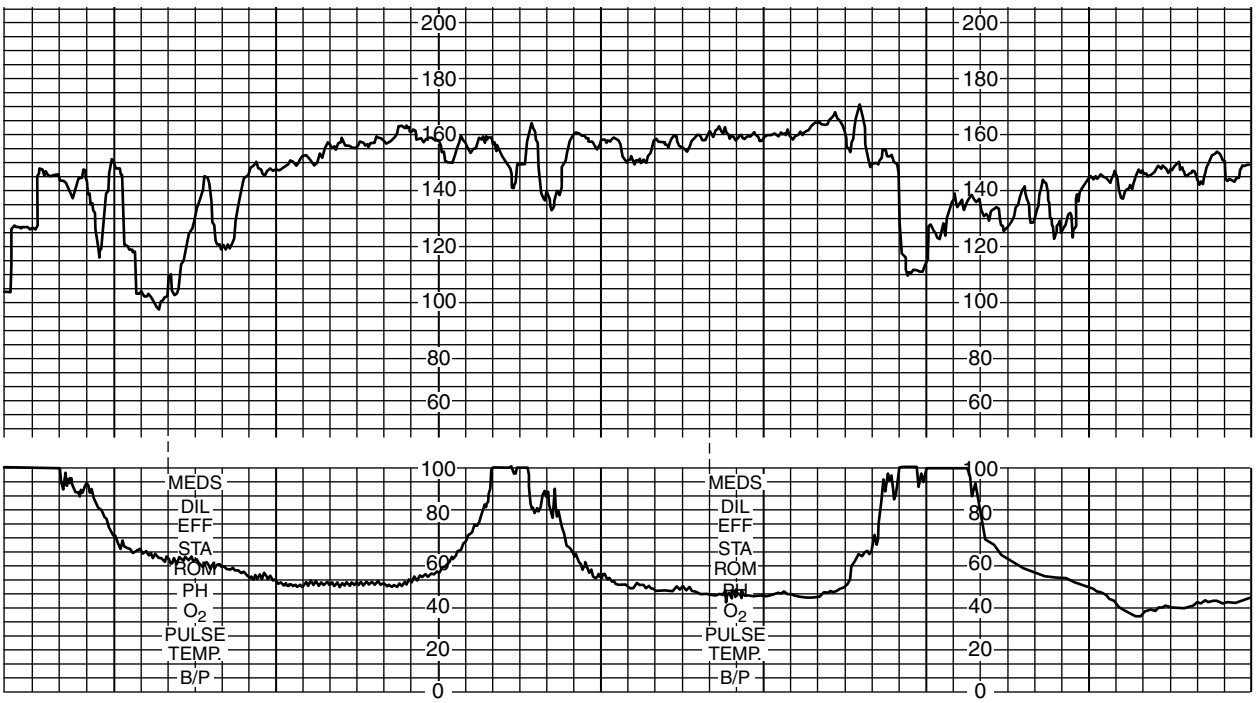


FIGURE 27-9 Wandering baseline.

Midwifery Management of Nonreassuring Fetal Heart Rate Patterns

All abnormal fetal heart rates and patterns require that the midwife notify the consulting physician immediately if there is not a clear cause of the pattern such as narcotic administration or if the pattern does not resolve with usual attempts to resuscitate the fetus in utero. Detection and identification of these abnormalities are essential. When a nonreassuring heart rate is present, it must be considered in reference to other factors in the clinical scenario such as the following:

1. Maternal complications that increase the risk for uteroplacental insufficiency (e.g., preeclampsia, hypertension, diabetes, lupus erythematosus)
2. Fetal complications (e.g., postdates, intrauterine growth retardation, decreased amniotic fluid index)
3. The differential diagnosis of the fetal heart rate pattern
4. Presence or absence of tachycardia and/or decreased variability
5. Whether attempts to correct the underlying problem are successful
6. Acid-base status of the fetus determined either through scalp or acoustic stimulation or via direct fetal scalp blood sampling
7. Presence or absence of meconium
8. Gestational age (with the preterm fetus having a lower tolerance for hypoxia than the term infant)
9. Anticipated time until birth
10. Availability of consultant physician, emergency operative staff and facility

Midwifery management of nonreassuring fetal heart rate patterns will be determined by the actual FHR pattern and its duration and severity. If a fetus has recently had a reassuring pattern and now develops a nonreassuring pattern that is not emergent, such as decreased baseline variability of short duration (<60 minutes) without decelerations, multiple mild or moderate variable decelerations with rapid return to baseline and adequate variability, or transient tachycardia, the following steps may be taken:

1. Position the woman on her side to achieve the following:
   a. Redistribute uterine contents in an attempt to alleviate any cord compression.
   b. Alleviate supine hypotension syndrome.
   c. Decrease frequency of uterine contractions.
2. Assess hydration and start or increase IV hydration with a solution that does not contain glucose.
3. Consider potential causes of the changes, such as fetal sleep cycle, response to narcotic administration, oligohydramnios.
4. Consider use of fetal scalp stimulation or acoustic stimulation.
5. If using intermittent auscultation, consider use of external EFM for documentation of the FHR pattern.
6. If using EFM, consider internal fetal scalp electrode for better definition of the FHR tracing and as a means of scalp stimulation.
7. Notify the consulting physician if unchanged within a reasonable period of time.

If nonreassuring patterns of the FHR are persistent, do not respond to the above measures, or are severe (such as prolonged bradycardia or persistent late decelerations with minimal variability) the midwife must act quickly to reassure fetal well-being or prepare for delivery. The following steps may be taken by the midwife or other available staff at the direction of the midwife to expedite this management:

1. Notify the consulting physician.
2. Perform a vaginal examination to determine the following:
   a. Rule out a prolapsed umbilical cord. If the cord is prolapsed, elevate the presenting part and implement emergency delivery procedures (see Chapter 29).
   b. Ascertain if there has been rapid descent of the head.
   c. Ascertain the expected length of time until birth.
   d. Perform fetal scalp stimulation.
   e. Initiate internal fetal monitoring if indicated.
3. Begin IV hydration with a solution that does not contain glucose.
4. Discontinue any pitocin stimulation to decrease uterine activity and alleviate any resulting uteroplacental insufficiency.
5. Administer oxygen via a well-fitting face mask at 8 to 10 L/min. A well-fitting mask provides more oxygen for any level of oxygen transfer that is occurring in the presence of uteroplacental insufficiency. It is not effective when the problem is complete cord compression.
6. Perform scalp, acoustic, or abdominal stimulation of the fetus. If no acceleration occurs in response, prepare to obtain a fetal scalp blood sample.

7. Administer tocolytic therapy with 0.25 mg terbutaline subcutaneously or 0.125 to 0.25 mg intravenously to allow for intrauterine resuscitation if decelerations are related to uterine hyperstimulation or if there will be an unavoidable delay to operative intervention. Tocolytic therapy should not be used to delay intervention.
8. Perform amnioinfusion if the problem is because of umbilical cord compression. Do not delay preparations for intervention while carrying out this procedure. It may, however, be successful in correcting the problem, thus preventing the need for emergency delivery.
9. If the FHR pattern is progressively worsening or is severe, initiate preparations for delivery by cesarean section.
10. Explain the seriousness of the situation to the mother and her support persons while taking steps to alleviate the problem or preparing for delivery.

Amnioinfusion

There are two primary indications for amnioinfusion: (1) cord compression that may improve with restored intra-amniotic fluid and (2) meconium-stained amniotic fluid that may be diluted or rinsed away. Amnioinfusion has been shown to improve fetal and maternal outcomes in labors complicated by variable decelerations, oligohydramnios, and thick meconium in the amniotic fluid [38–40]. The presence of meconium with signs of fetal hypoxia (i.e., persistent late decelerations, variable decelerations, loss of variability and tachycardia, or sinusoidal pattern) is a serious indicator of fetal distress that requires prompt attention. Aspiration of thick or particulate meconium by the fetus may be decreased by amniofusion.

Amnioinfusion is a simple method used to restore the normal amount of fluid surrounding the fetus. This is accomplished by instilling sterile saline or lactated Ringer's solution through an intrauterine pressure catheter (IUPC) (see Chapter 64). The membranes must be ruptured and the cervix dilated to at least 2 centimeters to allow for insertion of the IUPC and to be safely guided into the correct placement.

Indirect, Noninvasive Means of Assessing Fetal Acid-Base Balance

Use of fetal scalp blood sampling is time consuming, uncomfortable for the woman, expensive, and not available in all settings. In addition, the single pH reading is only valid at the actual time of sampling. Both fetal scalp stimulation and vibroacoustic stimulation are simple, quick means of identifying the fetus with nonreassuring FHR patterns that actually has a normal blood pH. This has the potential to decrease the need for more invasive and expensive fetal scalp blood sampling or operative intervention. The midwife should understand the use and implications of both tests.

Fetal Scalp Stimulation A simple test of fetal well-being is stimulation of the fetal scalp through the dilated cervix. This can be done with the examining finger with 15 seconds of gentle massage of the fetal head [41–43]. If that is not adequate, an Allis clamp can be used to pinch the scalp. The anticipated response is an acceleration of the fetal heart rate of at least 15 bpm for a minimum of 15 seconds (see Figure 27-10). A reactive response correlates with a pH of >7.20; however, lack of response appears to occur in fetuses with normal pH approximately 50 percent of the time.

When performing a vaginal examination, note on the EFM strip when there is an acceleration associated with exam as an example of fetal well-being. Similarly, if auscultation is being performed during the exam and an acceleration is audible, document this in the record as well. Remember that there does not have to be a nonreassuring situation to be aware of and document signs of wellness.

Vibroacoustic Stimulation in Labor Vibroacoustic (sound) stimulation (VAS) of the term fetus with simultaneous continuous auscultation by Doppler monitoring is a noninvasive test for fetal well-being. When the FHR pattern is nonreassuring, this is a simple, quick method of indirectly obtaining information regarding fetal oxygenation. Several investigators have demonstrated that fetal heart rate accelerations in response to vibroacoustic stimulation are associated with a pH >7.25 [41, 43, 44]. Smith et al. found that of 34 fetuses who remained nonreactive following VAS, 18 had confirmed acidosis with pH <7.20 [43].

Vibroacoustic stimulation is performed using a handheld vibroacoustic stimulator (artificial larynx), which is applied to the maternal abdomen over the region of the fetal head, where it delivers a sound stimulus for 3 to 5 seconds. This may be repeated if indicated. Observe the EFM strip for the fetal response. Discussion of the use of VAS in the antepartal period is detailed in Chapter 23.

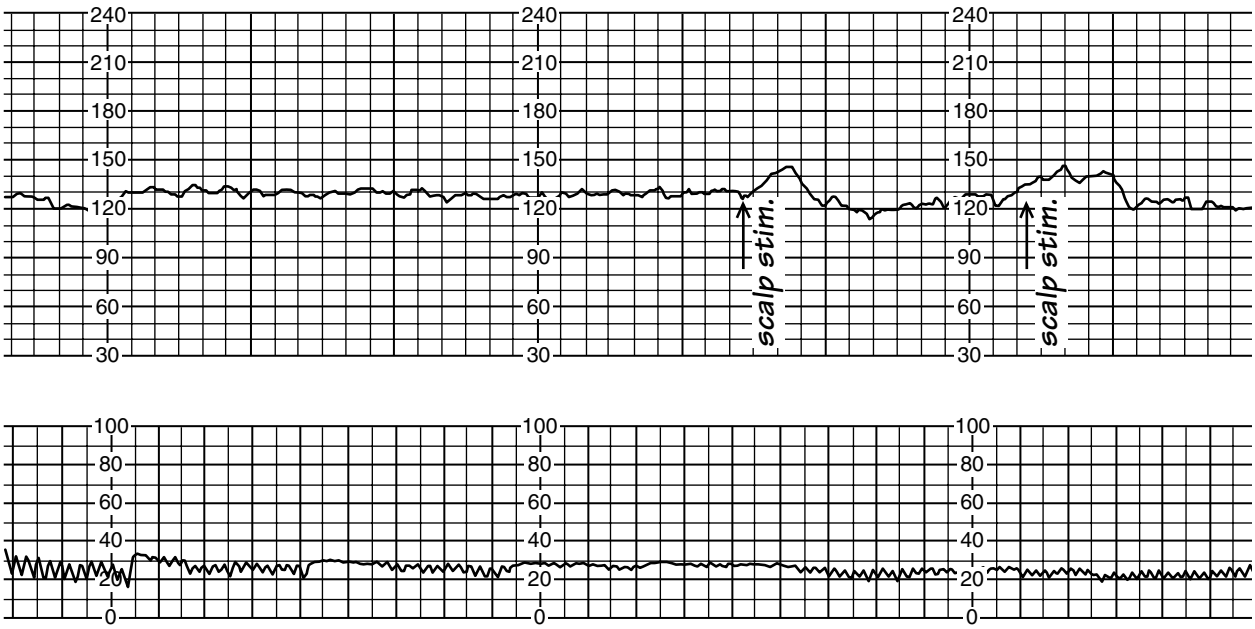


FIGURE 27-10 Fetal heart rate tracing with FHR acceleration immediately following stimulation of the fetal head with the examining finger.

Methods to Evaluate Fetal Acid-Base Balance Directly

Fetal Blood Sampling

Fetal blood sampling (FBS) of the fetal blood is the only direct means of determining fetal acid-base status. When nonreassuring FHR patterns occur, the midwife and physician must consider the severity of the patterns, maternal and fetal complications, potential for intrauterine resuscitation of the fetus, and time anticipated to birth. In some situations—for example, prolonged bradycardia in an IUGR fetus at 4 cm dilation or sudden onset of deep variable decelerations with the fetus at a +2 station—the choice of rapid cesarean or vaginal birth is an obvious choice. However, when the tracing is equivocal and birth is not imminent, more specific data regarding fetal well-being may be needed to make an appropriate management decision about the course of the labor. In the event of severe FHR patterns, time should not be squandered with the collection of FBS instead of delivering the infant as soon as possible [28].

In this case, a sample of fetal blood from the presenting part may offer the opportunity to make decisions based on the actual acid-base status of the fetal blood. In order to perform the procedure, the cervix must be dilated to 2 to 3 cm, and the membranes must be ruptured. In order to avoid supine hypotension with its potential to cause bradycardia and hypoxia, the mother should be positioned on her side. Her upper leg must be supported to allow for introduction of an amnioscope into the vagina to rest on the presenting part. A light source makes visualization of the fetus possible. The fetal skin is cleansed, a drop of silicone gel is applied, and then a 2-millimeter blade on a long handle is used to puncture the fetus. A drop of blood is then collected into a heparinized capillary tube for analysis in a blood gas analyzer (see Figure 27-11). This procedure may be repeated within a few minutes if a confirmatory sample is desired, or intermittently through the remaining course of labor as determined by the EFM tracing and serial FBS [28]. A scalp pH <7.20 is confirmation of fetal acidosis. A pH value between 7.20 and 7.25 is considered to be equivocal and should be repeated within 5 minutes. A value over 7.25 is normal, but must be repeated every 20 to 30 minutes as long as the nonreassuring FHR pattern persists [3].

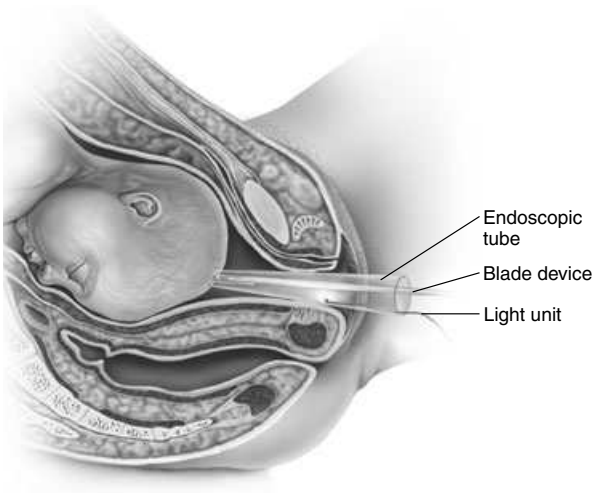


FIGURE 27-11 Technique of fetal scalp blood sampling.

TABLE 27-5 Normal Blood Gas Values of Umbilical Artery and Vein

	Mean Value	Normal Range
Artery		
pH	7.27	7.15 to 7.38
PCO_2	50	35 to 70
Bicarbonate	23	17 to 28
Base excess	−3.6	−2.0 to −9.0
Vein		
pH	7.34	7.20 to 7.41
PCO_2	40	33 to 50
Bicarbonate	21	15 to 26
Base excess	−2.6	−1.0 to −8.0

Source: From Garite, T. J. Intrapartum fetal evaluation. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. (Eds.) *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, p. 425. Reprinted by permission.

The limitations to FBS include the need for intervention to mother and fetus—including the rupture of membranes and puncture of the fetal skin, not to mention the awkward, uncomfortable positioning of the mother. Frequency of sampling is also quite cumbersome. Equipment calibration is commonly a problem thereby providing misleading results. Serum pH is dynamic and can change very quickly. A normal pH at one point in time may no longer be accurate a few minutes later or in a different phase of the contraction.

Midwives may be involved in performing the collection of the fetal blood sample if they have obtained the skills necessary to collect the sample. However, if the fetal heart rate pattern requires evaluation with FBS, the consulting physician should be involved in collaborating on care of the woman and infant.

Umbilical Cord Blood Gas Analysis

Determination of fetal acid-base status at the time of birth is done by the collection of arterial and venous fetal blood samples from the umbilical cord. This information may be very useful in interpreting the potential for or presence of perinatal asphyxia. Severe acidemia is necessary to cause damage to fetal brain tissue. Cord pH values in the normal range (see Table 27-5) may refute a diagnosis of perinatal asphyxia in a depressed or compromised infant [3, 45]. The Apgar score has been used for many years as a surrogate for the definition of perinatal asphyxia. While a 5-minute score of 7 or greater virtually negates the possibility of fetal acidosis, the converse is not true. Apgar scores were created as a guide for the need for infant resuscitation. As previously discussed in the chapter, low Apgar scores are not a measure of neonatal status. Therefore, measurement of the blood gases in the umbilical cord can serve as documentation of the actual acid-base status at the time of birth. Thorp and Rushing state that, "cord blood gas analysis . . . excludes the diagnosis of birth asphyxia in approximately 80 percent of depressed newborns" [45].

In some hospitals, cord blood gases are collected with every birth [44]. Most departments find this to be unnecessary and limit these samples to situations where there have been nonreassuring fetal heart rate patterns, meconium-stained fluid, or the need for infant resuscitation, or with an antepartum diagnosis of IUGR or other high-risk situations.

Sampling of the cord blood gases is performed by double-clamping a 10- to 30-centimeter segment of the cord at the time of birth when the cord is clamped and the infant separated from the cord [3]. Samples of both arterial and venous blood are withdrawn into heparinized syringes and then taken to the lab for blood gas analysis. This should be done as soon as possible because delayed collection or interpretation will result in decreasing pH values. This has been a concern for midwives who prefer not to cut the cord until it has stopped pulsating. If the infant is vigorous, there may be no need for cord blood sampling. In the event of a depressed infant, the cord will need to be cut to allow for im-

mediate care of the newborn, and the cord may be clamped and sampled at that time.

Fetal Oxygen Saturation Monitoring

Fetal oxygen saturation monitoring (FS_pO_2), also known as fetal pulse oximetry, was introduced worldwide in the early 1990s and approved by the FDA in January 2000. The technique is used as an adjunct to EFM when nonreassuring or uninterpretable patterns arise. It is intended to assist clinicians with determining the actual level of fetal oxygenation in order to make decisions regarding the continuation of labor or need to move rapidly to delivery. Because EFM has a high false-positive rate with an accompanying increase in operative interventions, the goal of FS_pO_2 is to more accurately determine which FHR patterns actually represent a compromised fetus [6, 14, 46–48]. It is hoped that this technology will decrease unnecessary intervention in normal labor [6, 14, 46].

Fetal oxygen saturation monitoring uses the same technology as the adult pulse oximetry used on the finger, toe, or ear lobe. By monitoring the light absorption of oxyhemoglobin and deoxyhemoglobin during cardiac systole, the percentage of oxygen in the observed tissue is calculated [49]. To utilize this technique, a single-use S_pO_2 reflectance sensor is inserted through the cervix, into the uterus and rests on the fetal cheek, temple, or forehead, supported by the uterine wall (see Figures 27-12 and 27-13). A continuous real-time tracing of the fetal oxygen saturation is displayed on the fetal monitor strip, overlaying the uterine contraction graph [6, 46].

The normal range of FS_pO_2 for the fetus during labor is 30 to 70 percent. When the FS_pO_2 returns to 30 percent or more between contractions, the results are considered to be reassuring, and labor should be allowed to continue. However, if the FS_pO_2 remains less than 30 percent or the signal is not obtainable for more than 10 minutes, then intervention is warranted in the absence of other reassuring indicators [46]. A single FS_pO_2 reading is not sufficient for evaluation; instead the trend should be assessed in addition to the EFM tracing and other clinical data.

It is critical that the data from FS_pO_2 be interpreted cautiously. Several authors have identified difficulty in obtaining accurate readings when the fetal blood pH is in the acidotic range below 7.16

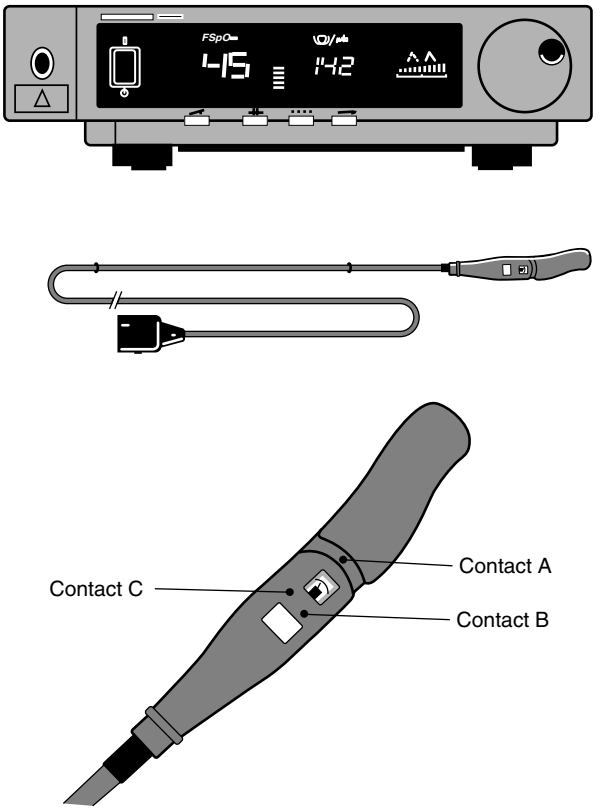


FIGURE 27-12 A fetal pulse oximeter.

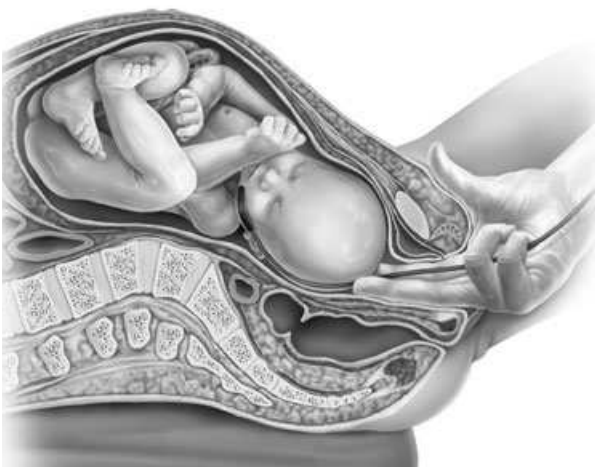


FIGURE 27-13 Proper placement of the pulse oximeter on the fetal cheek.

[46–49]. In addition, it is known that common situations such as fetal scalp edema, caput succedaneum, dark, thick, curly hair, or very light hair color, skin thickness, and vernix caseosa may alter the pulse oximetry readings [48, 49]. A study by Schmidt et al. of 128 fetuses monitored with FS_pO_2

found that the readings did not aid in management of labor or improve fetal outcome: "Fetal distress and impaired condition of the newborn are not identified or predicted during routine application of FS_pO_2 monitoring in the fetus during labor with adequate safety" [47].

The utilization of FS_pO_2 requires that the following criteria be met:

1. Ruptured membranes
2. Singleton pregnancy
3. Vertex presentation
4. At least 36 weeks' gestation
5. Cervical dilatation of at least 2 centimeters
6. Fetus at –2 station or below [45, 49]

Contraindications include the following:

1. Placenta previa
2. Ominous FHR pattern requiring immediate delivery
3. Need for immediate delivery (unrelated to FHR pattern)—for example, because of active vaginal bleeding
4. Maternal HIV, active genital herpes, or hepatitis B infections

Fetal pulse oximetry has the promise of being able to identify oxygen levels of the fetus during labor. At this time, the technology is still new, shortcomings are being evaluated, and large randomized controlled trials have not yet been completed to the extent necessary to introduce this technology into general clinical practice [50]. Care must be taken not to allow the same situation to occur with this or any other technology—as was the case with electronic fetal monitoring, which was utilized on a widespread basis prior to scientific confirmation of its impact on neonatal and maternal outcomes.

Admission to L&D and Establishing Initial Well-Being

Labor admission tests (LATs), an initial electronic fetal monitor assessment of the fetus, are commonly used to assess the status of the fetus at the time of admission. The concept behind this is that the EFM strip is indicative of fetal status. If the strip is reactive or reassuring, this may be felt to be a reassuring sign of fetal well-being for the duration of the labor. A nonreassuring strip would then require continuous EFM and evaluation. The LAT, however, has not been shown to have adequate predictive value to use as an admission screening tool in high-risk or low-risk women and does have a high false-positive rate [51]. A study by Mires and colleagues randomized women with normal pregnancies to either EFM or auscultation on admission to L&D. Their findings were that, "admission cardiotocography does not benefit neonatal outcome in low-risk women. Its use results in increased obstetric intervention, including operative delivery" [13].

Impey and colleagues performed a randomized controlled trial of admission electronic fetal monitoring versus auscultation alone. In their group of 8580 women, the EFM at admission did not improve neonatal outcomes. There was an increase in use of EFM and fetal blood sampling, but no change in operative births [52].

AWHONN states, "Each health care facility should develop a policy that defines when . . . to use EFM and auscultation [15]. Figure 27-14 illustrates a suggested method of selecting women for auscultation only, electronic fetal monitoring only, or a combination if indicated. This is based on evidence found in the literature and allows for flexibility.

Midwives will most likely find that there are necessary times to make compromises between their own philosophy of care, the evidence in the literature, the woman's desires, and the opinions and policies of physician, nursing, and administrative colleagues. A thorough knowledge of the literature and issues is useful in making guidelines for midwifery practice.

Medical Legal Aspects

A common concern of clinicians and risk managers is that the lack of a fetal monitor strip will be problematic in the event of a malpractice suit. An increase in medical malpractice cases has been felt to be an additional legacy of EFM [53]. Symonds noted that "seventy percent of all claims concerning intrapartum care in relation to fetal brain damage are based on abnormalities of the cardiotocograms and electronic fetal monitoring" [54]. Because a clear link between neonatal hypoxic encephalopathy and specific fetal monitor patterns has not been demonstrated, the EFM strip may actually pose a greater risk. Some fear that a tracing demonstrating abnormal FHR patterns in a child who is born brain damaged will increase the likelihood of a lawsuit despite specific evidence that the practitioner was not at fault. As interpretation of EFM is quite varied among experts, the strip may indeed be a

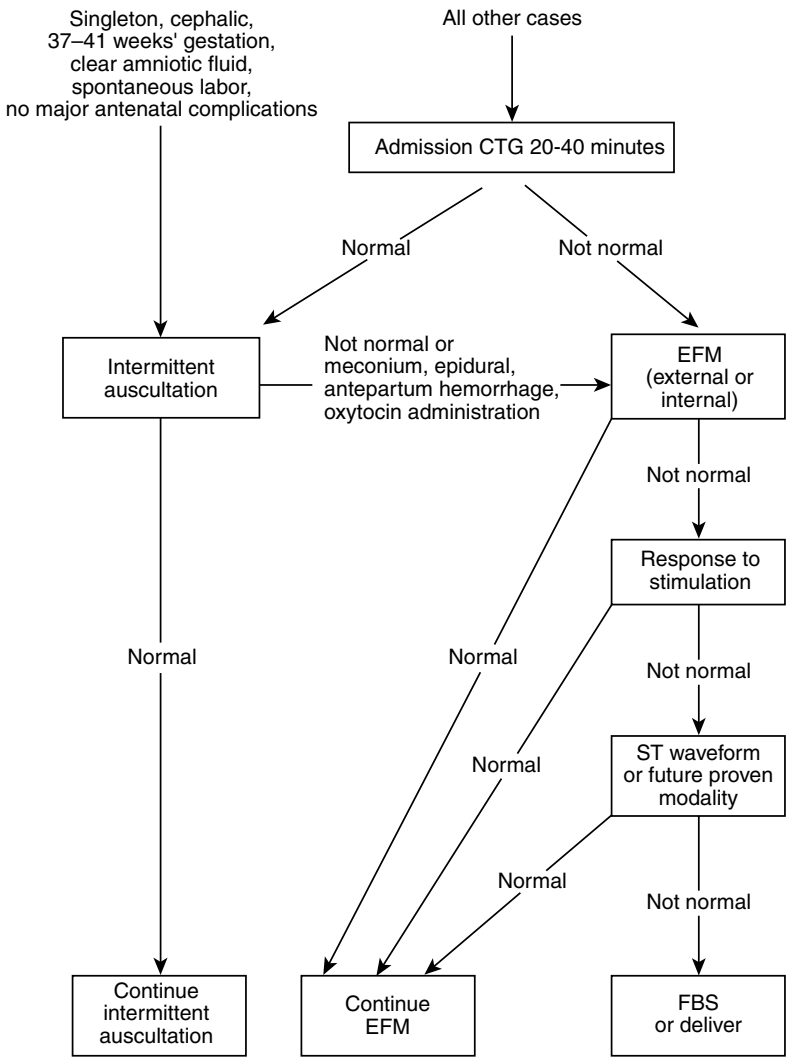


FIGURE 27-14 A proposed clinical management of fetal monitoring based on current research evidence.

Source: From Greene, K. R. Scalp blood gas analysis. *Obstet. Gynecol. Clin. North Am.* 26(4):653 (December) 1999. Reprinted by permission.

greater liability than if there were an auscultation graph with appropriate interventions documented.

Documentation of auscultation used according to the guidelines of the birthing site is the best defense in case of a malpractice suit. Accompanying progress notes with the rationale for decision-making and interventions initiated for abnormal findings offer strength to defending a case. Conversely, incomplete documentation will give the impression that inadequate care was provided. As providers of obstetric care, midwives cannot prevent all poor outcomes and cannot prevent legal actions, but they can diminish the risk for judgment against themselves.

Summary

The assessment of fetal well-being should be a critical element considered in managing labor and birth. However, it must be looked upon as an overall part of the supportive care for the mother. Regardless of the use of intermittent auscultation, electronic fetal monitoring, or a combination of the

two, the focus must be on the care of both mother and fetus, not just documentation of electronically generated data [2, 15].

As with many areas of practice, assessment of the fetus in labor is complex, and research information is being gathered continuously. The midwife must be very knowledgeable regarding the full scope of techniques used in order to optimally utilize the technology, to know when further information is necessary, and to be able to educate women and their families about their options and any interventions that may become necessary.

All midwives must utilize the methodologies that promote normal labor and birth while screening for and managing deviations from normal. The midwife may be the primary supporter of IA and the educator of other professionals in the birthing environment. It is a clear opportunity to blend the art and science of midwifery in a way that can make substantive social change.

References

1. Sparrow, M. M. Eavesdropping on the womb: the advent of fetal auscultation. *Pharos* 31–36 (Winter) 2000.
2. Albers, L. L. Monitoring the fetus in labor: evidence to support the methods. *J. Midwifery Womens Health*. 46(6):366–373 (November/December) 2001.
3. Garite, T. J. Intrapartum fetal evaluation. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. (Eds.) *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002, ch. 14.
4. Parer, J. T., and King, T. Fetal heart rate monitoring: is it salvageable? *Am. J. Obstet. Gynecol.* 182(4):982–987 (April) 2000.
5. Goodlin, R. C. History of fetal monitoring. *Am. J. Obstet. Gynecol.* 133(3):323–353, 1979.
6. Feinstein, N. F. Fetal heart rate auscultation: current and future practice. *JOGNN* 29(3):306–315 (May/June) 2000.
7. Kardong-Edgren, S. Using evidence-based practice to improve intrapartum care. *JOGNN* 30:371–375 (July/August) 2001.
8. MacDonald, D., Grant, A., Sheridan-Periera, M., Boylan, P., and Chalmers, I. The Dublin randomized controlled trial of intrapartum fetal heart rate monitoring. *Am. J. Obstet. Gynecol.* 152:524–539, 1985.
9. Shy, K. K., Luthy, D. A., Bennett, F. C., et al. Effects of electronic fetal heart rate monitoring, as compared with periodic auscultation on the neurologic development of premature infants. *N. Eng. J. Med.* 322:588–593 (March 1) 1990.
10. Leveno, K. J., Cunningham, F. G., Nelson, S. et al. A prospective comparison of selective and universal electronic fetal monitoring in 34,995 pregnancies. *N. Eng. J. Med.* 315:615–619, 1986.
11. Vintzileos, A. M., Antsaklis, A., Varvarigos, I., et al. A randomized trial of intrapartum electronic fetal heart rate monitoring versus intermittent auscultation. *Obstet. Gynecol.* 81(6):899–907 (June) 1993.
12. American College Obstetricians and Gynecologists. Fetal heart rate patterns: monitoring, interpretation and management. *ACOG Technical Bulletin* No. 207 (July) 1955.
13. Mires, G., Williams, F., and Howie, P. Randomized controlled trial of cardiotocography versus Doppler auscultation of fetal heart at admission in labour in low risk obstetric population. *Br. Med. J.* 322:1457–1462 (June 16) 2001.
14. Thacker, S. B., Stroup, D. F., and Peterson, H. B. Efficacy and safety of intrapartum electronic fetal monitoring: an update. *Obstet. Gynecol.* 86(4):613–620 (October) 1995.
15. Feinstein, N. F., Sprague, A., and Trepanier, M. Fetal heart rate auscultation: comparing auscultation to electronic fetal monitoring. *AWHONN Lifelines*. 4(3):35–44 (June/July) 2000.
16. Vintzileos, A. M., Nochimson, D. J., Guzman, E. R., et al. Intrapartum electronic fetal heart rate monitoring versus intermittent auscultation: a meta-analysis. *Obstet. Gynecol.* 85(1):149–155 (January) 1995.
17. Thacker, S. B., Stroup, D. F., and Chang, M. Continuous electronic heart rate monitoring for fetal assessment during labor (Cochrane Review). *The Cochrane Library*, Issue 2, 2002.
18. Enkin, M., Kierse, M., Neilson, J., et al. *A Guide to Effective Care in Pregnancy Care in Pregnancy and Childbirth*, 3rd ed. New York: Oxford University Press, 2000.
19. Low, J. A. Intrapartum fetal surveillance: is it worthwhile? *Obstet. Gynecol. Clin. North Am.* 26(4):725–739 (December) 1999.
20. U.S. Preventive Services Task Force. Intrapartum electronic fetal monitoring. In *Guide to Clinical and Preventive Services*, 2nd ed. Washington, DC: U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 1996.

21. Low, J. A., Lindsay, B. G., and Derrick, E. J. Threshold of metabolic acidosis associated with newborn complications. *Am. J. Obstet. Gynecol.* 177:1391–1394, 1997.

22. Hadar, A., Sheiner, E., Hollock, M., et al. Abnormal fetal heart rate tracing patterns during the first stage of labor: effect on perinatal outcome. *Am. J. Obstet. Gynecol.* 185(4):863–868 (October) 2001.

23. Goodwin, T. M. Clinical implications of perinatal depression. *Obstet. Gynecol. Clin. North Am.* 26(4):711–723 (December) 1999.

24. Nelson, K. B., et al. Uncertain value of electronic fetal monitoring in predicting cerebral palsy. *N. Eng. J. Med.* 334(10):613–618 (March 7) 1996.

25. King, T., and Parer, J. The physiology of fetal heart rate patterns and perinatal asphyxia. *J. Perinat. Neonatal Nurs.* 14(3):19–39 (December) 2000.

26. Baird, S. M., and Ruth, D. J. Electronic fetal monitoring of the preterm fetus. *J. Perinat. Neonatal Nurs.* 16(1):12–24 (June) 2002.

27. National Institute of Child Health and Human Development Research Planning Workshop. Electronic fetal heart rate monitoring: research guidelines for interpretation. *Am. J. Obstet. Gynecol.* 77(6):1385–1390, 1997.

28. Greene, K. R. Scalp blood gas analysis. *Obstet. Gynecol. Clin. North Am.* 26(4):641–655 (December) 1999.

29. Haggerty, L. Continuous electronic fetal monitoring: contradictions between practice and research. *JOGNN* 28(4):409–416 (July/August) 1999.

30. Sandmire, H. F., and DeMott, R. K. Auscultation of the fetal heart presents advantages over electronic monitoring. *Wis. Med. J.* 94(12):661–663.

31. Chez, B. F., Harvey M. G., and Harvey, C. J. Intrapartum fetal monitoring: past, present, and future. *J. Perinat. Neonatal Nurs.* 14(3):1–18 (December) 2000.

32. Paine, L. L., Payton, R. G., and Johnson, T. R. B. Auscultated fetal heart rate accelerations. Part I: accuracy and documentation. *J. Nurse-Midwifery* 31(2):68–72 (March/April) 1986.

33. Paine, L. L., Johnson, T. R. B., Turner, M. H., and Payton, R. G. Auscultated fetal heart rate accelerations. Part II: an alternative to the nonstress test. *J. Nurse-Midwifery* 31(2):73–77 (March/April) 1986.

34. Paine, L. L., Zanardi, L. R., Johnson, T. R. B., Rorie, J. L., and Barger, M. K. A comparison of two time intervals for the auscultated acceleration test. *J. Midwifery Womens Health.* 46(2):98–102 (March/April) 2001.

35. Parer, J. T., and King, T. Fetal heart rate monitoring: is it salvageable? *Am. J. Obstet. Gynecol.* 182(4):982–987 (April) 2000.

36. Goodwin, L. Intermittent auscultation of the fetal heart rate: a review of general principles. *J. Perinat. Neonatal Nurs.* 14(3):53–61 (December) 2000.

37. Schmidt, J. V., and McCartney, P. R. History and development of fetal heart assessment: a composite. *JOGNN* 29(3):295–305 (May/June) 2000.

38. Sanchez-Ramos, L., Gaudier, F. L., and Pierce, J. The impact of intrapartum amnioinfusion in patients with meconium-stained amniotic fluid: a meta-analysis. *Am. J. Obstet. Gynecol.* 180(1S-II):81S, 1999.

39. Lind, B. K. Complications caused by extramembranous placement of intrauterine pressure catheters. *Am. J. Obstet. Gynecol.* 180(4):1034–1035 (April) 1999.

40. Klingner, M. C., and Kruse, J. Meconium aspiration syndrome: pathophysiology and prevention. *J. Am. Board Fam. Pract.* 12(6):450–466 (November/December) 1999.

41. Porter, T. F., and Clark, S. L. Vibroacoustic and scalp stimulation. *Obstet. Gynecol. Clin. North Am.* 26(4):657–669 (December) 1999.

42. Clark, S. L., Gimovsky, M. L., and Miller, F. C. The scalp stimulation test: a clinical alternative to fetal scalp blood sampling. *Am. J. Obstet. Gynecol.* 1848:247–277, 1984.

43. Smith, C. V., Nguyen, H. N., Phelan, J. P., et al. Intrapartum assessment of fetal well-being: a comparison of fetal acoustic stimulation with acid-base determinations. *Am. J. Obstet. Gynecol.* 155:726–728, 1986.

44. Spencer, J. A. D., Deans, A., Nicolaidis, P., et al. Fetal heart rate response to vibroacoustic stimulation during low and high heart rate variability episodes in late pregnancy. *Am. J. Obstet. Gynecol.* 165:86–90, 1991.

45. Thorp, J. A., and Rushing, R. S. Umbilical cord blood gas analysis. *Obstet. Gynecol. Clin. North Am.* 26(4):695–709 (December) 1999.

46. Simpson, K. R., and Porter, M. L. Fetal oxygen saturation monitoring: using this new technology for fetal assessment during labor. *AWHONN Lifelines.* 5(2):26–33 (April/May) 2001.

47. Schmidt, S., Kostowski, S., Sierra, F., Meyer-Wittkopf, M., and Heller, G. Clinical usefulness of pulse oximetry in the fetus with nonreassuring heart rate pattern. *J. Perinat. Med.* 28:298–305, 2000.

48. Luttkus, A. K., Lubke, M., Buscher, U., et al. Accuracy of fetal pulse oximetry. *Acta Obstet. Gynecol. Scand*. 81:417–423, 2000.

49. Yam, J., Chua, S., and Arulkumaran, S. Intrapartum fetal pulse oximetry. Part 1: Principles and technical issues. *Obstet. Gynecol. Survey*. 55(3):163–172 (March) 2000.

50. Dildy, G. A. The future of intrapartum fetal pulse oximetry. *Curr. Opin. Obstet. Gynecol.* 13:133–136, 2001.

51. Blix, E., and Pal, O. Labor admission test: an assessment of the test's value as screening for fetal distress in labor. *Acta Obstet. Gynecol. Scand*. 80:738–743, 2001.

52. Impey, L., Reynolds, M., MacQuillan, K., et al. Admission cardiotocography: a randomized controlled trial. *Lancet* 361:465–470, 2003.

53. Supplee, R. B., and Vezeau, T. M. Continuous electronic fetal monitoring: does it belong in low risk births? *MCN*. 21:301–306, 1996.

54. Symonds, E. M. Fetal monitoring: medical and legal implications for the practitioner. *Curr. Opin. Obstet. Gynecol*. 6:430–433 (October) 1994.

CHAPTER

28

The Normal Second Stage of Labor

The second stage of labor begins with complete dilatation of the cervix and ends with the birth of the baby. It is known as the stage of expulsion.

Database for the Second Stage of Labor

The database for determining the well-being of the mother and fetus during the second stage of labor is a continuation of the database collected and evaluated during the first stage of labor. The components of the database include the following:

1. Continuing evaluation of any significant findings from the history, physical and pelvic examinations, and laboratory work done during the initial evaluation of the mother and fetus in labor
2. Continuing evaluation of the progress of labor
3. Continuing evaluation of the fetus
4. Continuing evaluation of the woman
5. Continuing screening for signs and symptoms of obstetrical complications and fetal distress. (These are discussed in Chapters 27, 29, and 30.)

Again, the midwife must know the parameters of normal in order to evaluate the specific pieces of information obtained for each component of the database.

The Progress of Labor

In nulliparas, engagement usually occurs by the onset of true labor and no later than during the active phase of the first stage of labor. Philpott and Castle found that African Rhodesian primigravidas did not have engagement until the late first stage of labor [1]. Lack of engagement at the onset of the second stage of labor in multiparas is abnormal. The fetal presenting part begins descending during the first stage of labor and, according to Friedman, reaches its maximum speed during and toward the end of maximum speed in cervical dilatation [2, p. 203], and continues to descend through the second stage of labor until reaching the perineal floor. Friedman determined that the average maximum rate of descent is 1.6 centimeters per hour in nulliparas and 5.4 centimeters per hour in multiparas [2, p. 206]. The average length of the second stage, according to Friedman, is 46 minutes for primigravidas and 14 minutes for multiparas [2, pp. 37, 40]. Generally, a second stage that lasts longer than 2 hours for a primigravida or 1 hour for a multipara is considered abnormal by those who agree with Friedman. There has been acknowledgement, however, that the 2 hour limit does not indicate a need to deliver the baby by forceps or vacuum extractor as long as there is progressive descent and absence of fetal distress. A study by Kilpatrick and Laros of nearly seven thousand women who were "allowed to labor without interference until spontaneous delivery" determined a statistically significant difference in the length of both first and second stage labor dependent on whether conduction anesthesia was used; see Table 28-1 [3]. Any discussion of length of labor, thus, has to take into account whether the woman has an epidural block as this may make the labor significantly longer. The average length of the second stage of labor for 1472 women with no anesthesia in a study by Albers, Schiff, and Gorwoda had similar findings of 53 minutes for nulliparas and 17 minutes for multiparas [4]. Within their study population, they found a statistically significant shorter second stage of an average of 43

TABLE 28-1 Mean Lengths of the First and Second Stages of Labor

	No Conduction Anesthesia		Conduction Anesthesia	
	First Stage (hr)	*Second Stage (min)*	*First Stage (hr)*	*Second Stage (min)*
Nulliparous Mean	8.1	54	10.2	79
Multiparous Mean	5.7	19	7.4	45

All differences in the means are statistically significant ($P<.0001$).

Source: From Kilpatrick, S. J., and Laros, R. K. Jr. Characteristics of normal labor. *Obstet. Gynecol.* 74(1):86 (July) 1989. Adapted by permission.

minutes for American Indian nulliparas compared to an average of 60 minutes for non-Hispanic white nulliparas. A study by Diegman, Andrews, and Niemczura found further ethnic differences with an average length of second stage labor of 31.6 minutes for African-American nulliparas and 44.3 minutes for Puerto Rican nulliparas [5].

In the natural course of labor there is often a lull, or quiet period, between first and second stage. The hard contractions of transition are now past and the cervix is fully dilated. The woman's body seems to "take a breath" before starting expulsive efforts. The contractions space out and are not so intense. The woman rests and may even nap. This quiet period may last as long as an hour and is longer in primigravidas than in multigravidas. Gradually momentum builds as the fetal head descends through the pelvis; the contractions become more forceful and the woman begins to bear down voluntarily with expiratory, grunty, short pushes. The woman's grunts may be gutteral and her face may contort with effort (Figure 28-1).

Aderhold and Roberts identified this lull as the first of three phases of second stage labor, as follows [6]:

Phase I, the lull: From complete dilatation until the urge to bear down or the onset of frequent, rhythmic bearing-down efforts

Phase II, active bearing down: From the onset of rhythmic bearing-down efforts or the urge to push until the presenting part no longer retreats between bearing-down efforts (crowning)

Phase III, perineal: From crowning of the presenting part until the birth of the entire body

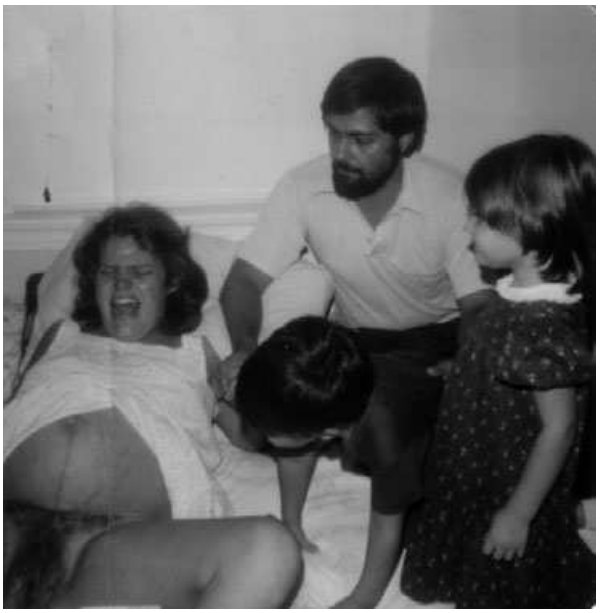


FIGURE 28-1 Children who have been prepared for the sounds and sights of labor and delivery are not disturbed by them and instead focus on being able to see more of the baby's head as it appears at the introitus.

Contractions during the second stage are frequent, strong, and slightly longer—that is, approximately every 2 minutes, lasting 60 to 90 seconds—of strong intensity, and becoming expulsive in nature. After the painful contractions she experienced during transition, the woman usually feels relief to be in second stage and able to push if she so desires. For most women, pushing gives utmost satisfaction, inasmuch as it contributes to a feeling of active involvement and accomplishment and that their effort is rapidly bringing about the climax of their labor. A sense of anticipation pervades this period. Women usually do not find the contractions very painful; instead they find the combination of the contraction and the work of pushing exhausting. On the other hand, some women feel acute pain with each push and fight the contractions and any effort to get them to push. Usually such a person is quite frightened; frequently her resistance diminishes as she is reassured and helped to push effectively and as some degree of natural anesthesia occurs because of the pressure of the baby's head against the pelvic musculature and other tissue.

As in the first stage of labor, the woman's behavior and physical manifestations during the second stage can also reflect progress. An irresistible desire to push usually signals the arrival of the sec-

ond stage of labor. This is not always true, however, particularly if the fetal head has not descended well into the pelvis. In such instances the woman may not feel the urge to push because the reflex mechanism that makes her feel like pushing does not occur until the fetal head presses against the pelvic floor. For a woman to feel like pushing after she has entered second stage informs you that some degree of descent has taken place. Descent can also be detected by a progressively lower location of the fetal heart tones and a progressively lower point of back pain. Confirmation, when necessary, is by vaginal examination.

On the other hand some women feel like pushing before second stage. This occurs when the fetal head is very low in the pelvis. The reflex mechanism (Ferguson's reflex) is initiated too early and makes the woman feel in constant need of having a bowel movement. Consequently she frequently asks for a bedpan or to go to the toilet. This is a difficult situation for her because she must not push prior to complete dilatation of the cervix. Such action will make the cervix edematous and friable and may lead to subsequent cervical lacerations, which, in turn, can be the cause of hemorrhage.

Rectal bulging, perineal bulging, and progressive visibility of the fetal head at the vaginal introitus are indicative of approaching delivery (see Figure 28-2). If a woman close to or in second stage suddenly says that she wants to go to the bathroom, the midwife should ask the woman if she has to urinate or if she is feeling like having a bowel movement. If her answer is the latter, then the midwife needs to ascertain if indeed the woman is going to have a bowel movement or is just feeling pressure—perhaps what she is feeling is the baby coming. Another almost infallible signal of imminent delivery is the woman's verbal expression, "My baby's coming!" In 99.99 percent of instances in which this occurs the baby is indeed coming, often in spite of a vaginal examination with findings to the contrary a few minutes earlier. Failing to listen to the woman is one of the biggest mistakes a practitioner can make.

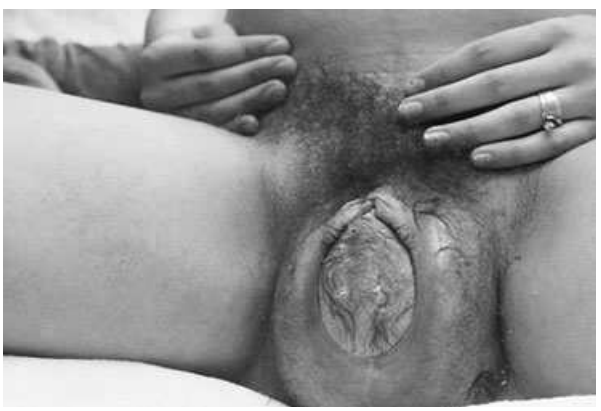


FIGURE 28-2 Perineal bulging. Note the relaxation and control of this nonanesthetized woman.

The Mechanisms of Labor

Engagement and descent are two of the mechanisms of labor. The mechanisms of labor are the positional movements that the fetus undergoes to accommodate itself to the maternal pelvis. These movements are necessary inasmuch as the larger diameters of the fetus must be in alignment with the larger diameters of the maternal pelvis in order for the full-term fetus to negotiate its way through the pelvis to be born.

Understanding the mechanisms of labor involves a knowledge of the essential average diameters of the fetal head, as shown in Figure 28-3 and in the list below. The related cephalic presentation is indicated in brackets.

- *Biparietal* (9.5 centimeters): the distance between the two parietal eminences; the largest transverse diameter of the fetal head, used in definition of engagement (see Figure 26-8)
- *Suboccipitobregmatic* (9.5 centimeters): the distance from the junction of the neck and the occiput to the bregma (anterior fontanel) [vertex]
- *Occipitofrontal* (11.5 centimeters): the distance from the occiput to the bridge of the nose [sincipital]
- *Occipitomental* (12.5–13.5 centimeters): the distance from the posterior fontanel to the mentum (chin); the largest diameter of the fetal head [brow]
- *Trachelo* (submental) bregmatic (9.5 centimeters): the distance from the junction of the neck and lower jaw to the bregma [face]

In order to evaluate progress of the fetus through the pelvis, screen for developing complications, and facilitate the birth appropriately, it is important to be well versed in the mechanisms of labor for each fetal presentation, position, and variety. The mechanisms of labor for all varieties of the cephalic vertex presentation are covered in this chapter. Mechanisms of labor for cephalic face and breech presentations are presented in Chapter 30.

There are eight basic positional movements that take place when the fetus is in a cephalic vertex presentation. These are as follows:

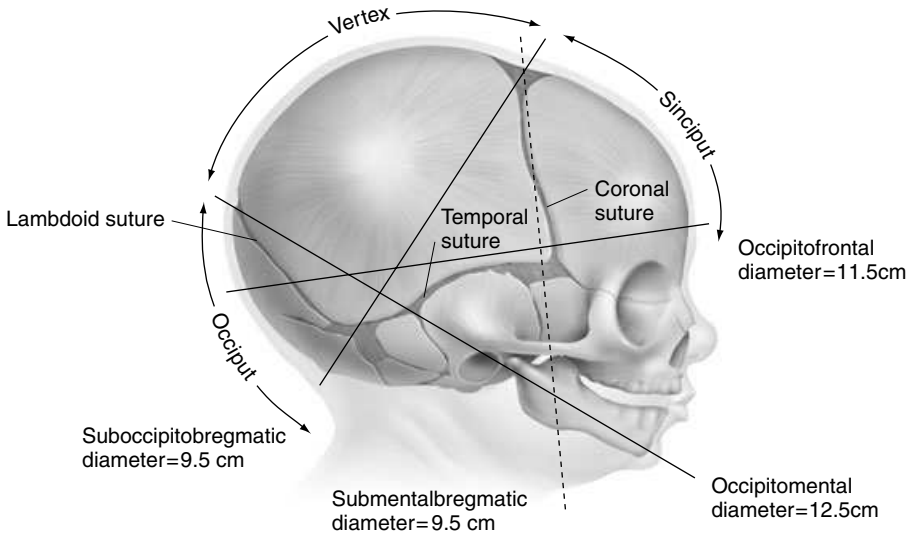


FIGURE 28-3 Diameters of the term fetal head.

1. Engagement
2. Descent throughout
3. Flexion
4. Internal rotation ___° to the ___ position
5. Birth of the head by _____
6. Restitution 45° to the ___ position
7. External rotation 45° to the ___ position
8. Birth of the shoulders and body by lateral flexion via the curve of Carus

Although the mechanisms of labor are listed separately, some overlap or occur simultaneously.

Engagement takes place when the biparietal diameter of the fetal head has passed through the pelvic inlet. See Chapter 26 for an explanation of the contribution of asynclitism to descent of the fetal head into the true pelvis.

Descent occurs throughout labor and is therefore both requisite to and simultaneous with the other mechanisms. Descent is the result of a number of forces, including contractions (which straighten the fetal spine, bring the fundus into direct contact with the breech, and cause the fundus to exert pressure on the breech) and, in second stage, the pushing the mother accomplishes by contraction of her abdominal muscles.

Flexion is essential to further descent. Through this mechanism, the smaller suboccipitobregmatic diameter is substituted for the larger fetal head diameters that exist when the fetal head is either not completely flexed, or in a military attitude, or in some degree of extension. Flexion occurs when the fetal head meets resistance; this resistance increases with descent and is first met from the cervix, then from the side walls of the pelvis, and finally from the pelvic floor. Some degree of flexion, therefore, may occur prior to engagement.

Internal rotation brings the anteroposterior diameter of the fetal head into alignment with the anteroposterior diameter of the maternal pelvis. Most commonly the occiput rotates to the anterior portion of the maternal pelvis, beneath the symphysis pubis. If internal rotation has not occurred by the time the fetal head has reached the pelvic floor it takes place shortly thereafter. Internal rotation is essential for vaginal birth to occur, except with abnormally small babies. To understand why, one need only look at the dimensions and planes of the pelvis. The inlet has a larger transverse diameter than anteroposterior diameter; the midplane and outlet have larger anteroposterior diameters than transverse diameters. Internal rotation is effected by the V-shape of the pelvic floor musculature and the decreased dimensions of the pelvic cavity because of the ischial spines. The amount of internal rotation is determined by the distance the occiput has to travel from its original position on entering the pelvis to the occiput anterior or occiput posterior position. The distance is expressed in degrees, as it is a portion of the arc of a circle that is being traversed (Figure 28-4).

When the occiput rotates from an LOP, ROP, LOT, or ROT position, the shoulders also rotate with the head until the LOA or ROA position has

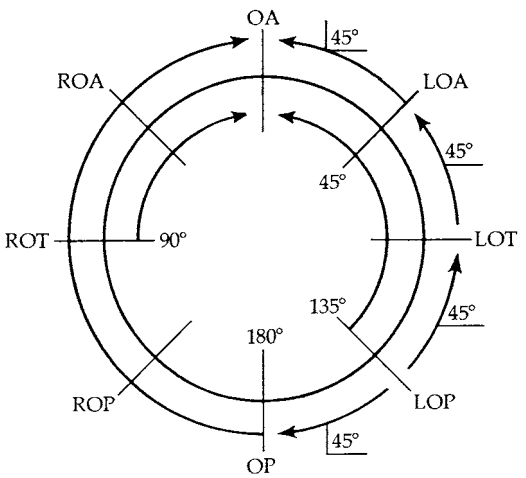


FIGURE 28-4 Degrees of internal rotation.

been reached. As the occiput rotates the final 45° into the occiput anterior position, the shoulders do not continue their rotation with the head but, instead, enter the pelvic inlet in one of the oblique diameters (the left oblique diameter for an LOA and the right oblique diameter for an ROA). The entire mechanism, therefore, has the effect of twisting the neck 45°.

Birth of the head is by *extension* for occiput-anterior deliveries. The mechanism is different when the occiput rotates to an occiput-posterior position, as explained later in this chapter. Extension must occur when the occiput is anterior because of the resistant force of the pelvic floor where it forms the curve of Carus, which directs the head upward to the vulval outlet. The suboccipital region, or nucha, impinges under the symphysis pubis and acts as a pivotal point. The fetal head is now positioned so that further pressure from the contracting uterus and maternal pushing serve to further extend the head as the vulvovaginal orifice opens (see Figures 28-2 and 28-5). Thus the head is born by extension as the occiput, sagittal suture, anterior fontanel, brow, orbits, nose, mouth, and chin sequentially sweep over the perineum. The suboccipitofrontal diameter is thus the largest diameter to pass through the vulvovaginal orifice.

Restitution is the rotation of the head 45° to either the left or the right, depending on the direction from which it rotated into the occiput anterior position. In effect, restitution untwists the neck and brings the head so it is again at a right angle with the shoulders. The sagittal suture is now in one of the oblique diameters of the pelvis and the bisacromial diameter of the fetus is in the other oblique diameter of the pelvis.

External rotation occurs as the shoulders rotate 45°, bringing the bisacromial diameter into alignment with the anteroposterior diameter of the pelvic outlet. This causes the head to rotate externally another 45° into the LOT or ROT position, depending on the direction of restitution.

Birth of the shoulders and body is by lateral flexion via the curve of Carus. The anterior shoulder comes into view at the vulvovaginal orifice, where it impinges under the symphysis pubis; the posterior shoulder then distends the perineum and is born by lateral flexion. After the shoulders are delivered the remainder of the body follows the curve of Carus and is readily born.

The *curve of Carus* is the lower exiting end of the pelvic curve. The fetus and placenta must follow this curve in order to be born. The pelvic cavity actually resembles a curved cylinder, so that the direction of either the baby or the placenta coming through it is first downward from the axis of the inlet to just above the tip of the sacrum and then forward, upward, and outward to the vulvovaginal orifice.

Occiput Anterior Variations of the eight basic positional movements are determined by the position and variety of the fetus and must be delineated for each. The mechanisms of labor for a fetus that begins labor in the LOA, LOT, LOP, ROA, ROT, or ROP position and delivers in an occiput anterior position are as follows (see Figure 28-6):

1. Engagement takes place for LOT and ROT positions with the sagittal suture of the fetus in the transverse diameter of the pelvic inlet and the

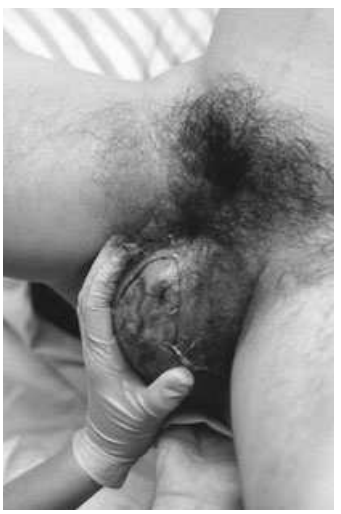
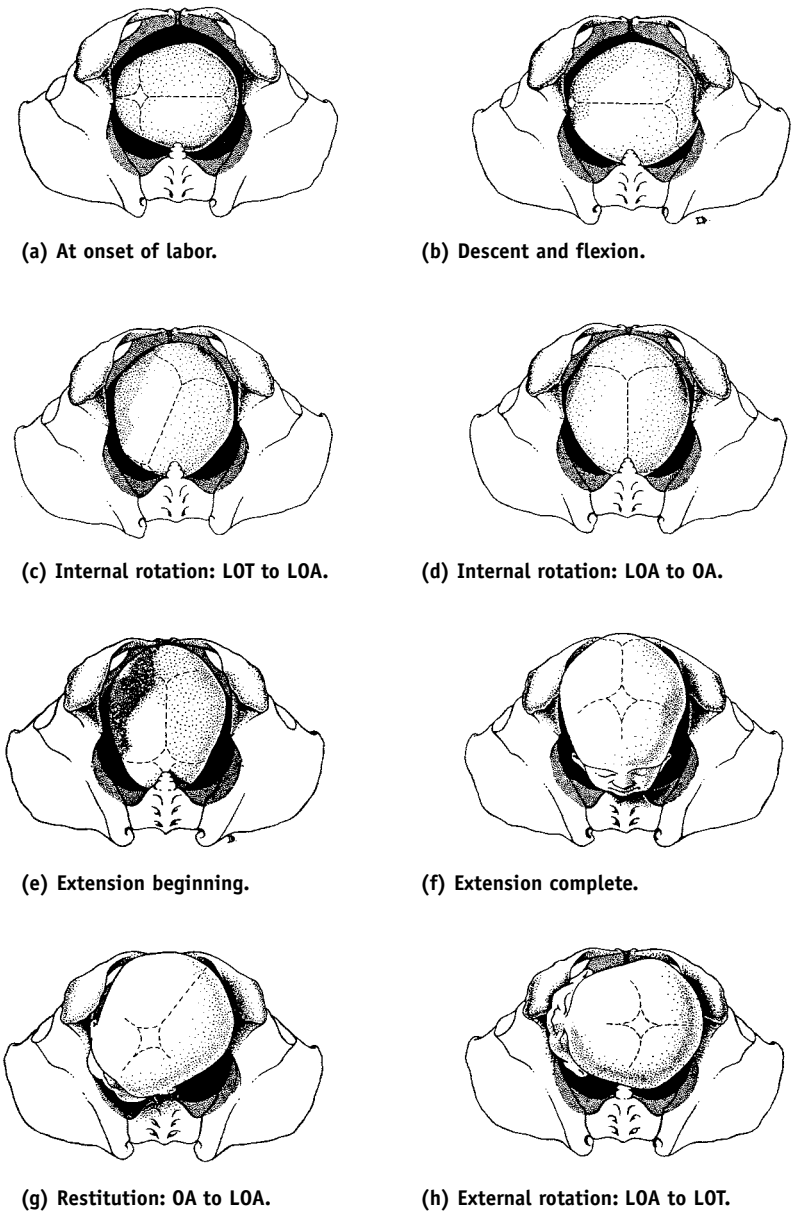


FIGURE 28-5 Perineal distention with head extension.



(a) At onset of labor.

(b) Descent and flexion.

(c) Internal rotation: LOT to LOA.

(d) Internal rotation: LOA to OA.

(e) Extension beginning.

(f) Extension complete.

(g) Restitution: OA to LOA.

(h) External rotation: LOA to LOT.

FIGURE 28-6 LOT to OA mechanisms of labor.

Source: From Oxorn, H. *Oxorn-Foote Human Labor and Birth*, 5th ed. Norwalk, CT: Appleton-Century-Crofts, 1986, p. 159. Reproduced by permission.

biparietal diameter of the fetus in the anteroposterior diameter of the pelvic inlet. For LOA, ROA, LOP, and ROP positions, engagement of the fetal head takes place with the sagittal suture in one of the oblique diameters of the pelvis (the right oblique diameter for LOA and ROP positions and the left oblique diameter for ROA and LOP positions). The biparietal diameter is thus in the oblique diameter of the pelvis opposite from the one the sagittal suture is in. The sagittal suture is used as the fetal landmark that determines in which oblique diameter the fetal head is entering the pelvis.

2. Descent occurs throughout.
3. Flexion substitutes the suboccipitobregmatic diameter for the diameter that entered the pelvic inlet.
4. Internal rotation takes place:
   45° (for LOA and ROA positions)
   90° (for LOT and ROT positions)
   135° (for LOP and ROP positions—long arc rotation)

   The fetal head is now in an occiput-anterior position in the anteroposterior diameter of the mother's pelvis.

5. Birth of the head by extension.
6. Restitution 45° to the LOA or ROA position: the fetal head moves left if it started the mechanisms of labor with the occiput in the left side of the pelvis and right if it started the mechanisms of labor with the occiput in the right side of the pelvis.
7. External rotation 45° to the LOT or ROT position: the direction of the rotation of the shoulders is determined by the direction of restitution. External rotation brings the bisacromial diameter of the shoulders into the anteroposterior diameter of the maternal pelvis.
8. Birth of the shoulders and body by lateral flexion via the curve of Carus

Persistent Posterior A persistent posterior position occurs when a right or left occiput posterior position undergoes internal rotation through a short arc of 45° to a direct occiput posterior position in the anteroposterior diameter of the maternal pelvis instead of a long arc rotation of 135° to a direct occiput anterior position, as described earlier. Short arc rotation is much less common, occurring approximately 6 to 10 percent of the time and most frequently in conjunction with an anthropoid or android type of pelvis.

Persistent posterior is considered a variation of normal. Its effect on the length of labor is debatable; if there is an effect, it is only slight and does not warrant delay in consulting with a physician in the event that any phase or stage of labor is prolonged beyond the parameters of normal. What is not debatable is the added and often excruciating back pain women have with a persistent posterior position.

Diagnosis of a posterior position is by abdominal examination and is confirmed by vaginal examination. Observation of the contour of the woman's abdomen may give the first clue of a posterior position. A depression the shape of a saucer is commonly seen at or just below her umbilicus. This depression occurs because the shoulder is posterior rather than anterior, so there is not a smooth anterior curve but rather what looks like a gap between the cephalic and podalic poles of the fetus. If the head is not engaged, there is a bulge between the symphysis pubis and the saucer-shaped depression. The total contour thus resembles a full bladder, which must be ruled out.

The mechanisms of labor for a fetus that begins in the LOP or ROP positions and delivers in an occiput posterior position (see Figure 28-7) are the same as for those that rotate to an occiput anterior position except as noted and explained below:

1. Engagement takes place in the right oblique diameter for the ROP position and in the left oblique diameter for the LOP position.
2. Descent occurs throughout.
3. Flexion.
4. Internal rotation takes place: The fetal head rotates 45° to an occiput posterior position in the anteroposterior diameter of the mother's pelvis.
5. Birth of the head by the double mechanism of flexion and then extension. The sinciput impinges beneath the symphysis pubis and becomes the pivotal point for delivery of the head. The head stays flexed as the occiput distends the perineum and is born to the nape of the neck. The remainder of the head is then born by extension, starting with the anterior fontanel and ending with the chin, as the head falls back toward the rectum with the face looking upward.
6. Restitution: The fetal head rotates 45° to the LOP or ROP position, depending on whether internal rotation was from the LOP or ROP position.
7. External rotation: The fetal head rotates 45° to the LOT or ROT position.
8. Birth of the shoulders and body by lateral flexion via the curve of Carus.

Fetal Well-Being

Evaluation of the fetus during the second stage of labor includes evaluation of the amount of caput succedaneum and molding, as discussed previously for the first stage of labor; evaluation of the normalcy of progress being made in the mechanisms of labor; and continuing evaluation of the fetal heart tones (see Chapter 27).

Maternal Physiological Changes

The normal maternal physiological changes described in the database for the first stage of labor (Table 26-5, pages 752–753) continue through the second stage of labor. Any variations in these are noted below.

Blood Pressure Blood pressure may rise another 15 to 25 mm Hg with contractions during the second stage. Maternal pushing effort also affects the blood pressure, causing it to increase and then decrease and end at a level slightly above normal. It is important, therefore, to evaluate the blood pressure well between contractions. An average rise in blood pressure levels of 10 mm Hg between contractions when a woman has been pushing is normal.

Metabolism The steady rise in metabolism continues through the second stage with the maternal

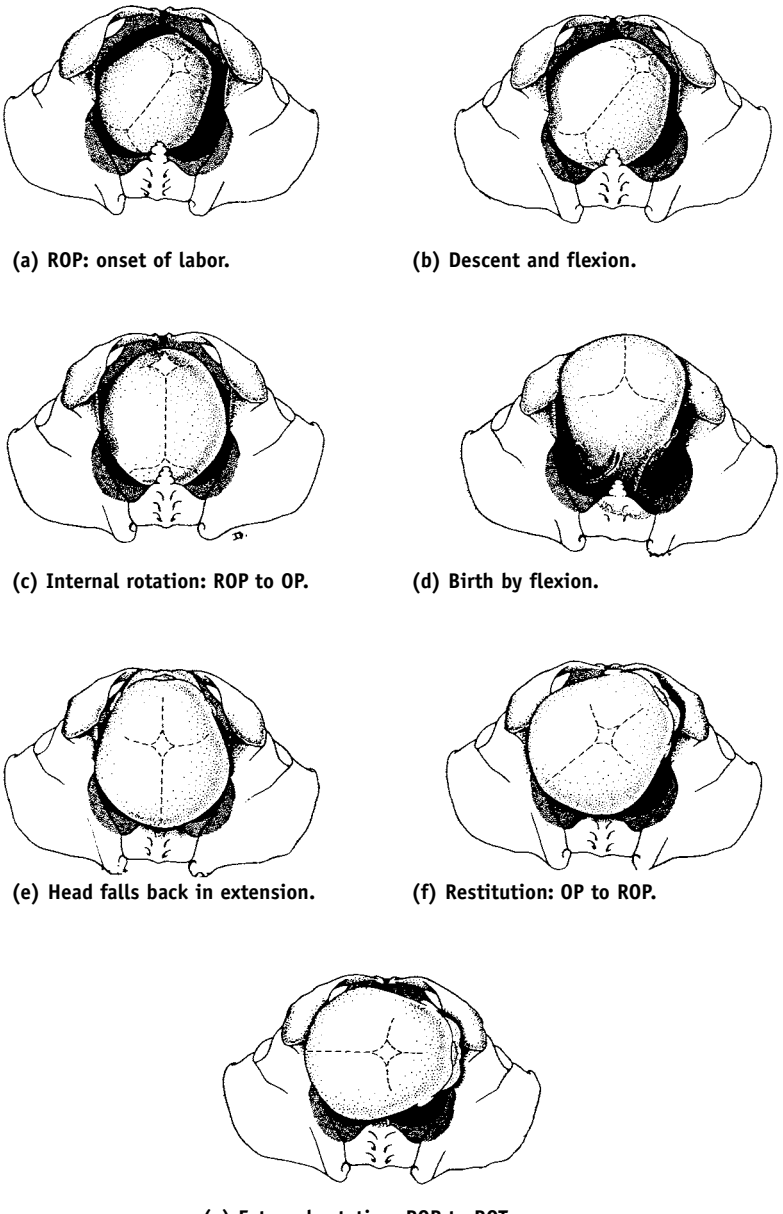


FIGURE 28-7 ROP to OP short arc rotation mechanisms of labor.
Source: From Oxorn, H. *Oxorn-Foote Human Labor and Birth*, 5th ed. Norwalk, CT: Appleton-Century-Crofts, 1986, p. 173. Reproduced by permission.

pushing effort adding further skeletal muscle activity to contribute to this increase.

Pulse The pulse rate varies during each maternal pushing effort. Overall, it is elevated throughout the second stage with a definite tachycardia reaching a peak at the time of birth.

Temperature The highest elevation of temperature occurs at the time of birth and immediately thereafter. A normal increase is 1 to 2°F (0.5 to 1°C).

Respirations Respirations are the same as during the first stage of labor.

Gastrointestinal Changes The severe reduction in gastric motility and absorption continues through the second stage. Usually the nausea and vomiting of transition subside during the second stage but

they may persist for some women. Vomiting, when it occurs, is normally sporadic. Persistent, constant vomiting at any time during labor is abnormal and may be indicative of obstetric complications such as uterine rupture or toxemia.

Renal Changes These changes are the same as during the first stage of labor.

Hematologic Changes Hematologic changes are the same as during the first stage of labor.

Management Plan for the Second Stage of Labor

Management of care of the second stage of labor is a continuation of the midwife's responsiblities during the management of care of the first stage of labor, as follows:

1. Continuing evaluation of maternal well-being
2. Continuing evaluation of fetal well-being
3. Continuing evaluation of the progress of labor
4. Bodily care of the woman
5. Supportive care of the woman and her significant others and family
6. Continuing screening for signs and symptoms of maternal and fetal complications (discussed in Chapters 27, 29, and 30)

In addition, the management of care during the second stage of labor includes these responsibilities:

7. Preparation for birth
8. Management of the birth
9. Making management decisions for the second stage of labor

Second stage management decisions include the following:

1. Frequency with which the woman's vital signs (blood pressure, pulse, and temperature) are to be checked
2. Frequency with which the fetal heart tones are to be checked
3. Whether to encourage the woman's pushing effort
4. Location of the birth
5. When to prepare for birth
6. Position of the woman for birth
7. Whether the woman needs to be catheterized immediately prior to birth
8. Whether to support the perineum, and if so, how
9. Whether to cut an episiotomy
10. If the decision is to cut an episiotomy, what type to cut
11. Type of analgesia/anesthesia
12. Whether to deliver the baby's head with a contraction or between contractions
13. Whether to use a Ritgen maneuver
14. When to clamp and cut the umbilical cord
15. Whether there is a need for physician consultation or collaboration

The decisions may vary depending on the woman, her desires, her condition, and her situation. Each decision is made in relation to the unique individuality and circumstances of a particular woman at a given moment. There are, however, specific factors to be considered in making each decision as it relates to the management responsibilities identified above and to the woman's progress through the second stage of labor. These factors are presented in the discussion below.

Continuing Evaluation of Maternal Well-Being

Continuing evaluation of maternal well-being during the second stage of labor includes the items used to evaluate the first stage of labor. The following list includes additional items specific to the second stage of labor. These are marked with an asterisk.

1. Vital signs
   - a. blood pressure
   - b. temperature
   - c. pulse
   - d. respirations
2. Bladder
3. Urine (see Chapter 26, page 775)
   - a. protein
   - b. ketones
4. Hydration
   - a. fluids
   - b. nausea or vomiting
   - *c. perspiration
5. General condition
   - a. fatigue and physical depletion
   - b. behavior and response to labor
   - c. pain and coping ability

*6. Maternal pushing effort
7. Need for analgesia or anesthesia
*8. Perineal integrity

Vital Signs The parameters of normal and their significance were discussed in Chapter 26. The frequency with which vital signs are checked increases during the second stage of labor. This frequency may vary somewhat from setting to setting or from clinician to clinician, but the generally accepted standard for a normal woman during the second stage of labor is that the woman's blood pressure should be checked every 15 minutes and her temperature, pulse, and respirations should be checked every hour (whether the membranes have ruptured no longer affects this frequency). It is important to remember in interpreting the blood pressure that the blood pressure *between* contractions (which is when it should be taken) is now normally increased by an average of 10 mm Hg if the woman has been pushing.

Bladder Management of the woman's bladder during the second stage of labor and the rationale for this management are the same as discussed for the first stage of labor. In addition, the midwife must decide whether the woman needs to be catheterized immediately prior to birth. The phrase "immediately prior to birth" means as part of the sequence of events in preparing for the birth, so this would be toward the end of the second stage of labor. If catheterization is required, it is usually done before any other procedure such as pudendal block or cutting of an episiotomy. This timing is chosen so that the catheter can be inserted before the fetal head gets any lower in the pelvis, since further descent makes the catheterization more difficult.

The following factors should be considered in deciding whether to catheterize the woman at this time:

1. The discomfort to the woman. Catheterization is an uncomfortable if not painful procedure. On the other hand, a distended bladder may add to the pain she is experiencing in her lower abdomen.
2. Whether her bladder needs emptying:
   a. Is it distended?
   b. Has the woman urinated within the last 2 hours?
   c. What has her fluid intake been since she last urinated?
3. The increased risk of a bladder infection with catheterization.
4. Whether you are anticipating a potential complication (e.g., immediate postpartum hemorrhage; shoulder dystocia). Management of both of these complications includes that the woman have an empty bladder. Precious time can be gained if an empty bladder is already ensured.

Generally speaking, if the woman's bladder is obviously distended and she is unable to urinate and empty her bladder, your decision should be to catheterize the woman in order to avoid further trauma to the bladder, decrease the discomfort in her lower abdomen, and circumvent a problem with the bladder in the event of the aforementioned complications. If her bladder is not obviously distended, the decision is based on your calculation of the probability of the woman's having one of the two complications. A low probability does not warrant catheterization. High probability does warrant catheterization if the woman has not recently urinated, even if a distended bladder is not obvious. The woman should end this phase of labor with an empty bladder. Ensuring that she does requires careful monitoring of her bladder during first and second stage labor (see Chapter 26) and use of all measures to get the woman to void naturally (see Chapters 26 and 33). It is uncommon for a woman cared for by a midwife to need catheterization.

If catheterization must be performed and the fetal head is in the true pelvis, the direction of the catheter is different from usual. The urethra is displaced by the fetal head and conforms with its contour. Therefore, immediately after inserting the catheter into the urethra, it is necessary to direct it upward and over the fetal head while going inward. Otherwise, by going straight in as usual you simply won't be able to get the catheter in and you will only have succeeded in traumatizing the urethra. Sometimes it is helpful to splint the urethra vaginally by placing a finger below it as the catheter is being inserted. Going up and over the fetal head also means that more of the catheter than usual will be inserted before reaching the bladder. (These same pointers apply if it is necessary to catheterize a woman during the first stage of labor and the fetal head is in the true pelvis.)

Hydration and General Condition Management of these two areas during the second stage of labor and the rationale for their management is the same as for the first stage of labor. Hydration, however, is further affected during the second stage of labor by fluid loss through the skin in the form of perspiration. The woman may perspire profusely from the effort of pushing, especially if the environment is not air-conditioned and you are in a geographic area that is both hot and humid. This makes attention to fluid intake even more vital.

The general condition of the woman during the second stage will depend on her general condition at the end of the first stage of labor. If she enters the second stage of labor exhausted, she is going to have difficulty mustering the energy required for pushing, especially if she is a primigravida. This is because the average length of a primigravid second stage is longer than that of a multipara. This problem is often overcome, however, if the woman believes that birth is near. Thus, the midwife should foster this thought in the woman's mind. This is not difficult, as it is true—birth *is* near, especially in comparison with the length of the first stage of labor. Most women respond well to evidence of progress. There can be no greater encouragement than for a woman to see for herself the bulging of her rectum and perineum and the color of her baby's hair (if a cephalic presentation) and to touch the baby's head. A mirror placed so she can see the effect of her pushing effort is invaluable for this purpose (Figure 28-8).

Maternal Pushing Effort The maternal pushing effort must be evaluated for effectiveness. Proof of effectiveness is the progressive descent of the fetal head and the sequence of the mechanisms of labor that the fetus undergoes. This is generally evidenced by the sequential bulging of the rectum, then the perineum, and finally being able to see an ever-increasing amount of the fetal presenting part at the enlarging vaginal orifice. In the absence of progress it is essential to reevaluate pelvic adequacy and rule out arrest in the mechanisms of labor by careful vaginal examination. If neither of these difficulties exists, the problem is probably either ineffectual pushing or a psychological obstacle. That a psychological obstacle can affect the progress of labor is an old observation that has been discovered anew. The effects of a woman's psychological state on labor are more apt to be seen in out-of-hospital settings where the woman's emotions are less controlled by external environmental forces. Dramatic change in the progress of labor can be effected by working through whatever psychological block the woman has.

FIGURE 28-8 Partner and midwife supporting a woman during second stage. A mirror has been placed between her legs so she can see the progress she is making with her pushing efforts.

Proponents of spontaneous or "physiologic" pushing continue to struggle against the entrenched breath-holding sustained pushing effort urged upon women when completely dilated as determined by vaginal examination. There are two issues involved in this controversy. The first is *when* to start pushing and the second is *how* to push.

When to start pushing is heavily influenced by concern over any policies, guidelines, or protocols regarding the length of the second stage of labor before intervention will occur if second stage is not completed within that time frame. Rigid adherence to the often used 2 hour limit that evolved from Friedman's graphico-statistical analysis of labor length [2] motivates many clinicians to vigorously encourage the maternal pushing effort as soon as the woman is known to be completely dilated. This is done in an effort to "beat the clock" before the trauma of instrument or surgical intervention is imposed. Excessive encouragement to push reflects a general impatience, which is fostered by the need to see immediate evidence that the fetus is progressing safely through the mechanisms of labor.

Missing in this scenario is clinical decision-making based on the well-being of both the mother and the baby and on the progress of labor. If the condition of the mother and fetus is good and there is evidence of progress in the descent of the fetal head, there are no grounds for rigid adherence to a preset time limit. Research has shown that there is no significant relationship between second stage duration and perinatal mortality, 5-minute Apgar scores below 7, neonatal seizures, or admission to the newborn intensive care unit [7]. However, if there is evidence of maternal exhaustion, or fetal intolerance of the stress of second stage labor or fetal distress, then immediate intervention is indicated.

Absolute lack of progress in descent or internal rotation in 2 hours is also an indication for intervention.

The more significant parameter in the duration of second stage is the length of time the woman is actively pushing rather than the time from complete dilatation to birth [8, 9]. The start of second stage is difficult to precisely ascertain as it can only be determined by vaginal examination. Not checking the woman's cervix until she evinces an urge to push gives some reality to the duration of second stage and redefines the start of second stage as a combination of complete dilatation and spontaneous pushing effort [10].

How to push is a matter of breathing and positioning (see also Chapter 67). There are generally two very different types of breathing related to pushing. One is the often used Valsalva maneuver of inhaling a deep breath, holding it, and pushing against a closed glottis as hard as possible for as long as possible—typically to a count of 10. The woman is encouraged to get three "good" pushes out of every contraction. There is evidence of potential detriments in the Valsalva maneuver, closed glottis sustained pushing efforts. Detrimental effects include decreased oxygenated blood to the placenta resulting in fetal hypoxia [8, 10–13], a higher incidence of perineal trauma (lacerations, episiotomies) [13–16], maternal exhaustion, and potential for cystocele and urinary stress incontinence [10] and for uterine prolapse from stretching of the cardinal ligaments.

The other type of breathing is spontaneous or physiologic in which the woman exhales as she involuntarily pushes for short periods of 5 to 7 seconds or less and takes several breaths between pushes. This type of open glottis pushing occurs when the fetal presenting part is at +1 station and has reached the pelvic floor. Pressure on the pelvic floor stimulates Ferguson's reflex and the woman feels an urge to push. This maternal response to Ferguson's reflex is triggered with each contraction and activated shortly after the onset of the contraction when it has started to build toward its acme. Studies have shown that there is no change in arterial umbilical cord blood pH [17, 18] and that the second stage of labor is either the same length or shorter [14, 17–19]. No detrimental effects have been shown, and the detrimental effects of the Valsalva maneuver type of breathing and pushing are avoided. Having the woman push only when she wishes is a much more natural approach that eliminates what at times is frenzied harassment of the woman to push and disruption of a possibly heretofore calm, relaxed situation of breathing and working with the contractions.

Positioning that facilitates second stage pushing can be summed up as anything but supine. The supine position is detrimental to uterine perfusion and alignment of the fetal head with the maternal pelvis. Especially facilitative of descent of the fetal presenting part during second stage are the upright positions such as standing, sitting, and squatting. Side-lying, sitting, squatting, and knees-hands positions have not been shown to have detrimental effects [12]. However, there is some evidence of increased risk of blood loss with birthing chairs [13] and of third-degree lacerations with the standing position [20].

It is possible to teach a woman how to push effectively who is not experiencing the Ferguson reflex such as happens with epidural anesthesia or when the fetal head has not yet descended to the pelvic floor. It is also critical to teach a woman how to push in those times when she is developing a complication and needs to push before she feels a natural urge to do so. There are also times when the natural maternal pushing effort is ineffectual and the woman needs to be taught how to push effectively as sometimes happens with a frightened woman who has had no preparation for childbirth. Breathing that simulates spontaneous physiologic pushing, body position, and arm position and action are essential to teaching a woman how to push (see Chapter 67).

Need for Analgesia/Anesthesia Analgesia during the second stage of labor usually is provided by the continued action of analgesia given the woman during the first stage of labor, as discussed in Chapter 26.

Anesthesia is for the delivery itself. Midwives may perform either a pudendal block or a local infiltration of the perineal body, or a combination of both, to provide anesthesia when necessary for normal spontaneous vaginal births, cutting an episiotomy, or, after birth, for repair of an episiotomy or lacerations. Correctly performed, both methods of providing anesthesia are safe procedures with minimal to no effect on the baby and constitute the safest known methods (for both mother and baby) of providing regional and local obstetric anesthesia.

If an episiotomy is planned, then pudendal block is the method of choice, for the following reasons:

1. It anesthetizes a larger area, so if there are lacerations in an area other than the perineal body (e.g., periurethral lacerations) or if it is necessary

to extend the episiotomy, those areas are anesthetized as well. A pudendal block anesthetizes the perineum and vulva including the clitoris, labia majora, labia minora, perineal body, and rectal area. A local infiltration anesthetizes only the tissue infiltrated with an anesthetic agent.

2. There is no tissue distortion with a pudendal block because the trunk of a major nerve is anesthetized, thereby anesthetizing all its branches and the tissue it innervates. Local infiltration distends the tissues into which the anesthetic agent is injected, thereby distorting their size and making proper approximation of tissue layers more difficult.
3. Pudendal block also anesthetizes the lower vaginal tract, thereby alleviating any discomfort or pain a woman may have from the tissue stretching caused from distention by the fetal head. The sensation of stretching may be actually more frightening than painful for some women, especially those who did not have any preparation for childbirth, because of their fear of "ripping open." This alone may constitute a reason for performing a pudendal block. If an episiotomy is being cut, a pudendal block spares the unprepared woman from being frightened by the sudden sensation of her "bottom splitting open" at the time the cut is made. A pudendal block is also sometimes used for the sole purpose of relaxing the perineal musculature, especially if the woman is tightening up from pain and fear. An episiotomy may or may not subsequently be necessary.

Selection of a local infiltration as the anesthesia of choice is discussed in Chapter 69, as are the different techniques used for performing a local infiltration both prior to delivery (for cutting an episiotomy) and after delivery (for repair of an episiotomy or lacerations). The technique, relevant anatomy, and necessary equipment and materials for performing a pudendal block are discussed in Chapter 68.

Perineal Integrity Perineal integrity is evaluated in order to determine if birth can possibly occur over an intact perineum or if an episiotomy is indicated. This decision is continually reevaluated until the baby is born.

A number of techniques facilitate birth over an intact perineum. Each has its advocates and detractors. The first division of thinking is between those who believe in "hands on" and those who believe in "hands off." The hands-off proponents believe that hands on interferes with the natural timing and stretching by the mother, especially in squatting and standing positions. They believe that touching stimulates muscle contraction and is distracting to the woman. Some birthing women in other positions have expressed distress at being touched on the perineum, because the area is already supersensitive and hyperstimulated. These women find perineal massage or any stretching technique irritating.

The hands-on advocates believe that a number of techniques are protective of the woman's perineum. They disagree among themselves as to which single or combined techniques are the best. There is now evidence that some of these techniques are indeed protective while others are associated with an increased incidence of lacerations or episiotomy [21]. Others are of unproven value. The techniques include the following:

1. Prenatal digital stretching of the vaginal outlet by the woman or her partner. This technique is usually advocated for nulliparous women with very muscular perineums or women expressing considerable fear or anxiety about perineal tearing or cutting. It is of unproven value but makes good sense. It also familiarizes a woman with the sensation of pressure.
2. "Ironing out" the perineum by sweeping your fingers back and forth from side to side while exerting considerable pressure on the posterior vaginal wall just ahead of the fetal head. The pressure applied to iron out, or stretch, the muscles also stimulates the pushing reflex. There may be justified occasions for you to use this technique to stimulate the pushing reflex but the technique is uncomfortable to the woman and may traumatize the tissue, making it friable and more prone to tearing. When possible, there are other ways to encourage descent and pushing, such as upright positions.
3. Warm compresses applied to the perineum. These increase circulation to the area, thereby promoting muscle relaxation, and have been shown to be protective of the perineum [21].
4. Perineal massage, usually done with warmed oils or lubricants. The warm oil increases circulation to the area and prevents friction from the massage. The massage is to stretch the tissues and promote perineal relaxation. This has been shown, however, to increase lacerations [21]. This may be the result of massaging highly vascularized tissues that are now additionally at risk for edema. Perineal massage may also be perceived by the woman as irritating or distracting. Concern has been expressed about the oil possibly getting inside the vagina thereby creating the risk of getting into the baby's mouth or respiratory tract during its passage.

5. Perineal support at the time of birth is done one of two ways. Some clinicians do this by directly bracing the perineal body with their hand. This may have the effect, however, of impeding gradual fetal head extension thereby directing the head into the perineum and increasing the risk of laceration. It also directs tissue away from the midline thereby flattening it and leaving it vulnerable to tearing. The other method of perineal support avoids this problem and is done by placing your thumb and middle finger across from each other in the left and right groin and pressing inward to provide a little extra give across the perineal body (see Figure 28-9). There should be a slight gap between your hand and the woman's perineum so that neither your fingers nor your hand will be in the way of the oncoming head.
6. Fetal head control by the application of pressure against the fetal head to keep it well flexed followed by gradual extension as the perineum stretches (Figure 28-9). This is absolutely essential in lithotomy and most dorsal positions in order to prevent tears. Some clinicians believe that if the fetal head is controlled properly there is no need to touch the perineum. Other clinicians combine fetal head control with perineal support at the time of crowning.

Maternal self-control is key to whatever method of delivering over an intact perineum you use. A woman who is out of control is more apt to tear or need an episiotomy.

FIGURE 28-9 Combination of fetal head control and perineal support at the time of crowning. (Photograph by Artemis/Harriette Hartigan.)

Need for, and Type of, Episiotomy The perineum should initially be evaluated prior to the time of birth for its length, thickness, and distensibility. This evaluation aids in determining whether an episiotomy is indicated and, if so, what kind of episiotomy. An extremely thick perineum may be found in athletes, the result of muscular overdevelopment, and is apt to be rigid and resistant to distension, thereby necessitating an episiotomy. A short perineum may indicate the need for a mediolateral episiotomy rather than a median (midline) episiotomy, if an episiotomy is necessary, in order to avoid injury to the rectal sphincter and wall.

The primary indication for an episiotomy is fetal distress. An episiotomy enables the mother to more quickly deliver her baby for you to assess and institute appropriate resuscitation measures. Another indication for an episiotomy is evidence of poor tissue integrity that may predispose to extensive lacerations. The primary reason not to do an episiotomy is that, with the exception of the indications just given, it is generally not necessary to cause the mother this pain. Some women feel as though an episiotomy is an assault on their body. Most women who state a preference usually request that an episiotomy not be done. They generally respond well to a plan of not cutting an episiotomy unless absolutely necessary in your judgment (i.e., to expedite birth because of maternal or fetal distress). If episiotomy does become necessary, you should inform the woman and discuss it with her to the extent that you can, given the situation.

There are some other considerations to take into account that may affect your decision-making about the need for an episiotomy. All aspects of this decision should be discussed with the woman during the prenatal period.

1. *Your beliefs about whether it is better to cut an episiotomy or let the woman tear* if delivery over an intact perineum is impossible and tearing is inevitable. Your thoughts about this may be influenced by findings that a severe laceration (third or fourth degree) is much more likely in women who have midline episiotomies than in women without episiotomies [22] and that there is a greater delay in perineal healing with an episiotomy than with no episiotomy [23].

   Some midwives believe that they can do a better anatomical repair of an episiotomy than of a laceration, which may be jagged. An inevitable laceration of the perineal body is evidenced by narrow white lines resembling stretch marks and visible just beneath the per-

ineal skin. These appear just prior to laceration and probably represent beginning tearing of the underlying tissues. A quick episiotomy prior to the moment of crowning is possible and can substitute for an inevitable tear.

2. *The need for space in which to perform necessary interventions and manipulations*, such as in the case of fetal malpresentations and malpositions or an anticipated shoulder dystocia. A malpresentation or malposition in an average-sized baby means that (1) the widest diameter of the fetal head coming through the pelvic outlet and vaginal orifice is larger than usual, thereby creating a higher probability of laceration, and (2) you or your consulting physician may need room for manual or instrument manipulations in order to effect a safe birth. This latter reason may also be true for anticipated shoulder dystocia.
3. *The size of the baby*. Cutting a good-sized episiotomy may be indicated for birth of the preterm or SGA (small-for-gestational-age) baby, depending on the relaxation of the perineum. Also, *depending on the length and distensibility of the perineum and the control of the woman*, a baby estimated to be 4000 grams (9 pounds) or more may cause need for an episiotomy either to prevent laceration or in anticipation of a possible shoulder dystocia.
4. *Self-control of the woman.* A woman who is in good control of herself—that is, able to respond to directions to push or to breathe in order to slowly ease the baby's head out—is a far better candidate for no episiotomy and for delivering over an intact perineum. An uncontrolled woman is nearly guaranteed to lacerate, and some midwives would prefer to cut an episiotomy than to repair a laceration in that case.

If you make a decision to cut an episiotomy, then the next decision is what type of episiotomy will be cut: midline (median) or mediolateral. Several factors should be considered in making this decision.

First, consider how much room is needed in relation to the length of the perineal body and to the reason for the episiotomy. If the distance between the posterior fourchette and the rectal sphincter is unusually short, a mediolateral episiotomy is indicated in order to prevent severe and extensive laceration through the rectal sphincter and into the rectum. If the episiotomy is being cut to prevent a perineal laceration, then the amount of room you get from cutting a mediolateral episiotomy is not needed and a midline episiotomy would be the better choice.

A second consideration is that a midline episiotomy is less painful than a mediolateral episiotomy during the healing process. This is because there are fewer nerve branches in the locale of a midline episiotomy and its repair. Also, the arrangement of the muscles that have been cut across and into in a mediolateral episiotomy causes points of stretch that pull on the incisional repair line, thereby causing pain. This is in contrast with a midline episiotomy, which is cut into the central tendinous point of the perineum and only separates the two sides of pairs of muscles rather than cutting across the muscles themselves.

Finally, a midline episiotomy is easier to repair than a mediolateral episiotomy. This is because a mediolateral episiotomy is cut on a slant in relation to the perpendicular midline of the perineum. This means that the size of the bites for each half of a single stitch on either side of the incisional line will be deliberately unequal; that there is an increased risk of entering the rectum during the repair because of greater retraction of the medial aspect of the incision; that manipulation of the necessary equipment and materials is more awkward; and that it is more difficult to approximate the tissues in order to have good functional results.

Chapter 79 discusses how to cut the episiotomy you have decided on and describes the relevant anatomy. When cutting an episiotomy, it is vital to remember that with the cut the force that previously restrained progress of the head is suddenly released. Depending on when you cut it (i.e., during a contraction or not, while the woman is pushing or not) and on how distended the vaginal orifice is, it is possible for the fetal head to suddenly "pop"—a totally uncontrolled delivery of the head. Since this can be damaging to both the baby and the woman, you need to control the baby's head as you cut. You do this with the back of your vaginal hand, which is already delineating the area to be cut and protecting the baby's head.

Continuing Evaluation of Fetal Well-Being

Continuing evaluation of fetal well-being during the second stage of labor is a continuation of the evaluation of the well-being of the fetus during the first stage of labor, including evaluating the following:

1. Normality of the fetal lie, presentation, attitude, and variety
2. Fetal adaptation to the pelvis (synclitism or asynclitism, molding of the fetal skull, the formation of caput succedaneum)

3. The fetal heart rate and pattern (see Chapter 27)
4. Evaluation of the normality of progress being made in the mechanisms of labor

Numbers 1, 2, and 4 are determined during a vaginal examination. The first two were discussed in Chapter 26, relating to the first stage of labor. The normality of progress being made in the mechanisms of labor is evaluated by noting the progress of the fetus through the pelvis (engagement and descent) and the cardinal turning movements of the fetus (flexion and internal rotation) as identified by the changing position (variety) of the fetal head prior to delivery.

Continuing Evaluation of the Progress of Labor

Continuing evaluation of the progress of the second stage of labor is based on the following:

1. Contraction pattern
2. Length of second stage
3. Descent/station
4. Progress through the mechanisms of labor other than descent and engagement

The norms for these items were discussed earlier in this chapter.

Management decisions relating to the continuing evaluation of the progress of labor include the following:

1. When to prepare for the birth
2. Whether it is necessary to consult with your consulting physician

When to prepare for the birth was discussed in Chapter 26. The midwife may need to make a decision concerning physician consultation as she or he (1) continues to evaluate the normality of the progress of labor, the well-being of the fetus, and the well-being of the mother, (2) continues to screen for abnormalities and complications, and (3) anticipates potential problems based on the interpretation of findings resulting from this database evaluation. Screening for the collaborative management of complications during labor, including when to consult with the physician, is discussed in Chapters 29 and 30.

Evaluation of progress through the mechanisms of labor is essential to detecting deep transverse arrest and concomitant second stage hypotonic uterine dysfunction (see Chapter 29). Generally, the fetus is not in danger if hypotonic uterine dysfunction occurs and *is not ignored*.

The fetus is in danger when there are strong, expulsive contractions and maternal pushing effort but failure to progress because of some form of fetopelvic disproportion, including deep transverse arrest. The fetus in this situation is subjected to a literal battering. It is mandatory that the progress of labor as determined by progressive descent be carefully assessed. Detection of progressive descent was discussed earlier in this chapter and includes the following:

1. Progressively lower location on the woman's spine of back pain due to pressure from the fetal head
2. Progressively lower location in the woman's abdomen of the point of maximum intensity of the fetal heart tones
3. Increasing desire of the woman to push, which indicates descent of the fetal head to the pelvic floor and subsequent initiation of the Ferguson reflex mechanism for pushing
4. Vaginal examination findings indicative of a change in station, which is evidence of descent and progress through the pelvis
5. Rectal and perineal bulging
6. Appearance of the presenting part at the vaginal orifice
7. The woman's assertion that her baby is coming, confirmed by either observation or examination

Engagement should have occurred during the active phase of the first stage of labor in the nullipara and by the onset of the second stage of labor in the multipara. Failure of engagement to have occurred by entry into the second stage of labor is a signal of a potential problem.

Simkin and Ancheta have described a number of positions for a woman to assume and movements for her to make that help the fetal head be in alignment with her pelvis and in the most favorable or optimal position. Such alignment and rocking facilitate the movement of the fetus through the pelvis via the mechanisms of labor and may prevent labor dystocia. They have also detailed a "toolkit" of related comfort measures [10].

Bodily and Supportive Care of the Woman

Bodily and supportive care during the second stage of labor are continuations of the care begun during the first stage of labor, modified to meet the woman's changing needs as she progresses through labor. The effectiveness of the support and comfort measures depends on how each woman experiences and accepts them. There are a few additional measures and considerations specific to the second stage of labor—those pertaining to breathing, pushing, and the woman's significant others.

Breathing The woman should use a controlled form of breathing, such as that used during the ac-

FIGURE 28-10 Partner actively involved in birth of baby in birthing room.

tive phase of the first stage of labor, through the contractions if she does not yet feel like pushing. This type of breathing starts with a cleansing breath, then goes into a slow chest breathing that increases in speed as the contraction reaches its acme, then slows down as the contraction tapers off, and ends with another cleansing breath.

A woman may need help with her breathing and in making effective use of her natural pushing effort (see Chapter 67). The breathing to be used as she is pushing was discussed in detail earlier in this chapter.

The woman needs to be instructed to pant if she feels like pushing but you don't want her to push. Panting may be a quick inhalation followed by a forcible exhalation and repeated immediately. It may also be a rapid, shallow throat breathing as described in Chapter 26. The woman's ability to pant and not push can be critical, and she should be taught how to do this when she enters the second stage of labor if she has not been taught before.

Pushing A woman who feels like or needs to push can be helped in a number of ways in order to make her effort as effective as possible. Helping her push will make her partner feel important, contributing, and participating in the experience (Figure 28-10). These techniques are described in detail in Chapter 67.

Significant Others Ideally, whom the woman wants present at the time of birth has been discussed and planned for some time in advance. The birth setting without restrictions on whom will be present for the birth, except those placed by the woman, is the home. Birth centers also generally have few to no restrictions. The most restrictive setting is a hospital delivery room in which the number of significant others usually is limited to one or two. Depending on the size of the labor room or if birth is going to take place in an LDR or LDRP (labor/deliver/recovery/postpartum room), more significant others might be permitted. The policies regarding the presence of significant others at the time of birth vary with hospital settings. More enlightened hospitals allow siblings to be present during labor and at the time of birth. Restrictive hospital policies have been one of the reasons for couples to seek out-of-hospital childbirth alternatives.

If children are to be present for the birth (see Figure 28-11), regardless of setting, there needs to be a familiar adult designated as the person primarily responsible for them and their care. Children need to be able to leave the birthing environment if they so choose, or if necessary. Children should be prepared for the sights and sounds of birth and be involved in preparations for the birth and the baby [24, 25].

If birth is going to be in a delivery room, the midwife should welcome the partner and make the person feel wanted and needed, as was done in the labor room. Give the person space beside the woman, provide a stool to sit on, and emphasize his or her importance in being there. If the significant other has to change clothes in order to be in the delivery room, allow plenty of time so that he or she doesn't miss the

FIGURE 28-11 A sibling present at birth. (Photograph by Artemis/Harriette Hartigan.)

birth. Include the significant other in your explanations of the ongoing activities.

The significant other's activities during the second stage of labor again depend on the person's capabilities and wishes and how much participation is agreeable to the woman, the person, and you. For example, partners can continue what they were doing during the first stage of labor (e.g., back rubbing, coaching breathing, timing contractions, fanning). They might also help the woman in the technique of pushing, encourage her, wipe her face, share the anticipation and then the moment of birth with her, and cut the umbilical cord.

Preparation for Birth

It is the midwife's responsibility to ensure that all is in readiness for the birth. Management decisions included in preparation for birth involve the location of the birth and the position of the woman for giving birth. Since subsequent preparations depend somewhat on these two decisions, these decisions will be discussed first.

Location of the Birth The location of the birth should have been planned long before labor begins. Whether they can have what they want—significant others present, a certain position for birth, no routine episiotomy, no separation from their baby, and so forth—will determine for some women whether to give birth in a hospital, a birth center, or at home. The alternatives for delivery within a hospital are the delivery room, the labor room, a birthing room, or an LDR or LDRP. Newer hospitals often are designed with birthing rooms or some combination of labor/delivery/recovery/postpartum rooms for women with normal pregnancies. In a childbirth center birth takes place in a birth room. Part of the planning for birth at home is discussion of where in the home the birth will take place. Sometimes it is a bedroom; other times it is a special arrangement of mattress/bedding/beanbag chair/birth stool or the like in another room. The planned location of labor and birth may change because of unforeseen circumstances (e.g., the birth room is already occupied) or because the development of complications necessitates either a transfer into the hospital from an out-of-hospital setting or, within the hospital, to the delivery room.

Water birth is an alternative to the traditional birth practices that are detailed here and can occur in the home, birth center, or hospital. Differentiated from water labor, in which a woman spends some portion of her labor in water, water birth is when the infant is actually born under water. This sometimes happens by plan and sometimes by accident when a woman simply does not want to remove herself from an environment that is giving her pain relief and comfort. Although not able to breathe when born under water and thus posing no risk of aspiration, the baby's face/head is immediately brought to the surface where the air stimulates it to breathe before the placenta ceases to fully function. Meticulous care must be paid to water temperature and infection control when using a tub/pool for either labor or birth.

Position of the Woman for Birth Women can give birth in the lithotomy, dorsal, lateral, squatting, standing, knee-chest, or hands-knees position or on a birth stool or birth chair. Any of the alternatives to the lithotomy position are possible in out-of-hospital settings and in enlightened hospital labor or birth rooms. The usual positions in a hospital delivery room are lithotomy or dorsal. Midwives believe that in neither of these positions does the woman have to be flat on her back; rather, they encourage a semi-sitting, or "back up" and "legs down," modification of these positions (see Figure 28-12). Liu showed that women in a 30-degree upright position (as opposed to lying flat) have a shorter second stage of labor, which is further shortened if the woman uses physiological pushing [19]. In deciding which of these two positions a woman in a delivery room should use, the midwife should consider the following:

1. The woman's preference. Although the dorsal position is a more natural position, some women prefer the lithotomy position with the metal leg supports because they feel more comfortable when their legs are supported. Many labor beds are also designed for birth and usually have foot rests for support. If it is necessary for the woman to be in the delivery room, she can just be wheeled into that room and remain in this kind of birthing bed rather than transferred to the delivery table.
2. The condition of the woman's legs. A woman with severe varicosities should be delivered in dorsal rather than lithotomy position. This position avoids pressure on the legs and in the popliteal space, which is exerted by both the full-leg and knee-break stirrups and causes circulatory interference. The risk of thrombophlebitis would be quite high with the woman in stirrups.
3. Any existing or anticipated complications. In the event of any existing complications (e.g., malpresentations, multiple gestation) or anticipated complications (e.g., shoulder dystocia), the woman should be in a lithotomy position because the clinician needs best possible visualization and needs room in which to function with ready, direct access to the woman.

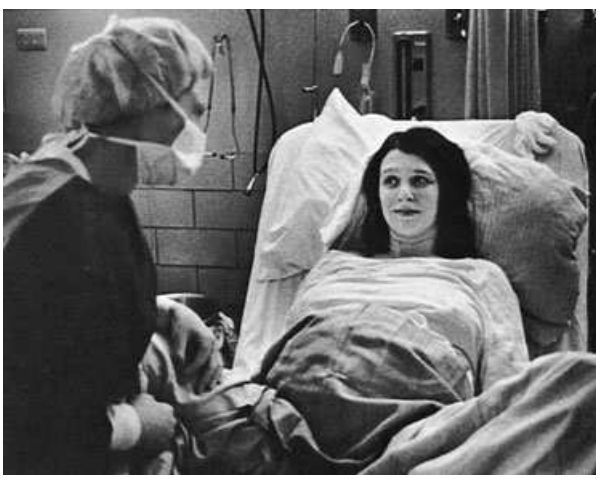


FIGURE 28-12 Midwife helping woman with "back up, legs down" positioning in a delivery room.

General Preparations The general preparations depend, in part, on the location of the birth. The pacing of the preparations depends on the woman's progress of labor. The ideal pace is one of steady progression with neither frantic haste nor a long wait for the actual birth after all is in readiness.

Certain preparations are the same regardless of setting:

1. Wash/scrub your hands.
2. The woman settles into the place prepared for her to give birth.
3. If needed, clean off the woman's perineal area and place clean dry underpads beneath her buttocks.
4. Her significant others know that birth is imminent, are in attendance, and have their cameras, videotapes, or whatever the mother wants ready for recording of the birth.
5. Blankets for the baby are warmed.
6. Whatever equipment and supplies you need for the birth are ready and their sterility protected (e.g., gloves, clamps, scissors, bulb syringe).
7. Put on whatever protective gear you will be wearing.
8. Put on your gloves.
9. Continue to keep the woman and her significant others informed and involved in the ongoing progress and activities.
10. Patiently wait, watch, and encourage.

The delivery room in a hospital setting requires the most complex and detailed preparations involving multiple policies and personnel. As a midwife, you may from time to time be in a delivery room. It is important to know how to function and be comfortable in this setting. The following are basic steps in preparing for a birth in the delivery room:

1. Notify the nursing staff that the woman you are caring for is nearing birth by informing them of your findings and estimation of how soon you are going to want to move her to the delivery

room. You should notify the staff approximately on entry into transition for a multipara and into second stage labor for a primigravida.

2. Make sure that the woman's significant others have already changed into acceptable attire for the delivery room, or that they do so now.
3. Make sure that the newborn resuscitation equipment and supplies are present and in working condition.
4. Request that blankets be warmed for the baby if there is not a blanket warmer in the setting.
5. Make sure that the source of heat for the baby is functioning (e.g., radiant heater, incubator).
6. Decide when to move the woman to the delivery room.
7. Notify the nursing staff of your decision.
8. Assist with moving the woman from the labor room to the delivery room.
9. Depending on the availability of nursing staff, assist with moving the woman safely onto the delivery room table and removing the labor room bed or transport cart from the room.
10. See to it that the significant others are capped and masked, if required, prior to entering the delivery room and that they are safely seated on stools beside the woman and out of the way of the nursing personnel, general activities going on in the room, and sterile fields.
11. Inform the woman and her significant others that you are leaving the room to scrub but that you will be right outside the door. Tell them that you will keep an eye on her, as will the nurses in the room, and that the next time they see you, you will be in a cap and mask.
12. Inform the nursing staff of the following:
    a. that you are leaving to scrub
    b. the position of the woman for birth (lithotomy or dorsal), as this makes a difference in what they do with the stirrups and the end of the delivery table
    c. what size gloves you wear
    d. whether you want a pudendal set, Iowa trumpet, and/or needle and syringe for local infiltration, and what local anesthetic
    e. anything else you are going to want that the circulating nurse must get or do while she is doing her other tasks (e.g., extra 4 × 4s, exam jelly, catheter)

    Midwives who are former labor and delivery room nurses remember what it was like to try to jump in six different directions at the same time and resent having to try while wishing that the person giving the orders was better organized. Experienced delivery room nurses have developed a routine that allows them to accomplish a myriad of essential tasks in a short amount of time while also continuing to support and instruct the woman. If you tell them what you will need before you need it, they can incorporate your requests smoothly into their routine and have everything ready for you by the time you're back in the room from scrubbing. If you wait until you are scrubbed and in the room to tell them your glove size and ask for other needed items, you not only disrupt an effective routine but frustrate both the nurse (who can't get it all at once) and yourself, as you end up waiting—which, depending on the circumstances, may or may not matter.
13. Don a cap, mask, and pair of booties if you haven't already done so. Although it is considered better technique to have on a cap and mask whenever you enter the delivery room, it is not generally considered a serious breach in technique to have been in the delivery room without wearing a cap and mask if none of the sterile packs is open or sterile fields uncovered, as is usually the situation when the woman is moved into the delivery room.
14. Perform a surgical scrub. If you did a surgical scrub upon entry to the labor and delivery suite (a good idea), then the length of your scrub now can be cut in half. Remember to put on your cap and mask, in that order, before starting your scrub. Otherwise, when you realize that you have not yet done so, you have to break scrub, put on your cap and mask, and then start your scrub over again.

    It is essential while scrubbing to keep an eye on what is going on in the delivery room and to watch specifically for signs of imminent birth. Most delivery rooms are adjacent to the scrub sinks, which enables you to look in easily while scrubbing. (Needless to say, a controlled birth of the fetal head is eminently more important than a complete—or any—scrubbing of your hands.) Scrub time is also a good time to mentally review, even if quickly, your management plan for delivery of this individual woman and baby.
15. When you reenter the delivery room from scrubbing, the woman will be positioned for delivery, the sterile delivery table of supplies and instruments will be uncovered, chart forms will be started, and so forth. You should be familiar with the delivery room, where equipment and supplies are, the routines of the circulating nurse, and how to function within the room so if need be you know how to operate the delivery room table, fix stirrups, adjust lights and mirror, and so on.
16. Dry your hands and arms, using surgical technique.

17. Gown, using sterile technique.

18. Glove, using sterile technique.

19. The person who does the perineal prep varies. In some settings it is the circulating nurse; in other settings it is the midwife or physician helping the woman deliver her baby. (See Chapter 66 for the procedure.)

If the woman is in lithotomy position, the perineal prep is the time when the table is broken. *Once the table is broken it is imperative that you keep at least one eye on the woman's perineum at all times no matter what else you are doing*. This is vital to protect the safety of the about-to-be-born baby.

20. Drape the woman in accord with the drapes provided and institutional procedure. After the woman is draped, if she is in stirrups, you can more easily keep your eye on the perineum if you bring the instrument table up beside you with the end slanted under her draped leg.

21. If the woman so desires, have the overhead or portable mirror adjusted so that she and her significant others can watch the birth of the baby. It helps in adjusting the mirror for you to hold your hand right in front of the vaginal orifice and ask the woman and her partner if they can see your hand—a hand may be more recognizable to them. After the mirror is adjusted you can point out landmarks and the area to watch and describe what they can expect to see.

22. Request either sterile normal saline or an antiseptic solution such as benzalkonium (Zephiran), Betadine, or Hibiclens to be put in either a separate sterile splash basin or in a kidney basin if there is one on the instrument table. Use the solution to wet your gloves for vaginal examinations and rinse off your gloves of powder, blood, and so on.

23. Organize your instrument table. (It is set up in an organized way but you will need to organize it further.) It is helpful to separate what you will need for the birth of the baby (i.e., two clamps and a pair of scissors for clamping and cutting the umbilical cord; a cord clamp, and a bulb syringe for oropharyngeal and nasal suctioning) from the other instruments and supplies on the table. Then if you need any of these items in a hurry you will have them available rather than having to try to find them and losing precious time. It also helps to separate out the scissors for cutting an episiotomy, even if you do not plan to do one, in case you reverse this decision at the last minute. The table can be reorganized as events progress and you need different items; for example, reorganize the table for repair work when you are ready to do this by separating the needle-holder, suture scissors, pickup forceps, suture, and local infiltration apparatus from the other instruments and supplies.

24. Do a vaginal examination

- **a.** Reconfirm the presentation and position of the baby.
- **b.** Ascertain the station, if necessary.
- **c.** Evaluate the distensibility of the woman's perineum again.

25. If indicated, perform either a pudendal block or a local infiltration (see Chapters 68 and 69).

26. If indicated, cut the appropriate type of episiotomy (see Chapter 79).

Throughout all these preparations for birth, you will have continued to keep the woman and her partner informed of and involved in the ongoing activities, coached her in her breathing and pushing effort, and responded to any questions or concerns they might have. You will also have assumed management of the delivery room. Remember that you are responsible not only for the birth, the mother, the baby, and the significant others but also for everything that is going on in the delivery room, as it all affects directly or indirectly these central people. In this capacity you must not only be aware of everything happening in the room but also redirect any activity with which you do not agree. You are the one the staff will look to for direction and instructions. You must control the situation for the safety of mother and baby and to provide the best possible experience for them.

An effective learning tool for thinking through the responsibilities and the multiple preparations for birth is to play a mental game in which you envision yourself making the decisions, performing some preparatory acts, and directing others in the performance of other preparatory acts in a given situation. Once you have drilled and mastered the basics, you can alter the game by changing variables in the situation (e.g., primigravida versus multipara, different settings [e.g., home versus hospital delivery room], precipitous second stage). Mentally envision what you would do from beginning to end, in sequence, in each situation. The value of the mental game is that when faced with the actual situation, you have already thought through your actions and will thus face and manage the situation with greater equanimity and more seasoned judgment.

Management of the Birth

Management of the birth includes using the proper hand maneuvers to assist the baby's birth and pro-

viding immediate care of the newborn. In managing the birth the midwife must decide the following:

1. Whether to deliver the baby's head with a contraction or between contractions
2. Whether to use a Ritgen maneuver
3. When to clamp and cut the umbilical cord

Hand Maneuvers The hand maneuvers for birth of the baby in an occiput anterior (OA) position with the mother in a lithotomy position, a dorsal position, on hands and knees, and squatting are detailed in the skills section of this book (Chapters 70–73). The hand maneuvers for other presentations and positions of the baby are detailed in the discussion of the mechanisms of labor and managing the birth for each (i.e., breech, face) in Chapter 30. The hand maneuvers for a persistent occiput posterior (OP) position are the same as for an occiput anterior except for control of the head. The direction of pressure to help maintain the head in flexion and then to allow gradual extension when the head is occiput posterior is exactly opposite from the direction of the pressure exerted for the same purpose when the head is occiput anterior.

You must thoroughly drill and master the hand maneuvers you use for delivering a baby in every position before you need to use them so they become second nature to you. Those used infrequently should be reviewed periodically and practiced, so you will know them when you need them.

Birth of the Baby's Head Whether to deliver the baby's head with a contraction or between contractions or to use a Ritgen maneuver may not be your decision. A woman who is out of control and pushing with all her might despite all efforts to get her to stop will determine how the head is born.

Between Contractions. The idea behind delivering the baby's head between contractions is that the combination of the contraction and the maternal pushing effort exerts a double force at the moment of birth. This makes the birth of the head more rapid and the release of restraining pressure more abrupt, both of which increase the risk of intracranial damage to the baby and lacerations to the woman. If the woman is in control of herself it is possible for her to follow your instructions and to pant through a contraction and then gently push in between contractions, which will ease the baby's head out with the least amount of trauma to the baby and to the woman.

Ritgen Maneuver. The Ritgen maneuver, or modified Ritgen maneuver, is a technique by which the clinician controls the delivery of the baby's head (see Figure 28-13). It is performed as follows:

1. One hand remains on the occiput for control of the baby's head.
2. The other hand is covered with a towel to protect it from contamination.

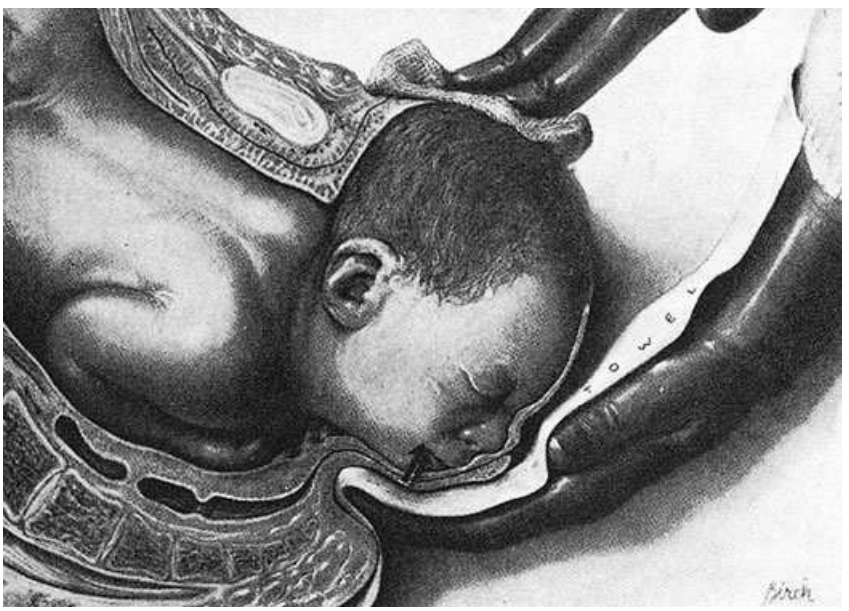


FIGURE 28-13 Ritgen maneuver. The arrow indicates the direction of moderate pressure applied to the fetal chin by the posterior hand.

Source: From Pritchard, J. A., and MacDonald, P. C. *Williams Obstetrics*, 15th ed. New York: Appleton-Century-Crofts, 1976. Reproduced with permission of the McGraw-Hill Companies.

3. The draped hand then exerts inward pressure posterior to the woman's rectum until the baby's chin is located and in the grasp of the fingers.
4. Forward and outward pressure is then exerted on the underneath side of the chin and the head is controlled between this hand and the hand exerting pressure on the occiput.

Most midwives do not routinely use the Ritgen maneuver. They believe the baby's head can be controlled in other ways (see Chapters 70–73) that are better for the baby and mother because they allow gradual natural processes to unfold, interfere less, and are less uncomfortable than the Ritgen maneuver. Discomfort arises from the fact that the anus is extremely distended with the bulging of the rectal wall into it. The Ritgen maneuver increases this anal stretching and most likely subjects it and the rectal wall to direct pressure and the rough surface of the towel. It is also associated with an increased incidence of periurethral lacerations.

However, it is useful to know how to do the Ritgen maneuver because it does enable you to "get hold of" the baby's head earlier and to deliver the baby's head faster in a controlled fashion if there is an urgent need for immediate delivery. It is possible to institute the Ritgen maneuver when the head is distending the vulva about half as much as it will when crowning, at which time the vulva encircles the largest diameter of the head at the moment before birth. A combination of an episiotomy and a Ritgen maneuver will shorten the end of the second stage of labor and bring it to a quick conclusion, if need be.

Clamping and Cutting the Umbilical Cord The umbilical cord is clamped by placing two instrument clamps on the cord with enough room between them to allow for easy cutting of the cord. After applying the first clamp, experienced clinicians routinely strip the cord the distance to the planned location of the second clamp. This prevents blood from spurting from a distended umbilical vessel at the time of cutting. When a clamp has been applied, the weight of the clamp must be supported and it should not be allowed to hang and exert pull or tension at the site of insertion into the baby, especially when the mother is in lithotomy position. Many clinicians prevent this when the mother is in lithotomy position by hooking the ring of the finger hold of the clamp over a finger of the hand that is holding or supporting the baby. This leaves the other hand free for cutting. The pull on the umbilicus by the clamp is not as much of a concern when the baby is born onto the bed or immediately placed on the mother's abdomen before the cord is cut. There is no pain for either the baby or the woman at the site where the umbilical cord is cut.

The timing of cutting the umbilical cord is a long-standing controversy between those who advocate delayed clamping of the cord and those who don't think it makes any significant difference when the cord is clamped [26]. In fact, neither early nor late clamping and cutting of the umbilical cord has any effect on the rate of infant mortality in term gestations. The more significant issue is whether to deliberately hold the preterm infant at or below the level of the vaginal introitus, thereby holding the baby at or below the level of the placenta. Lowering the infant, combined with delayed cord clamping, will result in a transfusion of approximately 80 milliliters of blood from the placenta into the baby. This transfusion gives additional blood volume, which is thought to facilitate physiological processes involved in the transition from fetal life to life after birth that may be critical to the very low birth weight preterm newborn [27]. This action has to be balanced against the baby's need for warmth and possible resuscitation. One workable compromise by Mercer and colleagues is to receive the baby into a warm blanket. The baby is then lowered the length of the umbilical cord, without tension on the cord, in order to obtain maximum placental infusion for 30–45 seconds before clamping and cutting the cord [27]. It is clear, however, that placental transfusion is *not* desirable if there is a known blood incompatibility between the mother and the baby.

Leboyer, in his plea for decreasing the violence of childbirth to the baby, advocates delayed clamping of the cord because he believes that the baby makes the transition to breathing air more easily without trauma and without danger of anoxia [28]. This is accomplished with patience and by allowing the newly born baby to have two sources of oxygen during the transition: (1) from the lungs and (2) from the placenta through the umbilical cord. Then when the gradual transition from dependence on the placenta to dependence on the lungs is completed, as evidenced by cessation of cord pulsations, the umbilical cord is clamped and cut. This process is completed approximately 4 to 5 minutes after birth.

Immediate Care of the Newborn Immediate assessment and resuscitation of the newborn are detailed in Chapters 37 and 38. However, it does not hurt to reemphasize vital points of care during the first minute of life, as this is the climax of the second

stage of labor. From the end of the birth of the baby, the usual steps of care are as follows:

1. Establish a clear airway. In normal births this usually involves
   a. holding or positioning the baby so that the head is lower than the body and is turned somewhat to the side for drainage
   b. wiping off the baby's face and head and wiping fluid from the nose and mouth
   c. suctioning the nasal and oral passages with a soft rubber bulb syringe
2. Keep the baby warm. The warmest place for the baby is on the mother's chest and abdomen. Wipe and dry the baby off so body heat is not lost, put a stockinette cap on the baby's head, and cover the baby with a warm blanket. If in a hospital and the baby has to be separated from the mother (e.g., for resuscitation), the baby is dried off and kept warm under a radiant heater.
3. Show the baby to the mother and her significant others or place the baby on the mother's abdomen if not already there (Figure 28-14).
4. Clamp and cut the umbilical cord (see preceding discussion). Many midwives simply use the cord clamp as one of the two clamps when clamping can be done without haste. Having the partner cut the cord is often an appreciated and special experience for the couple.
5. Assign the 1-minute and 5-minute Apgar scores (preferably done by someone other than you).

If you are in the hospital and take the baby to a warmed crib, incubator, or Kreiselman, take along the bulb syringe as well as the cord clamp and scissors for the final clamping and cutting of the cord, if this is not already done. During this minute of life, while doing the above, you should also grossly examine the baby for any visible deformities or congenital defects.

FIGURE 28-14 Midwife placing baby on mother's abdomen immediately after birth. Note the baby's open eyes.

While you are applying the cord clamp approximately 1 to 2 centimeters from the baby's skin edge, cutting off the excess cord, and completing your gross examination, *remember to keep one eye on the mother's perineum to note any sudden hemorrhaging or signs of placental separation.*

An alternative to the management and immediate care of the newborn presented in this chapter is to use all or part of the Leboyer approach to childbirth and the immediate care of the baby.

Leboyer Methodology The Leboyer approach to childbirth and to transition of the baby from intrauterine to extrauterine life is geared toward making this transition as atraumatic, painless, and nonfrightening as possible for the baby. This requires a reeducation process for parents and professionals alike. A full discussion of the methodology and its effect may be found in Dr. Frederick Leboyer's book, *Birth Without Violence* [28]. The following is a listing of specific actions, in sequence, suggested in his book:

1. Extinguish or dim lights to the minimum needed for birth; dim the lights still further after birth. Overhead lights or spotlights are not really necessary at this time.
2. Maintain silence. Any essential communication should be done in very low, muted voices toward the end of labor, reducing to a whisper at the time of birth and thereafter.
3. Practice patience throughout.
4. Support the baby's body without touching the baby's sensitive head during the delivery and place the baby on the mother's abdomen. Normally the baby emits one to three good, clear cries, no more, and settles into breathing. If the cries are not good, clear, and vigorous and the baby is limp, then resuscitation efforts are indicated.
5. Place the baby initially on the mother's abdomen with the limbs underneath the body. After the baby has stretched and the limbs are moving, turn the baby onto one side because this position facilitates relaxation of the limbs. Then, briefly, place the baby on his or her back.
6. Cut the umbilical cord when it has stopped pulsating. (The cord is cut immediately if necessary during birth if it is tight around the baby's neck.)
7. While the baby is on its abdomen, on the mother's abdomen, someone (preferably the mother) should massage the baby's body. Begin

the massage by letting the hands lie motionless yet attentive, responsive, and loving. Then massage in slow, continuous waves down the baby's back, over and over in measured fluidity.

8. The baby is then placed in a basin for a water bath. The temperature of the water should be 98° to 99°F (36.6° to 37.2°C). The baby is placed in the water extremely slowly and remains in the bath until completely relaxed. Bathing the baby is a good role for the woman's partner, as it allows this person to remain involved in events and bond with the baby. The baby most likely will open his or her eyes during the bath and may also smile and indulge in exploratory play (Figure 28-15).
9. Remove the baby slowly from the water bath, reimmerse, and then remove her or him from the water again. This facilitates the baby's adjustment to gravity.
10. Place the baby on a warmed diaper and wrap him or her in warm blankets without restraining the baby's hands.
11. Place the baby on one side with back support.
12. Leave the baby alone in stillness. This does not mean that the baby is no longer under continuing observation.

This entire process takes approximately 10 minutes, depending on the length of time in the water bath.

The Leboyer method dovetails nicely with attachment processes, maternal-infant bonding, and the initiation of the parenting continuum. Further contact with the mother, including breastfeeding and eye-to-eye contact, may be smoothly initiated after completion of the Leboyer method.

FIGURE 28-15 Father giving his baby a Leboyer bath with help of mother and siblings.

A more recent study in Sweden, however, showed that newborns with uninterrupted contact with their mother begin to make crawling movements toward her breast after 20 minutes and by an average of 50 minutes most of the newborns were correctly sucking and breastfeeding [29]. Most of the other group of newborns, who were separated from their mothers after 20 minutes for routine procedures and then returned to them, did not demonstrate the crawling behavior, nor did they suck correctly when put to breast. This raises questions not only about the timing of newborn procedures (weight, footprints, examination, bath, dressing) but also about any separation from the mother. It also calls into question accepted theory regarding motor development, which places crawling at 28 weeks of life [30].

References

1. Philpott, R. H., and Castle, W. M. Cervicographs in the management of labour in primigravidae: I. The alert line for detecting abnormal labour. *J. Obstet. Gynaecol. Br. Common.* 79:592–598 (July) 1972.
2. Friedman, E. A. *Labor: Clinical Evaluation and Management*, 2nd ed. New York: Meredith, 1978.
3. Kilpatrick, S. J., and Laros, R. K. Jr. Characteristics of normal labor. *Obstet. Gynecol.* 74(1):85–87 (July) 1989.
4. Albers, L. L., Schiff, M., and Gorwoda, J. G. The length of active labor in normal pregnancies. *Obstet. Gynecol.* 87(3):355–359 (March) 1996.
5. Diegmann, E. K., Andrews, C. M., and Niemczura, C. A. The length of the second stage of labor in uncomplicated, nulliparous African American and Puerto Rican women. *J. Midwifery Womens Health* 45(1):67–71 (January/February) 2000.
6. Aderhold, K. J., and Roberts, J. E. Phases of second stage labor: four descriptive case studies. *J. Nurse-Midwifery* 36(5):267–275 (September/October) 1991.
7. Menticoglou, S. M., Manning, F., Harman, C., and Morrison, I. Obstetrics: perinatal outcome in relation to second-stage duration. *Am. J. Obstet. Gynecol.* 173(3):906–912 (September) 1995.
8. Roberts, J., and Woolley, D. A second look at the second stage of labor. *J. Obstet. Gynecol. Neonatal Nurs.* 25(5):415–423 (June) 1996.

9. Petersen, L., and Besuner, P. Pushing techniques during labor: issues and controversies. *J. Obstet. Gynecol. Neonatal Nurs.* 26(6):719–726 (November/December) 1997.
10. Simkin, P., and Ancheta, R. *The Labor Progress Handbook*. Oxford, England: Blackwell Science, 2000.
11. Caldeyro-Barcia, R. The influence of maternal bearing-down efforts during second stage of fetal well-being. *Birth Fam. J.* 6(1):17–21, 1979.
12. Sleep, J., Roberts, J., and Chalmers, I. Care during the second stage labour. In Chalmers, I., Enkin, M., and Keirse, M.J.N.C. (Eds.) *Effective Care in Pregnancy and Childbirth*. London: Oxford University Press, 1989, pp. 1129–1144.
13. Roberts, J. E. The "push" for evidence: management of the second stage. *J. Midwifery Womens Health* 47(1):2–15 (January/February) 2002.
14. Beynon, C. L. The normal second stage of labor: a plea for reform in its conduct. *J. Obstet. Gynaecol. Br. Empire* 64:815, 1957.
15. Yeates, D. A., and Roberts, J. E. A comparison of two bearing-down techniques during the second stage of labor. *J. Nurse-Midwifery* 29(1):3–11 (January/February) 1984.
16. Sampselle, C. M., and Hines, S. Spontaneous pushing during birth: relationship to perineal outcomes. *J. Nurse-Midwifery* 44(1):36–39 (January/February) 1999.
17. Paine, L. L., and Tinker, D. D. The effect of maternal bearing-down efforts on arterial umbilical cord pH and length of the second stage of labor. *J. Nurse-Midwifery* 37(1):61–63 (January/February) 1992.
18. Parnell, C., Langhoff-Roos, J., Iversen, R., and Damgaard, P. Pushing method in the expulsive phase of labor: a randomized trial. *Acta Obstet. Gynecol. Scand.* 72:31–35, 1993.
19. Liu, Y. C. The effects of the upright position during childbirth. *Image: J. Nurs. Scholarship* 21(1):14–18 (Spring) 1989.
20. Hanson, L. Second-stage positioning in nurse-midwifery practices. Part 1: Position use and preferences. *J. Nurse-Midwifery* 43(5):320–325 (September/October) 1998.
21. Albers, L. L., Anderson, D., Cragin, L., et al. Factors related to perineal trauma in childbirth. *J. Nurse-Midwifery* 41(6):236 (November/December) 1996.
22. Shiono, P., Klebanoff, M. A., and Carey, J. C. Midline episiotomies: more harm than good? *Obstet. Gynecol.* 75(5):765–770 (May) 1990.
23. McGuinness, M., Norr, K., and Nacion, K. Comparison between different perineal outcomes on tissue healing. *J. Nurse-Midwifery* 36(3):192–198 (May/June) 1991.
24. Simkin, P. When should a child attend a sibling's birth? *Midwifery Today* 28:37 (Winter) 1993.
25. Jonquil, S. G. Preparing siblings. *Midwifery Today* 28:34–35 (Winter) 1993.
26. Mercer, J. S. Current best evidence: a review of the literature on umbilical cord clamping. *J. Midwifery Womens Health* 46(6):402–414 (November/December) 2001.
27. Mercer, J. S. Cord of prevention. *Adv. Nurs. (N. Engl.)* 2(16):14–16 (August 5) 2002.
28. Leboyer, F. *Birth Without Violence*. New York: Knopf, 1976.
29. Righard, L., and Alade, M. O. Effect of delivery room routines on success of first breastfeed. *Lancet* 336:1105–1107, 1990.
30. Kennell, J. H. The time has come to reassess delivery room routines. *Birth* 21(1):49–51 (March) 1994.

• • • Bibliography (Chapters 26 and 28)

ACNM Clinical Bulletin No. 3—December 1998. Intrapartum nutrition, *J. Nurse-Midwifery* 38(4):124–128 (March/April) 1999.

ACOG Practice Bulletin No. 36. Obstetric analgesia and anesthesia. *Obstet. Gynecol.* 100(1):177–191 (July) 2002.

American College of Obstetricians and Gynecologists. *Operative Vaginal Delivery*. Technical Bulletin 196. Washington, DC: ACOG, 1994.

Aderhold, K. J., and Roberts, J. E. Phases of second stage labor: four descriptive case studies. *J. Nurse-Midwifery* 36(5):267–275 (September/October) 1991.

Albers, L. L., and Savitz, D. A. Hospital setting for birth and use of medical procedures in low-risk women. *J. Nurse-Midwifery* 36(6):327–333 (November/December) 1991.

Albers, L. L., Schiff, M., and Gorwoda, J. G. The length of active labor in normal pregnancies. *Obstet. Gynecol.* 87(3):355–359 (March) 1996.

Albers, L. L., Anderson, D., Cragin, L., et al. Factors related to perineal trauma in childbirth. *J. Nurse-Midwifery* 41(6):236 (November/December) 1996.

Albers, L. L., Anderson, D., Cragin, L., et al. The relationship of ambulation in labor to operative delivery. *J. Nurse-Midwifery* 42(1):4–8 (January/February) 1997.

Albers, L. L., for the CNM Data Group, 1996. The duration of labor in healthy women. *J. Perinatol.* 19(2):114–119, 1999.

Anderson, E. *Rationale for Use of Ketostick, Labstick in Obstetric Labor: Detection of Ketosis*. Unpublished paper, University of Mississippi Medical Center, Jackson, MS, 1974.

Arkoosh, V. A. Neuraxial analgesia techniques. In Norris, M. C. (Ed.) *Obstetric Anesthesia*, 2nd ed. Baltimore, MD: Lippincott Williams and Wilkins, 1999, pp. 317–330.

Ball, R. H., and Parer, J. T. The physiologic mechanisms of variable decelerations. *Am. J. Obstet. Gynecol.* 166(6):1683–1689, 1992.

Beynon, C. L. The normal second stage of labor: a plea for reform in its conduct. *J. Obstet. Gynaecol. Br. Empire* 64(6):815–820, 1957.

Bing, E. *Six Practical Lessons for an Easier Childbirth*. New York: Grosset and Dunlap, 1967.

Blackburn, S. T., and Loper, D. L. *Maternal, Fetal, and Neonatal Physiology: A Clinical Perspective*, 2nd ed. Philadelphia, PA: W. B. Saunders, 2002.

Bowe, N. L. Intact perineum: a slow delivery of the head does not adversely affect the outcome of the newborn. *J. Nurse-Midwifery* 26(2):5–11 (March/April) 1981.

Bowman, T. A. Water babies. *Advance for Nurses* 1(1):12–14 (June 18) 2001.

Brooks, G. G., Lewis, D. F., Gallaspy, J. W., Thompson, H, and Dunnihoo, D. R. Labor in the gravida with 10 or more years between pregnancies. *J. Reprod. Med.* 37(4):336–338 (April) 1992.

Brown, C. Therapeutic effects of bathing during labor. *J. Nurse-Midwifery* 27(1):13–16 (January/February) 1982.

Bucklin, B. A., Chestnut, D. H., and Hawkins, J. L. Intrathecal opioids versus epidural local anesthetics for labor analgesia: a meta-analysis. *Reg. Anesth. Pain Med.* 27(1):23–30 (January/February) 2002.

Burns, E., and Kitzinger, S. *Midwifery Guidelines for Use of Water in Labour*. Oxford, England: Oxford Centre for Health Care Research and Development, 2000.

Burst, H. V. "Real" midwifery. *J. Nurse-Midwifery* 35(4):189–191 (July/August) 1990.

Caldeyro-Barcia, R., et al. Effect of position changes on the intensity and frequency of uterine contractions during labor. *Am. J. Obstet. Gynecol.* 80:284, 1960.

Caldeyro-Barcia, R. Some consequences of obstetrical interference. *Birth Fam. J.* 2:34, 1975.

Caldeyro-Barcia, R. The influence of position during the second stage of labor. *ICEA Conference Proceedings*. Minneapolis, MN: International Childbirth Education Association, 1978.

Caldeyro-Barcia, R. The influence of maternal bearing-down efforts during second stage of fetal well-being. *Birth Fam. J.* 6(1):17–21, 1979.

Chestnut, D. H. (ed.). *Obstetric Anesthesia: Principles and Practice*, 2nd ed. Baltimore, MD: Mosby, 1999.

Church, L. K. Water birth: one birthing center's observations. *J. Nurse-Midwifery* 34(4):165–170 (July/August) 1989.

COMET Study Group UK. Effect of low-dose mobile versus traditional epidural techniques on mode of delivery: a randomized controlled trial. *Lancet* 358:19–23, 2001.

Cunningham, F. G., Gant, N. F., Leveno, K. J., et al. *Williams Obstetrics*, 21st ed. New York: McGraw-Hill, 2001.

Dick-Read, G. *Childbirth Without Fear*, 2nd ed. New York: Harper and Row, 1959.

Dickinson, R. L., Belskie, A., and Hoffman, M. *Birth Atlas*, 6th ed. New York: Maternity Center Association, 1968.

Diegmann, E. K., Andrews, C. M., and Niemczura, C. A. The length of the second stage of labor in uncomplicated, nulliparous African American and Puerto Rican women. *J. Midwifery Womens Health*, 45(1):67–71 (January/February) 2000.

Eberle, R. L., and Norris, M. C. Effects on progress and outcome of labor. In Norris, M. C. (Ed.) *Obstetric Anesthesia*, 2nd ed. Baltimore, MD: Lippincott Williams and Wilkins, 1999.

England, P., and Horowitz, R. *Birthing from Within*. Albuquerque, NM: Patera Press, 1998.

Enkin, M., Keirse, M. J. N. C., Neilson, J., et al. *A Guide to Effective Care in Pregnacy and Childbirth*. Oxford, England: Oxford University Press, 2000.

Faucher, M. A., and Brucker, M. C. Intrapartum pain: pharmacologic management, *J. Obstet. Gynecol. Neonatal Nurs.* 29(2):169–180 (March/April) 2000.

Fisher, S. R. Factors associated with the occurrence of perineal lacerations. *J. Nurse-Midwifery* 24(1):18–26, 1979.

Fraser, W. D., Marcoux, S., Krauss, I., et al. Multicenter randomized, controlled trial of delayed pushing for nulliparous women in the second stage of labor with continuous epidural analgesia. *Am. J. Obstet. Gynecol.* 182:1165–1172, 2000.

Friedman, E. A. An objective method of evaluating labor. *Hosp. Pract.* (July) 1970.

Friedman, E. A. *Labor: Clinical Evaluation and Management* New York: Meredith Publishing, 1967, 2nd. ed., 1978.

Friedman, E. A. Labor in multiparas: a graphico-statistical analysis. *Obstet. Gynecol.* 8(6):691–703 (December) 1956.

Friedman, E. A. Primigravid labor: a graphicostatistical analysis. *Obstet. Gynecol.* 6(6):567–589 (December) 1955.

Friedman, E. A. The functional divisions of labor. *Am. J. Obstet. Gynecol.* 109:274, 1971.

Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2001.

Gannon, J. M. Delivery on the hands and knees: a case study approach. *J. Nurse-Midwifery* 37(1):48–52 (January/February) 1992.

Gardosi, J., Sylvester, S., and Lynch, C. B. Alternative positions in the second stage of labour: a randomized controlled trial. *Br. J. Obstet. Gynecol.* 96:1290–1296 (November) 1989.

Garite, T. J. Amniotomy in labor: routine or reserved for specific indications? *Contemp. OB/GYN* 39(5):39–58 (May) 1994.

Gatt, S. P., and Pybus, A. *Hypertextbook of Regional Anesthesia for Obstetrics*. Australia: Manbit Anesthesia Software, 1999. Accessed online at http://www.manbit.com.

Gimbel, J., and Nocon, J. J. The physiological basis for the Leboyer approach to childbirth. *JOGNN* 6:11, 1977.

Glosten B. Epidural and spinal analgesia/anesthesia: local anesthetic techniques. In Chestnut, D. H. (Ed.) *Obstetric Anesthesia: Principles and Practice*, 2nd ed. Baltimore, MD: Mosby, 1999, pp. 360–381.

Goetzl, L., Cohen, A., Frigoletto, F. Jr., Ringe, S. A., Lang, J. M., and Lieberman, E. Maternal epidural use and neonatal sepsis evaluation in afebrile mothers. *Pediatrics* 108(5):1099–1102 (November) 2001.

Golay, J., Vedam, S., and Sorger, L. The squatting position for the second stage of labor: effects on labor and on maternal and fetal well-being. *Birth* 20(2):73–78 (June) 1993.

Greenhill, J. P., and Friedman, E. A. *Biological Principles and Modern Practice of Obstetrics*. Philadelphia, PA: Saunders, 1974.

Hamlin, R. H. J. *Stepping Stones to Labour Ward Diagnosis*. Adelaide, Australia: Rigby Limited, 1959.

Hankins, G. D. V. Apgar scores: are they enough? *Contemp. OB/GYN* (6)(special issue):13–25, 1991.

Hanson, L. Second-stage positioning in nurse-midwifery practices. Part 1: Position use and preferences. *J. Nurse-Midwifery* 43(5):320–325 (September/October) 1998.

Hawkins, J. L., Chestnut, D. H., and Gibbs, C. P. Obstetric anesthesia. In Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002.

Hawkins, J. L., Koonin, L. M., Palmer, S. K., and Gibbs, C. P. Anesthesia-related deaths during obstetric delivery in the United States, 1979–1990. *Anesthesiology* 86(2):277–284 (February) 1997.

Hellman, L. M., and Pritchard, J. A. *Williams Obstetrics*, 15th ed. New York: Appleton-Century-Crofts, 1976.

Highley, B. L., and Mercer, R. T. Safeguarding the laboring woman's sense of control. *Am. J. Maternal Child Nurs.* 3:39, 1978.

Hodnett, E. Nursing support of the laboring woman. *J. Obstet. Gynecol. Neonatal Nurs.* 25(3):257–264 (March/April) 1996.

Howell, C. J. Epidural versus non-epidural analgesia for pain relief in labor, *Cochrane Database Syst. Rev.* 2:CD000331, 2000.

Howell, C. J., Kidd, C., Roberts, W., et al. A randomized controlled trial of epidural compared with non-epidural analgesics in labor. *Br. J. Obstet. Gynaecol.* 108:27–33, 2001.

Jonquil, S. G. Preparing siblings. *Midwifery Today* 28:34–35 (Winter) 1993.

Kennell, J. H. The time has come to reassess delivery room routines. *Birth* 21(1):49–51 (March) 1994.

Kier, J. *Woman's Guide to a Stress-Free Pregnancy and Creative Childbirth*. Houston, TX: Butterfly Books, 1985.

Kilpatrick, S. J., and Laros, R. K. Jr. Characteristics of normal labor. *Obstet. Gynecol.* 74(1):85–87 (July) 1989.

King, T. Epidural anesthesia in labor: benefits versus risks. *J. Nurse-Midwifery* 42(5):377–388 (September/October) 1997.

Kitzinger, S., and Simkin, P. *Episiotomy and the Second Stage of Labor*, 2nd ed. Seattle, WA: Pennypress, 1986.

Klein, M. C., Grzybowski, S., Harris, S., et al. Epidural analgesia use as a marker for physician approach to birth: implications for maternal and newborn outcomes. *Birth* 28(4):243–248 (December) 2001.

Leboyer, F. *Birth Without Violence*. New York: Knopf, 1976.

Leighton, B. L., and Halpern, S. H. The effects of epidural analgesia on labor, maternal, and neonatal outcomes: a systematic review. *Am. J. Obstet. Gynecol.* 186:S69–77, 2002.

Lesser, M. S., and Keane, V. R. *Nurse-Patient Relationships in a Hospital Maternity Service*. St. Louis, MO: Mosby, 1956.

Lieberman, E., and O'Donoghue, C. Unintended effects of epidural analgesia during labor: a systematic review. *Am. J. Obstet. Gynecol.* 186(5, pt. 2):S031–68, 2002.

Liu, Y. C. The effects of the upright position during childbirth. *Image: J. Nurs. Scholarship* 21(1):14–18 (Spring) 1989.

Lowe, N. K. The pain and discomfort of labor and birth. *J. Obstet. Gynecol. Neonatal Nurs.* 25(1):82–92 (January) 1996.

Ludka, L. M., and Roberts, C. C. Eating and drinking in labor: a literature review. *J. Nurse-Midwifery* 38(4):199–207 (July/August) 1993.

Lydon-Rochelle, M. T., Albers, L., and Teaf, D. Perineal outcomes and nurse-midwifery management. *J. Nurse-Midwifery* 40(1):13–18 (January/February) 1995.

MacArthur, A., MacArthur, C., and Weeks, S. Is epidural anesthesia in labor associated with chronic low back pain? A prospective cohort study. *Anesth. Analg.* 85:1066–1070, 1997.

Mann, O. H., and Albers, L. L. Informed consent for epidural analgesia in labor. *J. Nurse-Midwifery* 42(5):389–392 (September/October) 1997.

Mardirosoff, C., Dumont, L., Boulvain, M., and Tramer, M. R. Fetal bradycardia due to intrathecal opioids for labour analgesia: a systematic review. *Br. J. Obstet. Gynaecol.* 109(3):274–281 (March) 2002.

Martensson, L., and Wallin, G. Labour pain treated with cutaneous injections of sterile water: a randomised controlled trial. *Br. J. Obstet. Gynaecol.* 106(7):633–637 (July) 1999.

Mayberry, L. J., Clemmens, D., and De, A. Epidural analgesia side effects, co-interventions, and care of women during childbirth: a systematic review. *Am. J. Obstet. Gynecol.* 186(5, pt. 2):S081–93 (May) 2002.

Mayberry, L. J., Wood, S. H., Strange, L. B., Lee, L., Heisler, D. R., and Neilsen-Smith, K. Managing second-stage labor: exploring the variables during the second stage. *AWHONN Lifelines* 3(6):28–34 (December/January) 1999/2000.

McGuinness, M., Norr, K., and Nacion, K. Comparison between different perineal outcomes on tissue healing. *J. Nurse-Midwifery* 36(3):192–198 (May/June) 1991.

McKay, S. (Ed.) *Maternal position during labor and birth. ICEA Review*. Minneapolis, MN: International Childbirth Education Association, 1989.

McKay, S., and Mahan, C. S. How worthwhile are membrane stripping and amniotomy? *Contemp. OB/GYN* 173–182 (December) 1983.

McKay, S., and Roberts, J. Obstetrics by ear: maternal and caregiver perceptions of the meaning of maternal sounds during second stage labor. *J. Nurse-Midwifery* 35(5):266–273 (September/October) 1990.

Menticoglou, S. M., Manning, F., Harman, C., and Morrison, I. Obstetrics: perinatal outcome in relation to second-stage duration. *Am. J. Obstet. Gynecol.* 173(3):906–912 (September) 1995.

Mercer, J. S. Current best evidence: a review of the literature on umbilical cord clamping. *J. Midwifery Womens Health* 46(6):402–414 (November/December) 2001.

Milhon, D. (ed.) Amniotomy. *ICEA Review*, 1992.

Miller, J., Williams, H. B., and Macarthur, J. L. Hemoglobin changes in labor and the puerperium. *Am. J. Obstet. Gynecol.* 78:303, 1959.

Morton, R., and Chesley, L. C. Intrapartum proteinuria. *Obstet. Gynecol.* 7:373, 1956.

Murphy, D. J. Failure to progress in the second stage of labour. *Curr. Opinion Obstet. Gynecol.* 13(6):557–561 (December) 2001.

Nagato, Y. *Beliefs, Practices, and Conflicts Relating to Childbearing among Japanese Women in the United States*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1995.

Newton, M. The effect of position on the course of the second stage of labor. *Surg. Forum* VII:517–520, 1957.

Noble, E. *Childbirth with Insight*. Boston, MA: Houghton Mifflin, 1983.

Novick, G. *Spontaneous Versus Sustained Bearing-down Efforts in Labor*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1983.

Obstetric anesthesia and analgesia. *ACOG Technical Bulletin* 112 (January) 1988.

Odent, M. *Birth Reborn*, 2nd ed. New York: Pantheon, 1992.

Oliver, C. M., and Oliver, G. M. Gentle birth: its safety and its effect on neonatal behavior. *JOGNN* 7:35, 1978.

Otigbah, C. M., Dhanjal, J. K., Harmsworth, G., and Chard, T. A retrospective comparison of

water births and conventional vaginal deliveries. *European J. Obstet. Gynecol. Reproduc. Biol.* 91:15–20, 2000.

Oxorn, H. *Oxorn-Foote Human Labor and Birth*, 5th ed. Norwalk, CT: Appleton-Century-Crofts, 1986.

Paine, L. L., and Tinker, D. D. The effect of maternal bearing-down efforts on arterial umbilical cord pH and length of the second stage of labor. *J. Nurse-Midwifery* 37(1):61–63 (January/February) 1992.

Parnell, C., Langhoff-Roos, J., Iverson, R., and Damgaard, P. Pushing method in the expulsive phase of labor: a randomized trial. *Acta Obstet. Gynecol. Scand.* 72:31–35, 1993.

Petersen, L., and Besuner, P. Pushing techniques during labor: issues and controversies. *J. Obstet. Gynecol. Neonatal Nurs.* 26(6):719–726 (November/December) 1997.

Phillips, C. R. The essence of birth without violence. *Am. J. Mat. Child Nurs.* 1:162, 1976.

Philpott, R. H., and Castle, W. M. Cervicographs in the management of labour in primigravidae. Part I: The alert line for detecting abnormal labour. *J. Obstet. Gynaecol. Br. Common.* 79:592–598 (July) 1972.

Perl, F. M., and Hunter, D. J. S. What cervical dilatation rate during active labour should be considered abnormal? *Eur. J. Obstet. Gynecol. Reprod. Biol.* 45:89–92, 1992.

Pomerantz, M. *Factors Contributing to the Widespread Use of Epidurals for Pain Relief in Childbirth*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1999.

Reynolds, J. L. Sterile water injections relieve back pain of labor. *Birth* 27(1):58–60 (March) 2000.

Righard, L., and Alade, M. O. Effect of delivery room routines on success of first breastfeed. *Lancet* 336:1105–1107, 1990.

Roberts, J. Alternative positions for childbirth. Part 1: First stage of labor. *J. Nurse-Midwifery* 25(4):11–18 (July/August) 1980.

Roberts, J. Alternative positions for childbirth. Part 2: Second stage of labor. *J. Nurse-Midwifery* 25(5):13 (September/October) 1980.

Roberts, J. E., and Kriz, D. M. Delivery positions and perineal outcome. *J. Nurse-Midwifery* 29(3):186–190 (May/June) 1984.

Roberts, J., and Woolley, D. A second look at the second stage of labor. *J. Obstet. Gynecol. Neonatal Nurs.* 25(5):415–423 (June) 1996.

Roberts, J. E. The "push" for evidence: management of the second stage, *J. Midwifery Womens Health* 47(1):2–15 (January/February) 2002.

Sabo, V. *Comparison of the Effects of Spontaneous Versus Sustained Bearing Down on the Second Stage of Labor*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1988.

Sampselle, C. M., and Hines, S. Spontaneous pushing during birth: relationship to perineal outcomes. *J. Nurse-Midwifery* 44(1):36–39 (January/February) 1999.

Sharma, S. K., Alexander, J. M., Messick, G., et al. Cesarean delivery: a randomized trial of epidural analgesia versus intravenous meperidine analgesia during labor in nulliparous women. *Anesthesiology* 96(3):546–551 (March) 2002.

Shermer, R. H., and Raines, D. A. Positioning during the second stage of labor: moving back to basics. *J. Obstet. Gynecol. Neonatal Nurs.* 26(6):727–734 (November/December) 1997.

Shearer, M. H. Some deterrents to objective evaluation of fetal monitors. *Birth Fam. J.* 2:58, 1975.

Shiono, P., Klebanoff, M. A., and Carey, J. C. Midline episiotomies: more harm than good? *Obstet. Gynecol.* 75(5):765–770 (May) 1990.

Simkin, P. When should a child attend a sibling's birth? *Midwifery Today* 28:37 (Winter) 1993.

Simkin, P., and Ancheta, R. *The Labor Progress Handbook*. Oxford, England: Blackwell Science, 2000.

Sleep, J., Roberts, J., and Chalmers, I. Care during the second stage labour. In Chalmers, I., Enkin, M., and Keirse, M. J. N. C. (Eds.) *Effective Care in Pregnancy and Childbirth*. London: Oxford University Press, 1989, pp. 1129–1144.

Stensland, J. Sterile water papules for low back pain in labor. Accessed online at www2.coastalnet.com/~coyotemidwife/SWP_PAPE.htm.

Swan, H. D., and Borshoff, D. C. Informed consent: recall of risk information following epidural analgesia in labour. *Anesth. Intensive Care* 22(2):139–141 (April) 1994.

Taylor, P. M., Bright, N. H., and Birchard, E. L. Effect of early versus delayed clamping of the umbilical cord on the clinical condition of the newborn infant. *Am. J. Obstet. Gynecol.* 86:893, 1963.

Technical Working Group. *Care in Normal Birth: a Practical Guide*. Geneva, Switzerland: World Health Organization, Department of Reproductive Health and Research, 1999.

Thallon, A. and Shennan, A. Epidural and spinal analgesia and labour. *Curr. Opinion Obstet. Gynecol.* 13(6):583–587 (December) 2001.

Thoms, H., Roth, L. G., and Linton, D. *Understanding Natural Childbirth*. New York: McGraw-Hill, 1950.

Thorp, J. A., Trobough, T., Evans, R., Hedrick, J., and Yeast, J. D. The effect of maternal oxygen administration during the second stage of labor on umbilical cord blood gas values: a randomized controlled prospective trial. *Am. J. Obstet. Gynecol.* 172(2):465–474, 1995.

Trolle, B., Moller, M., Kronborg, H., and Thomsen, S. The effect of sterile water blocks on low back labor pain. *Am. J. Obstet. Gynecol.* 164(5, pt. 1):1277–1281 (May) 1991.

Tucker, S. M. *Pocket Guide to Fetal Monitoring*, 4th ed. St. Louis, MO: Mosby, 2000.

van de Velde, M., Teunkens, A., Hanssens, M., van Assche, F.A., and Vandermeersch, E. Post dural puncture headache following combined spinal epidural or epidural anesthesia in obstetric patients. *Anesth. Intens. Care* 29(6):595–599 (December) 2001.

Wiedenbach, E. *Clinical Nursing—A Helping Art*. New York: Springer, 1964.

Wiedenbach, E. *Family-Centered Maternity Nursing*. New York: G. P. Putnam, 1958, 2nd ed, 1967.

Wynn, R. M. [Translator of original article by Ferdinand August Max Franz von Ritgen, 1855.] Concerning his method for protection of the perineum. *Am. J. Obstet. Gynecol.* 93:421, 1965.

Yancey, M. K., Zhang, J., Schwarz, J., Dietrich, C. S. III, and Klebanoff, M. Labor, epidural analgesia, and intrapartum maternal hyperthermia. *Obstet. Gynecol.* 98(5, Part 1):763–770 (November) 2001.

Yeates, D. A., and Roberts, J. E. A comparison of two bearing-down techniques during the second stage of labor. *J. Nurse-Midwifery* 29(1):3–11 (January/February) 1984.

Zakowski, M. Complications associated with regional anesthesia in the obstetric patient. *Semin. Perinatol.* 26(2):154–168 (April) 2002.

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CHAPTER

29

Screening for and Collaborative Management of Selected Complications During the First and Second Stages of Labor

The conditions and complications discussed in this chapter are the more common ones, and they actually may occur before or without labor (e.g., premature rupture of membranes, umbilical cord prolapse). No effort has been made to differentiate them by stage of labor because most of them can occur in either the first or the second stage.

The midwife must be familiar with these complications in order to recognize their development or existence as early as possible. The midwife then enters into a collaborative relationship with the consulting physician for the management of care of women with these conditions. In addition to contributing to the medical management of care, the midwife also contributes advocacy for a woman, provides continuity of care, protects the normal labor process insofar as possible, and promotes family-centered care and safe labor and birth options (including delivery by the midwife) appropriate to the situation.

This chapter reflects the fact that the recognition and evolution of a complicated clinical situation usually involve progressive levels of intervention. The midwife should evaluate the need for each intervention, the safety of nonintervention, the disruption in the normal process an intervention will cause, and the risk-benefit ratio of intervention and nonintervention. Some of the complications discussed in this chapter alter the normal physiological condition of the mother and the environment for the fetus. These alterations compromise the mother's and the fetus's normal reserve, thereby dictating the need for earlier and more aggressive intervention than is indicated for a normal progressive labor.

Other complications that are rarely seen in obstetric practice (either because they are so catastrophic that there is no question of urgent need for a physician (e.g., amniotic fluid embolism) or because they are rare results or causes of other complications for which physician consultation will have already been sought) are not discussed in this chapter. Examples of the latter category include Bandl's retraction ring, or pathological uterine constriction rings, and causes and results of cervical dystocia including cervical rigidity, conglutination of the cervix, cervical stenosis, and annular detachment of the cervix. The midwifery student who is interested in these rare complications is encouraged to pursue this interest in medical obstetric textbooks and journals.

Previous Cesarean Section

The management of care of women who have had one or more previous cesarean sections has undergone more than one revolution in the past several

years. In the early 1970s the medical community eased away from an earlier "once a section, always a section" philosophy and toward cautious attempts at vaginal birth after cesarean section (VBAC) in carefully selected women [1]. By the early 1990s, all women with previous lower uterine segment (low transverse or low vertical incision) cesarean sections and no contraindications were encouraged to labor rather than plan a repeat cesarean section [2, 3]. It was thought that vaginal birth after cesarean section presented fewer risks than a repeat cesarean section and that VBAC would lower the rate of cesarean sections, which had increased to nearly 25 percent by 1988 from 5.5 percent in 1970 [4, 5]. By the late 1990s and into the early 2000s, however, studies were published that indicated an increased risk of uterine rupture in women electing to have a trial of labor rather than a repeat cesarean section [6, 7]. One study found a uterine rupture rate of 5.2/1000 women with spontaneous onset of labor and of 1.6/1000 women with repeat cesarean section without labor [7].

The risk to a woman of having a ruptured uterus while attempting to give birth vaginally after a prior cesarean section is related to the type of uterine incision and in some instances to the gestational age of the fetus at the time the cesarean section was performed. The risk of uterine rupture is also increased if a woman's labor is induced by any means other than prostaglandins (7.7/1000). Induction with a prostaglandin dramatically further increases the risk of uterine rupture to 24.5/1000 [7]. Increased risk of uterine rupture may also be related to whether the closure during the previous cesarean section was a single layer with a continuous running stitch or a double layer with interrupted sutures, with the latter obviously a stronger closure [8]. The crucial piece of information is whether the incision was in the lower uterine segment. Any incision that extends into the muscle mass of the uterine corpus or fundus increases the risk of uterine rupture. Since the lower uterine segment is poorly developed in early gestation, a cesarean section done before 28 weeks without labor necessarily involves the corpus muscle mass, even with a low transverse incision. Safety of a subsequent vaginal delivery in such a situation is thus questionable, especially if there had been no labor. With labor the lower uterine segment develops even in the second trimester.

There are two types of cesarean sections: (1) those in which the uterine incision involves the upper contractile uterine segment (corpus/fundus) and (2) those in which the uterine incision involves only the lower noncontractile uterine segment. The former is a vertical incision and is known as the classical incision or cesarean section. The latter may involve either a low transverse incision or a low vertical incision. The risk of subsequent uterine rupture is directly related to the type of uterine scar. The risk of uterine rupture for women who have had a previous low transverse uterine incision is between 0.19 and 0.8 percent [9, 10]. For women who have had a previous low vertical uterine incision the risk of uterine rupture is 1.1 percent [11]. Women with classical uterine scars have a risk of catastrophic uterine rupture of around 12 percent [2, 12].

There are two types of uterine ruptures when there is a scar from previous uterine surgery, the most common surgery being cesarean section. These types are differentiated by clinical findings and resulting morbidity and mortality. One type is catastrophic, in which there is separation of the old incision for most of its length, the fetal membranes also rupture, all or part of the fetus is extruded into the peritoneal cavity, and there is significant bleeding. The other type is atraumatic dehiscence in which the separation of the old incision does not involve the entire length, the fetal membranes do not rupture, the fetus remains within the uterus, and bleeding is minimal or absent. Rupture of a low transverse uterine incision, if it occurs, is not generally catastrophic or life threatening to either the mother or the baby. Such a rupture is usually no more than a dehiscence of the old scar and an incidental finding during uterine exploration following a vaginal birth or during an elected repeat cesarean section. To be life threatening, rupture of a uterine scar either extends into the rich blood supply found in the uterine corpus and fundus or disrupts the placenta, which is normally located in the uterine fundus. Because of these possibilities VBAC is not recommended for women with classical upper uterine segment vertical scars.

The risk to a woman of having a repeat cesarean section is the increased morbidity and mortality associated with cesarean section as major abdominal surgery. Causes of morbidity and mortality include anesthesia risks, inadvertent injury to the bladder or bowel, hemorrhage, wound infection, and increased newborn respiratory problems [13].

Factors that are associated with a higher success rate of VBAC include nonrepetitive indications

for the previous cesarean section (e.g., breech or malpresentation, fetal distress, preeclampsia), spontaneous labor with normal progression, and a history of previous VBAC. Factors that are associated with repeat cesarean section after a trial of labor include possible repetitive indications for the previous cesarean section (e.g., cephalopelvic disproportion, failure to progress, labor dystocia), use of induction or augmentation, more than one prior cesarean section, no prior vaginal delivery, and nonreassuring fetal heart tones when first seen in labor [14, 15].

The midwife should discuss management options for labor and delivery with the woman during the prenatal period. This discussion starts upon learning, during the initial visit, that the woman has undergone a previous cesarean section. The database obtained during the initial visit includes the following:

1. History
   a. weeks gestation at time of cesarean section
   b. type of cesarean section
   c. reason for cesarean section
   d. length of labor
   e. cervical dilatation at time of delivery
2. Physical examination
   a. abdominal scar (describe)
3. Pelvic examination
   a. clinical pelvimetry
   b. nonparous cervix and vaginal introitus if all previous babies have been delivered by cesarean section

It is critical that the midwife remember that the abdominal skin incision is not synonymous with the uterine incision. Only review of the operative report will give definitive information regarding the location of the uterine incision. You should obtain the operative report and record of the previous labor and surgery. Both are essential for determining the relative safety of VBAC for an individual and helpful in taking care of the woman during the subsequent labor. Look specifically both for type of incision into the uterus and for type of closure.

If the previous incision was low transverse or low vertical, the management options are (1) a scheduled, elective repeat cesarean section, (2) an elective repeat cesarean section after the onset of labor, or (3) a trial of labor for a vaginal delivery. If the previous uterine incision was classical, then a repeat cesarean section without labor is the appropriate management option. The available options should be reviewed with the woman and the risks and benefits of a repeat cesarean section versus a VBAC should be discussed. Documentation that this discussion has taken place should be recorded in the chart.

Although some women feel strongly that they should have the opportunity to deliver vaginally after a cesarean section, there are other women who would rather have another cesarean birth [16]. From a health perspective, all women who had an incision in the lower uterine segment and have no contraindications should be encouraged to attempt vaginal birth. However, part of informed consent is for the woman to know that morbidity has been found to be higher in those women who attempt VBAC and labor but deliver again by cesarean section than in either women who attempt VBAC and birth vaginally (lowest risk) or women who have an elective repeat cesarean birth [6].

If a woman chooses to have a scheduled elective repeat cesarean section without waiting for the onset of labor, she most likely will be scheduled at 39 weeks' gestation. Unless the woman has sure dates or an early dating ultrasound, it may be necessary to confirm fetal maturity by amniocentesis for fetal lung maturity in order to avoid iatrogenic prematurity. This intervention is avoided if the woman enters spontaneous labor prior to the repeat cesarean section.

If a woman chooses to have a vaginal birth, she will have some special needs for support in her decision. Referral to a special VBAC course or support group, if available, may help her overcome any negative feelings and fears she has from her previous experience. Support throughout the antepartal course is especially important when family members are skeptical about the woman's decision. The midwife should explore issues of body image, fear of failure, and self-image with the woman antepartally. The midwife should also compare the woman's recollection of the length of her labor and reason for the cesarean section with her medical records in order to discuss any lack of knowledge or misperception that would lead to unrealistic concerns on her part.

The midwife should be cautious in labeling a woman a poor candidate for vaginal delivery on the basis of a previous diagnosis of cephalopelvic disproportion (CPD). Many diagnoses of cephalopelvic disproportion do not reflect actual CPD but, rather, an unknown reason for failure to progress in labor. Approximately 60 to 70 percent of women with a previous cesarean section for CPD (or failure

to progress) will deliver vaginally in a subsequent pregnancy [3, 10], and often deliver babies larger than the one for which CPD was the diagnosis.

Discussion with your consulting physician regarding a woman with a previous cesarean section should include your findings, a review of your discussion with the woman, and her decision about birth, locale for labor and birth, and whether the physician needs to be present.

A candidate for VBAC should be allowed to labor normally. She may have a psychological milestone to overcome at the point in labor at which she experienced the difficulties that led to the previous cesarean section. Also, from this point she will subsequently progress like a primigravida if she has never delivered vaginally. Thus it is important to note the point in the previous labor at which arrest or difficulty occurred, as this is the point in the present labor where progress might be slow or nonexistent. Support and exploration of fear of failure is essential when the woman reaches that point in labor.

Management of care of the VBAC woman in labor and for birth is the same as for any woman in labor (see Chapters 26 and 28) with the exception of more frequent monitoring of the fetal heart (every 15 minutes during the first stage and every 5 minutes in second stage), if not using continuous electronic fetal monitoring, because the first indication of uterine rupture usually is fetal bradycardia.

Also, oxytocin for induction or augmentation should be used with great caution, weighing risks and benefits; prostaglandins should not be used for ripening the cervix and misoprostol (Cytotec) is contraindicated. There no longer is concern that epidurals might mask the symptoms of uterine dehiscence or rupture at the site of the scar because most of the symptoms have nothing to do with whether a woman feels pain. Fetal bradycardia, abrupt and persistent, may be the only indication that uterine rupture has occurred [9]. The woman should be closely monitored for the signs and symptoms of uterine rupture: abrupt change or cessation of uterine contractions, vaginal bleeding, and a loss of fetal station [3], as well as an abrupt change in the fetal heart rate. All interventions should be evaluated for safety and interference with normal labor progress and mechanisms.

In management of the third stage of labor, it is useful to remember that there is an increased incidence of the placenta's being implanted over the uterine scar. This leads to an increased incidence of placenta accreta. For this reason, in the event of a retained placenta you should transfer the woman to the hospital if you are at home or in a birth center and either ask your consulting physician to attempt the manual removal of the placenta rather than doing it yourself, or ask the physician to be present if you choose to do it.

Manual exploration of the uterine cavity immediately after birth to rule out scar dehiscence is a subject of controversy. The individual situation and events during labor should be considered and the absolute necessity of this painful procedure should be explored with your consulting physician. The management of asymptomatic scar dehiscence following vaginal birth is to do nothing, as the defect will heal itself by 6 weeks postpartum.

Preterm Labor/Birth

Preterm, or premature, labor is labor commencing any time after the start of the twentieth week of gestation up to completion of the thirty-seventh week of gestation. Preterm labor culminates in preterm birth in almost 12 percent of all births in the United States and is second only to birth defects as the leading cause of neonatal mortality. Despite all efforts during the 1980s to identify risk, develop preterm birth prevention programs, and intervene with tocolytic drugs, the research is inconclusive and the rate of preterm birth actually increased from 8.9 percent in 1980 to 10.2 percent in 1988 to 11.8 percent in 1999 [17].

Preterm birth accounts for 75 percent of all perinatal deaths and up to 50 percent of the neurological handicaps found in infancy. The incidence of preterm birth varies among different populations, with the lowest incidence in the socioeconomically more advantaged population and the highest incidence occurring in the medically indigent population. As the medically indigent population has a higher proportionate number of blacks than whites, the higher incidence of preterm birth in this population may account for the higher mortality rate among black infants than among white infants [18].

Management of preterm labor is predicated on first identifying the woman at risk for this complication. Risk-scoring tools have proved to have such low sensitivity, specificity, and positive-predictive value as to have limited usefulness except with upper socioeconomic women and with multigravidas [19]. However, a number of predisposing risk factors have been associated with preterm labor:

1. Low socioeconomic status
2. Nonwhite race: differences between the preterm birth rate for blacks and whites persist even when socioeconomic status is not a factor. This may reflect the fact that black women who are currently classified as middle-class are more likely than white women who are currently classified as middle-class to have been conceived and raised in poverty; the possible cumulative effect of poverty from generation to generation that stays in poverty; and the possible improvement in the rate of low birth weight in middle-class black women with each subsequent generation conceived and raised in the middle class [20].
3. Poor nutritional status: low prepregnancy weight; weight gain of less than 10 pounds by 20 weeks' gestation; weight loss; inadequate protein and calorie intake (see Chapter 22)
4. Previous history of a preterm labor or birth: any woman who had one preterm birth in a past pregnancy has a 20 to 40 percent risk of recurrence. The risk increases or decreases with each subsequent preterm or full-term birth, respectively. It is sometimes difficult to distinguish, from the history of birth weight and supposed months of gestation, whether a previous infant was preterm or growth-retarded. Therefore, an attempt should be made to obtain the medical records for any woman who had a previous infant weighing less than 2500 grams or who delivered prior to 36 weeks' gestation.
5. One or more spontaneous second trimester abortions
6. Short interval between pregnancies: one study found that for black women, an interval of fewer than 9 months between pregnancies was associated with a significantly greater prevalence of preterm delivery and lower birth weight, whereas for white women only an interval of fewer than 3 months between pregnancies was associated with a greater prevalence of preterm birth and lower birth weight [18].
7. Multiple gestation: ten percent of all preterm births are because of multiple gestation.
8. Substance abuse (cigarettes, alcohol, street drugs, particularly cocaine)
9. Inadequate prenatal care
10. Uterine anomalies
11. Incompetent cervix
12. DES exposure in utero
13. Urinary tract infection
14. Hemoglobinopathies (e.g., G_6PD)
15. Genital tract colonization and infection with Group B Streptococci, *Ureaplasma urealyticum*, *Mycoplasma hominis*, *Gardnerella vaginalis*, bacteroides species, *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, *Trichomonas vaginalis*, or bacterial vaginosis [21].
16. Premature rupture of the membranes
17. Chorioamnionitis
18. Severe physical violence during pregnancy [22]
19. Abruptio placentae or placenta previa
20. Fetal death
21. Polyhydramnios

In addition to scrutinizing all the possible predisposing factors, intensive efforts have been made to identify biological markers for predicting and preventing preterm birth [17]. The results have been disappointing and the evidence is often inconsistent.

1. Use of home monitoring for frequency of contractions has been found to have a sensitivity and positive predictive value below 30 percent. Data are inconsistent on any difference in outcome. Further, although preterm delivery undoubtedly increases with increased frequency of contractions, measurement of contraction frequency was found to not be clinically useful for predicting preterm delivery [17, 23].
2. Measuring salivary estriol, which increases before the onset of spontaneous term or preterm labor, has a high number of false positives and too many confounding variables [17].
3. Making use of the known association of bacterial vaginosis and preterm labor [24] by screening and treatment protocols has been the focus of a number of studies. Results are inconsistent but largely without significant differences in the rate of preterm labor from unscreened and untreated control groups both in the United States and abroad [17, 25]. Certainly women who are symptomatic should be treated, but since 40 to 50 percent of women are asymptomatic, the evidence to date does not support screening and treatment of all pregnant women [17]. However, a significant reduction in the incidence of preterm delivery has been found in treating women with a previous preterm delivery and a diagnosis of bacterial vaginosis in the second trimester with oral metronidazole (Flagyl) for one week or more [21].
4. Fetal fibronectin (fFN) is a protein produced by the fetal membranes that serves as an adhesive binder of the membranes and placenta to the decidua and is normally present in cervical secretions until 20 to 22 weeks' gestation. After

that time, however, the presence of fFN is associated with preterm labor from 24 through 34 weeks. Screening for fFN has shown a positive test to have 61% sensitivity and 83% specificity for predicting preterm labor, however, a negative test is 95% predictive for *not* delivering within 14 days [17]. The problem is that even if fFN reliably predicted preterm labor, there is to date no related intervention that will decrease the risk of preterm delivery. Therefore, the test should not be used for routine screening of low-risk, asymptomatic women, and the following criteria should be met if used in specific high-risk groups [17]:

   a. membranes intact
   b. less than 3 centimeters cervical dilatation
   c. test used no earlier that the start of the 24th week of gestation and no later than the end of the 34th week of gestation

   A benefit of the high negative predictive value of the fFN test is that it can be used to rule out imminent preterm birth, avoid unnecessary intervention, and reassure expectant parents that their risk for the next two weeks is low. The test costs about $200 [26].

5. There is clearly an association between cervical shortening and preterm delivery [27], but the predictive value of using cervical ultrasonography has ranged from 68 to 100% sensitivity and 44 to 79% specificity [17]. The problem is the lack of a related effective treatment that would decrease the risk of preterm birth. Therefore, routine use of cervical length determination by ultrasonography is not recommended [17].

The same problem holds true for the strong predictive value of a combination of a positive fFN test and cervical ultrasonography of a cervical length of less than 25 millimeters as neither test alone has a related effective intervention. The negative predictive value is more useful at this time, especially with women with a number of predisposing risk factors.

Women with a history of incompetent cervix (see Chapter 24) and previous pregnancy loss, however, may benefit from weekly or biweekly monitoring of cervical length with vaginal ultrasound since they do not exhibit signs and symptoms of preterm labor until the membranes rupture, they have vaginal bleeding, or experience pelvic pressure and the cervix has already effaced and dilated. Although prophylactic cervical cerclage has not been found to be beneficial in the prevention of preterm labor [28, 29], once there are findings of the cervix becoming shorter or there is funneling (prolapse) of the membranes through the internal cervical os into the cervical canal, placement of a cerclage suture may be beneficial, although the evidence is inconsistent [28–31].

Screening for preterm labor, therefore, involves identifying both the predisposing factors for preterm labor during routine prenatal care and the signs and symptoms of preterm labor. The signs and symptoms of preterm labor are as follows:

1. Painful menstrual-like cramps—may be confused with round ligament pain
2. Dull low backache—different from the usual low backache a pregnant woman may have
3. Suprapubic pain or pressure—may be confused with urinary tract infection
4. Sensation of pelvic pressure or heaviness
5. Change in character or amount of vaginal discharge (thicker, thinner, watery, bloody, brown, colorless)
6. Diarrhea
7. Unpalpated uterine contractions (painful or painless) felt more often than every 10 minutes for 1 hour or more and not relieved by lying down
8. Premature rupture of the membranes

The signs and symptoms of preterm labor should be included as a routine part of the woman's prenatal education beginning around 20 to 24 weeks' gestation.

In addition to routine screening for complications, the midwife should provide the following care to a woman with a history of one previous preterm labor or birth and no signs and symptoms of preterm labor in this gestation:

1. Monthly screening for asymptomatic bacteriuria
2. Treatment of any vaginal and cervical infections
3. Diet history and appropriate nutritional counseling
4. Reinforcement of routine instructions about the signs and symptoms of preterm labor
5. Counseling, if necessary, regarding cigarette, drug, and alcohol use
6. Encouragement to communicate if she is having personal stress, so she can obtain appropriate help with stress reduction

If a woman has a history of two or more previous premature labors or births or has a multiple gestation and shows no signs and symptoms of preterm labor, then in addition to the above the midwife should do the following:

1. Conduct a vaginal examination every 2 weeks starting at 24 weeks' gestation for cervical

changes in position, consistency, effacement, and dilatation and for station of the presenting part. Research findings are inconsistent as to the predictive value of serial cervical examinations [19]. Findings from serial cervical examinations, however, may be used to make clinical management decisions [19].

2. Recommend a change and/or reduction in workload if the woman's job involves heavy lifting, pushing or pulling, long hours, rotating shifts, or a lengthy commute.
3. Recommend use of condoms during sexual intercourse to prevent sexually transmitted diseases that might predispose the woman to premature rupture of the membranes and to prevent prostaglandin in the semen from causing uterine irritability.
4. Advise the woman to avoid nipple/breast stimulation to prevent uterine contractions.

Research has not shown that the interventions of bed rest, home uterine activity monitoring (except for daily contact with a nurse), routine screening and treatment of asymptomatic pregnant women for bacterial vaginosis or for *Trichomonas vaginalis* [25, 32], prophylactic oral tocolytic therapy, or prophylactic cerclage are effective in the prevention of preterm labor [19, 29].

A woman with signs and symptoms of preterm labor, with or without any predisposing factors, should be seen immediately. You should make the following assessment and if the woman is indeed in preterm labor, notify your consulting physician.

1. History
   a. signs and symptoms of preterm labor
   b. signs and symptoms of urinary tract infection
   c. signs and symptoms of vaginitis/cervicitis/sexually transmitted diseases
   d. signs and symptoms of viral or bacterial infection
   e. signs and symptoms of premature rupture of membranes
2. Physical examination
   a. vital signs (especially temperature and pulse)
   b. evaluation of gestational age
   c. evaluation of contractions
   d. evaluation of fetal heart rate and pattern
   e. abdominal palpation for presentation, position, multiple gestation, estimated fetal weight, and assessment of abdominal pain
   f. costovertebral angle tenderness
   g. assessment of low back pain and suprapubic pain
3. Pelvic examination
   a. speculum examination for evaluation of any existing vaginitis or cervicitis, sexually transmitted diseases, premature rupture of the membranes, bloody show, meconium
   b. digital examination for evaluation of any existing cervical changes and of the station of the presenting part (a digital exam is not done if premature rupture of membranes is diagnosed upon speculum examination)
4. Laboratory tests
   a. microscopic urinalysis
   b. urine culture and sensitivity
   c. wet mount for bacterial vaginosis and for *Trichomonas vaginalis*
   d. cultures for Group B Streptococcus and any genital lesions
   e. specimen for gonorrhea and chlamydia diagnostic testing
   f. complete blood count (CBC) and differential (if the woman has signs and symptoms of infection)
   g. fern test (see pp. 743 and 864)
   h. nitrazine test (see pp. 743 and 864)

Multiple approaches are needed to provide the most accurate information when assessing preterm labor contractions. First is the woman's perception of the contractions: frequency, duration, where she feels the contractions, whether they have gotten any stronger, longer, or closer together, if they are regular or irregular, and if they feel like a previous preterm labor. Second is the midwife's palpation of the contractions for frequency, duration, and intensity. Third is the use of external electronic fetal monitoring. It is important to realize that a small uterus and mild contractions may not accurately trace on the monitor graph. Findings from fetal monitoring and the record of contractions should be correlated with the woman's perceptions and your findings from palpation.

Assessment of the fetus is done by external electronic fetal monitoring (see Chapter 27). Of particular consideration is that a very preterm fetus is very mobile in utero and may be difficult to monitor. The baseline fetal heart rate is higher in earlier gestation and should be ascertained before any tocolytic agents are given because tachycardia is a frequent side effect of the commonly used beta-adrenergic agonists (ritodrine; terbutaline). The very preterm fetus prior to 28 weeks will usually not have accelerations of the heart rate great enough to meet criteria for reactivity on a nonstress

test due to their immaturity (see Chapters 23 and 27).

An accurate diagnosis of preterm labor is critical to determining the appropriate treatment. Contractions alone are not enough to diagnose preterm labor. A diagnosis of preterm labor is made between 20 and 37 weeks' gestation when the woman is having uterine contractions (frequency of 5 to 8 minutes apart or four contractions in 20 minutes or eight in 60 minutes) *and* she exhibits (1) ruptured membranes *or* (2) intact membranes *and* (a) progressive cervical change, *or* (b) 2 centimeters dilatation, *or* (c) a positive fFn test [33].

Women with signs and symptoms possibly indicative of preterm labor should be collaboratively managed with your consulting physician in the hospital. The midwife's initial evaluation of preterm labor should include the level of care immediately available to the woman and the length of time needed to transport the woman safely to a tertiary hospital for access to a neonatal intensive care unit.

Management of care of women with signs and symptoms possibly indicative of preterm labor includes bed rest in a lateral, or side-lying, position, external fetal heart and uterine contractility monitoring, and, if the membranes are intact, monitoring with vaginal examinations (preferably by the same examiner) for cervical change. Hydration has not been shown to be effective in stopping labor but it may increase the risk of pulmonary edema if tocolytic therapy is subsequently used [29], and delay prompt initiation of intravenous tocolysis when immediately needed. If the woman is given intravenous fluid, the risk of pulmonary edema is reduced if the fluid used is a hypotonic solution (i.e., 5% dextrose in water or 5% dextrose in 0.25% normal saline).

If on evaluation the woman does not meet criteria for the diagnosis of preterm labor, she may be sent home with the following instructions:

1. Limit activity—curtail working hours in a nonstrenuous and nonstressful job or take a leave of absence from a strenuous or stressful job; do no heavy housework.
2. Arrange for someone to help with household and child care responsibilities.
3. Engage in no sexual activity until reevaluation in 1 week. Resumption of sexual activity depends on uterine activity and the presence of any predisposing factors to preterm labor. If sexual activity is subsequently resumed, use condoms. If resumption of sexual activity causes an increase or recurrence of uterine contractions, the couple should be advised to abstain from sexual intercourse or other sexual activity that leads to orgasm in the woman.
4. Return for routine prenatal care and reevaluation for preterm labor in 1 week. Routine prenatal care should continue every other week until 36 weeks and then weekly. In the event of a recurrence of the signs and symptoms of preterm labor, she should be reevaluated immediately.
5. Continue to follow previous instructions on nutrition, recognizing signs and symptoms of preterm labor, stress reduction, and use of cigarettes, drugs, and alcohol.

Midwifery management of women who are in preterm labor is conducted in collaboration with the consulting physician. Decisions have the goal of a viable baby with the least amount of morbidity. Women who meet the definition of preterm labor who are less than 4 centimeters dilated and less than 34 weeks' gestation are potential candidates for tocolysis. The value of tocolysis for women who are between 34 and 37 weeks' gestation is debatable, given the minimal improvement in neonatal outcome over 34 weeks and a questionable cost-benefit ratio. There may be individual circumstances, however, that would warrant tocolysis between 34 and 37 weeks' gestation.

Tocolysis is the use of medication that will inhibit uterine contractions. An accurate early diagnosis is critical to the use of any of the various tocolytic agents that are available to attempt to stop uterine contractions. The midwife needs to be acutely aware, however, that these drugs are extremely toxic and may produce dangerous side effects in both the mother and the fetus (see Table 29-1). The drugs that have been most commonly used are the beta-adrenergic agonists (betamimetics) ritodrine and terbutaline, and magnesium sulfate.

Studies of the various tocolytic agents show that at best tocolysis prolongs a pregnancy for the short term—24 to 48 hours and in some instances 3 to 7 days. The largest study of ritodrine, however, found that "the use of ritodrine in the treatment of preterm labor had no significant beneficial effect on perinatal mortality, the frequency of prolongation of pregnancy to term, or birth weight" [34], which led others to call on the FDA to reconsider its approval of ritodrine as a treatment for preterm labor in light of its lack of efficacy for this purpose and the serious maternal risks involved with use of this drug [35].

The beta-adrenergic agonists are well known for their maternal side effects of tachycardia and pul-

TABLE 29-1 Side Effects of Tocolytic Agents

	Beta-adrenergic Agonists (ritodrine, terbutaline)	Magnesium Sulfate	Prostaglandin Inhibitor (indomethacin)	Calcium Channel Blockers (nifedipine, nicardipine)
Maternal Side Effects				
Nausea; nausea/vomiting		X	X	X
Headache		X	X	X
Diarrhea			X	
Facial flushing				X
Vasodilation				X
Visual changes		X		
Weakness		X		
Lethargy		X		
Tachycardia	X			
Anxiety/jitteriness	X			
Hyperglycemia	X			
Hypokalemia	X			
Increased systolic blood pressure	X			
Decreased diastolic blood pressure	X			
Decreased coronary artery perfusion	X			
Decreased peripheral resistance				X
Pulmonary edema	X			
Fluid retention	X			
Peptic ulcer			X	
Paralytic ileus	X			
Urinary retention		X		
Severe allergic reaction			X	
Thrombocytopenia			X	
Hepatotoxicity				X
Respiratory depression/distress	X	X		
Pulmonary embolus	X			
Cardiac arrest		X		
Death	X	X		
Fetal/Neonatal Side Effects				
Tachycardia	X			
Hypoglycemia	X			
Hyperinsulinemia	X			
Hydrops	X			
Hypotonia		X		
Drowsiness		X		
Bony abnormalities		X		
Congenital rickets		X		
Decreased uteroplacental blood flow				X
Oligohydramnios			X	
Decreased renal function			X	
Premature closure of the ductus arteriosus			X	

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monary edema, marked increased in cardiac output, effect on blood pressure, increase in blood sugar levels and in insulin secretion, and the fetal side effects of tachycardia, hypoglycemia, and hyperinsulinism after birth [29] (see Table 29-1). Magnesium sulfate lacks adequate evaluation, has serious side effects that can lead to maternal cardiac arrest and death, and may increase perinatal morbidity and mortality [29, 36]. Indomethacin is the most widely used of the prostaglandin synthesis inhibitors and is more

effective at inhibiting uterine contractions than any of the betamimetic drugs [29]. Although the prostaglandin synthesis inhibitors are not without their side effects, especially on the gastrointestinal tract (see Table 29-1), they are clearly preferable to betamimetics for women with heart disease, hyperthyroidism, or diabetes [29]; however, routine use should not be encouraged [37].

The calcium channel blockers (nifedipine, nicardipine) have been more recently studied and research indicates that they have fewer maternal side effects, no adverse effect on fetal outcome, postpone birth longer, are as effective as the betamimetics and magnesium sulfate in stopping uterine contractions and in delaying birth, and are preferable to betamimetics for tocolytic use [29, 38–40]. The use of oxytocin antagonists (e.g., atosiban) are comparatively new with fewer studies. They may have fewer maternal side effects and equal efficacy as a tocolytic [29, 37], but greater fetal risk [41].

The risk-benefit ratio must be carefully weighed in considering the use of tocolytic agents. Their limited effectiveness raises the question of whether labor should be allowed to proceed or whether a potentially unsafe and possibly ineffective effort should be made to stop it. Risk-benefit analysis should include the uterine environment and whether the fetus will have a better chance outside rather than inside; maternal risk from the side effects and complications of specific tocolytic drugs; fetal risk from the side effects and complications of specific tocolytic drugs; the need to provide time to transport the mother to a hospital with neonatal intensive care facilities and personnel; and the need to provide time for the fetus to benefit from administration of corticosteroids for fetal maturation.

Antenatal corticosteroid therapy has been shown to reduce the incidence and severity of respiratory distress syndrome, intraventricular hemorrhage, and neonatal mortality when administered between 24 and 34 weeks' gestation to women at risk for preterm birth within 7 days [33, 42]. Optimal benefits begin 24 hours after initiation of therapy and last 7 days. The 24 hours needed for optimal benefit from the administration of corticosteroids may be provided by the 24 hours that may be obtained from tocolytic therapy. The corticosteroids used most often and their dosages for therapy are as follows:

betamethasone 12 mg IM given in two doses 24 hours apart, *or*
dexamethasone 6 mg IM given in four doses 12 hours apart

Higher or more frequent doses or repeated weekly courses of corticosteroids do not increase the benefits of antenatal therapy or reduce composite morbidity compared to a single course but does increase the risk of adverse short- and long-term neurologic damage, including risk factors for cerebral palsy [42, 43].

Women receiving tocolytics for preterm labor require intensive support to help them overcome the physical side effects of the drugs. Continuous monitoring and support by the midwife to help alleviate the anxiety produced by these side effects contribute to the success of the tocolysis.

The follow-up for women whose preterm labor is stopped is weekly prenatal visits and vaginal examinations, preferably by the same examiner, to evaluate her for any cervical change. She should abstain from sexual intercourse or other sexual activity that leads to orgasm and continue to follow all previous instructions regarding work; nutrition; signs and symptoms of preterm labor; stress reduction; use of cigarettes, drugs, and alcohol; and household and child care responsibilities. The woman's partner and family should be included in the review of these instructions at each prenatal visit. Efforts to maintain pregnancy with maintenance doses of oral beta-adrenergic agonists have proven not to be efficacious and this therapy is not recommended [44].

With any woman at risk for premature labor, the midwife must be careful to help her avoid becoming anxious, as this in and of itself has been implicated as a causative factor. Certainly, for a woman who has delivered prematurely in the past, the subsequent pregnancy will be fraught with anxiety. Your screening and instructions to the woman, if done appropriately, may decrease this anxiety. You should attempt to make her feel that she has some degree of control over and contribution to make to the situation. You can do this by trusting her suspicions and her reports of her observations of any important changes. Your being available by telephone to allay fears or review her uneasiness about what she is feeling will help her to feel that she is a valued participant in her care.

Midwifery management of progressive preterm labor to birth is conducted in collaboration with the consulting physician. Every decision should have the goal of avoiding fetal asphyxia and trauma. Management involves the following:

1. Deciding on the route of birth. This decision is based on the fetal presentation and gestational age.

2. Deciding on the type of analgesia and anesthesia. Narcotics, ataractics, and sedatives should not be used prior to delivery. Pudendal block or local infiltration should be used for episiotomy and repair; or, *if necessary*, a woman may have an epidural for comfort and control. Maternal hypotension from epidural anesthesia can be lessened by adequate preloading with crystalloid intravenous fluids. However, if the woman received one of the betamimetic drugs for tocolysis, the increased risk for pulmonary edema must be kept in mind.
3. Monitoring the fetus. A preterm baby has less reserve with which to tolerate the stresses of labor. Careful monitoring is also necessary for picking up tachycardia as a sign of intrauterine infection, especially if the membranes are ruptured or if still under the effect of a betamimetic drug.
4. Carefully weighing the usefulness of internal electronic fetal monitoring against the dangers involved in the application of the scalp electrode. The preterm fetus has wider fontanels and a different skull bone density and consistency than a term fetus. The decision to use internal fetal monitoring must be based on a real need for internal electronic fetal monitoring and on gestational age.
5. Deciding whether an episiotomy is needed. The need for an episiotomy depends on the estimated fetal weight and the relaxation of the woman's perineum.
6. Arranging for the pediatrician/neonatologist to be notified and present for the birth.
7. Consideration of the benefit of delayed cord clamping versus the need to hand the baby over to neonatal specialists. A workable compromise is to hold the baby in a warm blanket below the level of the introitus (this speeds the transfer of fetal blood from the placenta to the infant) for 30 to 45 seconds before cutting the cord [45, 46].
8. Making provisions for keeping the baby warm and for transporting the baby if necessary if the birth did not take place in a Level III hospital. Neonatal mortality is reduced if birth takes place in a tertiary hospital. If at all possible, it is better to transport the mother if this can be done safely prior to birth than to transport the baby after birth.

Premature Rupture of the Membranes

Premature rupture of the membranes (PROM) may be technically defined as rupture of the membranes prior to the onset of labor, regardless of gestational age. In practice and in research, however, premature rupture of the membranes is defined in accord with the number of hours that elapse from the time of rupture until the onset of labor. This interval is called the latent period and may last anywhere from 1 to 12 or more hours. The absence of a uniformly accepted method of establishing the diagnosis of premature rupture of the membranes makes comparison of studies difficult and results in the lack of a standard operational definition. The incidence of premature rupture of the membranes is 2.7 percent to 17 percent, depending on the length of the latent period used in making the diagnosis. Premature rupture of the membranes prior to term is called preterm premature rupture of the membranes (PPROM). Rupture of the membranes more than 24 hours before delivery is called prolonged rupture of the membranes.

The incidence of premature rupture of the membranes is higher in women with incompetent cervix, polyhydramnios, fetal malpresentation, multiple gestation, or vaginal/cervical infection (e.g., bacterial vaginosis, trichomonas, chlamydia, gonorrhea, Group B Streptococcus). A significant relationship also has been found between occupational fatigue and an increased risk of *preterm* premature rupture of membranes among nulliparous women (but not multiparous women) [47]. Possible complications resulting from premature rupture of the membranes include preterm labor and delivery, intrauterine infection, and umbilical cord compression secondary to prolapsed umbilical cord or oligohydramnios.

Since the risk of intrauterine infection (chorioamnionitis) is increased with rupture of the membranes, it is important for the midwife to make an accurate diagnosis without increasing the risk of infection. Leakage of amniotic fluid has to be differentiated from urinary incontinence, vaginal or cervical discharge, semen, or (rarely) rupture of the chorion. The following data are used to make a diagnosis:

1. History
   a. Amount of fluid loss: rupture of the membranes may initially cause a large gush of fluid followed by a continuous discharge. In some instances of ruptured membranes, however, the only symptoms the woman notices may be a small, continuous discharge (clear, cloudy, yellow, or green) and a feeling of moistness on her panties.
   b. Inability to control leakage with Kegel exercises: differentiates PROM from urinary incontinence.

   c. Time of rupture.
   d. Color of fluid: amniotic fluid can be clear or cloudy; if meconium stained the fluid will be yellow or green.
   e. Odor of fluid: amniotic fluid has a distinct musty odor, which differentiates it from urine.
   f. Last sexual intercourse: semen expelled from the vagina can sometimes be mistaken for amniotic fluid.
2. Physical examination: do an abdominal palpation to ascertain amniotic fluid volume. When there is a frank rupture of the membranes, it is possible to detect the decrease in fluid because there is increased molding of the uterus and abdominal wall around the fetus and decreased ballottability compared to examination findings before rupture of the membranes. Leaking membranes do not give these same changes in abdominal findings.
3. Sterile speculum examination
   a. Inspect the external genitalia for signs of fluid.
   b. Visualize the cervix for a flow of fluid from the os
   c. Visualize pooling of amniotic fluid in the vaginal vault
   d. If you do not see any fluid, have the woman bear down (Valsalva maneuver). Alternatively, exert gentle fundal pressure or gently elevate the presenting part abdominally to allow fluid to pass by the presenting part in the event of a high leak so you can observe any leaking fluid.
   e. Observe any fluid for the presence of lanugo or vernix caseosa if the pregnancy is greater than 32 weeks' gestation.
   f. Visualize the cervix to estimate dilatation if vaginal examination is not going to be done.
   g. Visualize the cervix for prolapsed cord or fetal extremities.
4. Laboratory tests
   a. Positive fern test: ferning, also called arborization, on a microscope slide is caused by the presence of sodium chloride and protein in amniotic fluid. (During the sterile speculum examination, use a sterile cotton swab to obtain a specimen either of the fluid from the posterior vaginal fornix or of the fluid exuding from the cervical os, but be careful not to get into or touch the os itself as cervical mucus will also fern, although with a slightly different pattern. Smear the specimen on a microscope slide and allow to dry thoroughly for at least 10 minutes [48]. Inspect the slide under a microscope for a fern pattern. See Figure 29-1.)
   b. Positive nitrazine paper test: this mustard-gold pH-sensitive paper will turn dark blue in the presence of alkaline material. The normal pH of the vagina is ≤4.5. During pregnancy there is an increased amount of vaginal secretion from exfoliated epithelium and bacteria, mostly *Lactobacillus*, which makes the pH of the vagina even more acidic. The pH of amniotic fluid is 7.0 to 7.5. (Place a piece of nitrazine paper against the blade of the speculum after withdrawing the speculum from the vagina.)

      The fern test is more reliable than the nitrazine paper test. This is because a number of materials besides amniotic fluid have a more alkaline pH, including cervical mucus, vaginal discharge caused by bacterial vaginosis or trichomonal infection [49, p. 25], blood, urine, semen, and glove powder. Thus, a specimen taken directly from the cervical os and then smeared on nitrazine paper may produce a false-positive color change.

      Ultrasound for oligohydramnios may be helpful if the preceding measures do not give a clear picture of ruptured membranes. Other causes of oligohydramnios, however, need to be ruled out and you need to remember that a woman can have ruptured membranes and still have a normal amount of amniotic fluid, especially if the membranes are only leaking.
   c. Specimens for Group B Streptococcus (GBS) culture: if the woman was screened for GBS between 35 and 37 weeks and a negative culture result within the previous 5 weeks is on record, then another set of specimens for culture do not need to be obtained and antibi-

FIGURE 29-1 Fern pattern of amniotic fluid.

Source: Reproduced with permission by the College of American Pathologists.

otic prophylaxis is not indicated [50]. If GBS culture was not done or the results are not known and the woman is at term, then collection of specimens for GBS culture is not indicated but antibiotic prophylaxis is given if rupture of the membranes lasts 18 hours or more before delivery or the woman has a temperature of ≥100.4°F [50]. If the woman is less than 37 weeks' gestation and GBS culture either has not yet been done or the results are not yet known, then vaginal and rectal specimens should be taken for GBS culture and, unless it is obvious that preterm labor and delivery will be averted, antibiotics started until results are known [50]. (See section on GBS later in this chapter.)

The earlier an examination is performed after the rupture occurs, the easier it is to diagnose ruptured membranes. When more than 6 to 12 hours pass, many of the diagnostic observations become unreliable because of lack of fluid. Observation of fluid coming from the cervical os is diagnostic of ruptured membranes. In the absence of direct visualization of fluid from the os, a history strongly suggestive of rupture, with a positive fern test, is diagnostic.

The incidence of chorioamnionitis (see next section in this chapter) increases in direct relationship to the number of pelvic examinations performed. Therefore, the fewer examinations performed, the less risk there is of chorioamnionitis developing. For example, the palpation of forewaters does not preclude the existence of ruptured membranes with a high leak. A digital examination during the initial examination, therefore, only exposes the woman to an unnecessary increase in risk of infection. In preparing your plan of management, remember that 80 to 85 percent of women of all gestations with premature rupture of the membranes will be in labor within 24 hours. Another 10 percent will be in labor within 72 hours. This leaves 5 percent whose latent period will be longer than 72 hours. The infection rate in the first 24 hours for pregnancies of 37 to 42 weeks' gestation has been reported variously from 1.6 percent to 29 percent depending on race, socioeconomic factors, receipt of prenatal care, and gestational age. In term pregnancies, there is an increase in the incidence of intrapartal fever if the latent period from rupture of membranes to onset of labor is more than 24 hours. If this latent period is in excess of 72 hours, there is a significant increase in perinatal mortality. In pregnancies of less than 37 weeks' gestation, however, the rates vary according to gestational age, and the risks associated with prematurity are much greater than the risk of infection following premature rupture of the membranes.

The ongoing debate over management options [51] emanates from this information. One management option is to accomplish delivery within 24 hours of rupture of the membranes, since after this is the time of greater risk. The cesarean section rate for women at term who are induced in order to effect delivery in 24 hours is between 30 and 50 percent. Since most women at term will go into spontaneous labor within the first 24 hours after rupture of the membranes, another management option is to await the onset of spontaneous labor while observing the woman closely for signs and symptoms of chorioamnionitis (expectant management).

With either management option, an initial digital examination to determine cervical dilatation is unnecessary, since knowledge of the cervical findings is superfluous to the management. If the plan is to induce labor in order to effect delivery within the first 24 hours after rupture, the digital examination can be done at the time of induction. The presenting part can be determined by ultrasound if you are unsure of your findings from abdominal palpation. In the presence of a breech presentation, the importance of digital examination for prolapsed umbilical cord is probably greater than the risk of infection. If the fetal heart rate pattern is abnormal, a vaginal examination to rule out cord prolapse is warranted.

When the management plan is to deliver the woman within 24 hours of rupture of the membranes, a 12-hour leeway is usually given for the woman to enter spontaneous labor before oxytocin induction is started. During these 12 hours, other methods of inducing labor are used (see Chapter 25), such as having the woman drink castor oil (2 oz), nipple stimulation, rupture of forewaters, or all of these. Sexual intercourse is contraindicated because of the premature rupture of membranes. If the cervix is not ripe, preinduction cervical ripening may be indicated. Discuss the situation with your consulting physician.

In either management option the management of labor care is the same as any other labor, with the following additions:

1. Assess temperature and pulse every 2 hours. Maternal chills often precede an elevated temperature.
2. Conduct fetal heart rate monitoring. Checking the fetal heart rate every hour prior to the onset of labor is adequate as long as the heart rate is normal. Closer monitoring of the fetal heart

rate with continuous electronic fetal monitoring is done during oxytocin induction for evidence of fetal distress due to cord compression or the induction. Tachycardia may be indicative of intrauterine infection.

3. Avoid unnecessary vaginal examinations.
4. When doing an absolutely necessary vaginal examination, also note the following:
   a. whether the vaginal walls are unusually warm (hot) to touch
   b. the odor of the discharge or fluid on your gloves
   c. the color of the discharge or fluid on your gloves
5. Pay even more scrupulous attention to hydration in order to have a clear picture of any developing infection. There is often a temperature elevation with dehydration.

If the woman is at least 36 weeks and not in labor and the chosen management option is to await the onset of spontaneous labor regardless of the number of hours that have elapsed since rupture of the membranes, expectant management of the woman at home may be appropriate. To be managed at home, a woman should have no compounding medical or obstetrical risk factors, including malpresentation or unengaged cephalic presentation. She must be able to take her own temperature and read a thermometer; understand and be able to implement the restrictions regarding pelvic rest; have a telephone and access to transportation; and have someone with her for support, to do the cleaning, and to run errands outside the house.

Regardless of the management option, monitoring for signs and symptoms of chorioamnionitis is imperative. A presumptive diagnosis of chorioamnionitis is made when the woman has premature rupture of membranes and a temperature of 38°C (100.4°F) or greater with no obvious cause for the temperature. Foul-smelling purulent amniotic fluid gives a definitive diagnosis of chorioamnionitis.

Maternal temperature and pulse are taken every 4 hours (including at night). Although the definition of febrile morbidity is a temperature elevation to 38°C (100.4°F), a woman with a slowly rising temperature should be carefully observed and the midwife should initiate active management geared toward getting her delivered before she reaches true febrile morbidity.

After an initial extensive continuous electronic fetal heart monitoring, the fetal heart tones should be taken every 4 hours when the woman is in the hospital. Fetal tachycardia (160 beats per minute or greater) is a relatively good indication of possible chorioamnionitis. Nonstress tests and/or biophysical profiles are done every 2 days to weekly (varies with clinicians) to assess fetal well-being, oligohydramnios, and cord compression from oligohydramnios and to predict possible or subclinical chorioamnionitis. For example, a biophysical profile that includes a nonstress test might be done weekly with a nonstress test done midweek. If a woman has a biophysical profile score greater than 6 (Manning criteria), it is unlikely that she has an intrauterine infection.

The woman should be evaluated daily for uterine tenderness; she can do this herself. Uterine tenderness prior to delivery, however, is a difficult sign to rely on, because it is so variable and unpredictable and mimicks uterine contractions.

A white blood cell count with differential should be done daily or every other day. An elevated maternal white blood cell count, especially when accompanied by a shift to the left in bands, indicates an infectious process. An elevated white blood cell count is a late sign of chorioamnionitis because it is possible to have an early infectious process without an elevation in white blood cells.

It must be emphasized again that you should *not* do a vaginal examination, as the risk of chorioamnionitis drastically multiplies with vaginal examination. For this same reason the woman should be advised to observe pelvic precautions—no vaginal therapeutics, no douches, no sexual intercourse.

When a pregnancy less than 36 weeks' gestation is complicated by premature rupture of the membranes, the risk of sepsis is outweighed by the risks of prematurity, which is the primary cause of perinatal morbidity and mortality in this gestational age group. Management of care has the primary purpose of prolonging the pregnancy as long as the woman is not in labor, does not have chorioamnionitis, and there is no fetal distress. Administration of antibiotics to women with preterm premature rupture of the membranes for a week or more has been associated with prolonging pregnancy and a reduction in the rate of clinical chorioamnionitis and neonatal sepsis. These benefits do not occur if the membranes are intact [21, 52]. In preterm premature rupture of the membranes, especially if it occurs at less than 26 weeks of gestation, fetal lung hypoplasia and fetal deformities may occur secondary to oligohydramnios.

The management of women with preterm premature rupture of the membranes is to await the onset of spontaneous labor while observing for signs and symptoms of chorioamnionitis. Vaginal and rectal specimens for GBS culture should be obtained during the initial examination if not already done in this pregnancy. Cervical os specimens for gonorrhea and chlamydia should be obtained with sterile supplies during the initial sterile speculum examination. Specimens for GBS culture are obtained again in four weeks if birth has not yet occurred [50]. These women are usually admitted to the hospital and restricted to bed rest. Prophylactic amnioinfusion in the presence of oligohydramnios may be considered to prevent cord compression (see Chapter 64). In the event that there is no further leakage of amniotic fluid, the presentation is vertex, and there are no signs or symptoms of chorioamnionitis, the woman may be followed at home. She should be placed on pelvic precautions and bed rest, instructed in the principles of good hygiene, and instructed about return visits for the necessary screening tests for chorioamnionitis. She will need to return to the hospital at least weekly for a biophysical profile. She will also need to be seen for routine prenatal care. Arrangements can be made to have her blood drawn at home for the more frequent blood tests.

Preterm rupture of the membranes can create anxiety for the woman and her family. The midwife should help the woman explore fears accompanying the anticipated birth of a premature infant as well as the added risk of chorioamnionitis. The plan of management involving a possible prolonged period of bed rest and hospitalization should be discussed with the woman and her family. Their understanding and cooperation are important to the continuation of the pregnancy.

A digital vaginal examination increases the risk of infection and is not necessary for women with preterm rupture of the membranes, since these women will be managed expectantly until labor ensues or there are signs or symptoms of chorioamnionitis. If the woman develops signs or symptoms of chorioamnionitis, immediate consultation with your consulting physician is indicated for induction of labor and delivery. The choice of delivery method (vaginal or cesarean section) depends on the gestational age, presentation, and the severity of the chorioamnionitis.

At the time of birth appropriate cultures should be obtained, including cultures of the uterus, both maternal and fetal sides of the placenta, the umbilical cord, and a gastric aspirate from the newborn. Some pediatricians also culture the baby's skin or ears or both. Whether the pediatrician should be present at delivery depends on the length of time the membranes have been ruptured, the absence or presence of infection, the gestational length of pregnancy, and the protocol of the department of pediatrics at the particular institution. The perinatal mortality rate for all gestational ages when there is premature rupture of the membranes is 2.6 to 11 percent.

Amnionitis and Chorioamnionitis

Amnionitis is inflammation of the amniotic sac and amnion. Chorioamnionitis is inflammation of the chorion in addition to the amnion and amniotic sac. These conditions almost always coexist.

Amnionitis and chorioamnionitis most often result when there has been prolonged rupture of the membranes (over 24 hours), with or without prolonged labor, with repeated vaginal examinations or manipulative vaginal or intrauterine procedures. Amnionitis and chorioamnionitis may also infrequently occur in women with intact membranes, for unknown reasons. The organisms most often associated with chorioamnionitis and subsequent infection of the fetus after rupture of the membranes are Group B Streptococci, *Escherichia coli*, *Ureaplasma urealyticum*, *Fusobacterium species*, and *Mycoplasma hominis* [21, 52].

Both the mother and the baby will be infected, and each will suffer further resulting complications. The mother's uterine contractility is adversely affected—the uterus does not contract as well, which may lead to labor dystocia from uterine dysfunction and abnormal cervical dilatation; nor does the uterus respond as well to oxytocin. The infected woman has the potential for being very sick both intrapartally and postpartally (see Chapter 44). The infant may develop life-threatening intrauterine pneumonia and acidosis. Chorioamnionitis has also been identified as a risk factor for both cerebral palsy and cystic periventricular leukomalacia [53].

Signs and symptoms of amnionitis and chorioamnionitis are as follows:

1. Maternal fever
2. Maternal tachycardia
3. Fetal tachycardia
4. Tender uterus

5. Vaginal walls unusually warm (hot) to touch
6. Foul-smelling, purulent amniotic fluid
7. Elevated white blood cell count

After the birth the following additional information is available that is indicative of infection: steamy translucence of the umbilical cord and fetal membranes and the presence of polymorphonuclear leukocytes in smears of gastric aspirate from the baby and of the chorionic surface of the amnion. The infant most likely will have an Apgar score below 7 and may have hypothermia. On the other hand the baby may have high Apgar scores and then crash 10 to 25 minutes after birth. Continued close observation of the baby during the first hour after birth is imperative.

Intrapartal management of the woman with amnionitis or chorioamnionitis has the primary goals of birth of the baby and treatment of the infection. These goals are achieved through collaboration with your consulting physician. Labor management of a term pregnancy complicated with chorioamnionitis may include the following:

1. Facilitation of birth: Induced vaginal delivery or cesarean section should take place within 24 hours of diagnosis. Cesarean section may be indicated if the maternal or fetal condition is worsening, or if labor dystocia is not helped by oxytocin. A cesarean section is not done just because of chorioamnionitis.
2. Oxytocin induction or augmentation to shorten the latent phase of labor.
3. Rupture of forewaters if present.
4. Internal electronic fetal monitoring.
5. Hydration with intravenous fluids (e.g., 5% dextrose in Ringer's lactate).
6. Monitoring of maternal vital signs every hour.
7. Notification of the pediatrician.

If birth is expected within 1 or 2 hours, intravenous antibiotic therapy for the mother may be delayed until immediately after delivery. This delay is advisable because the antibiotics given the mother will interfere with the pediatrician's ability to identify the causative infecting agent in the newborn. Otherwise, the mother should be treated with antibiotics during labor to initiate treatment to both the mother and the baby and decrease the neonatal sepsis rate [54, 55]. Choice of antibiotics and dosage varies according to protocol and whether GBS is identified. In this event, the broad spectrum antibiotic regimen for chorioamnionitis needs to include a drug known to be active against GBS [50].

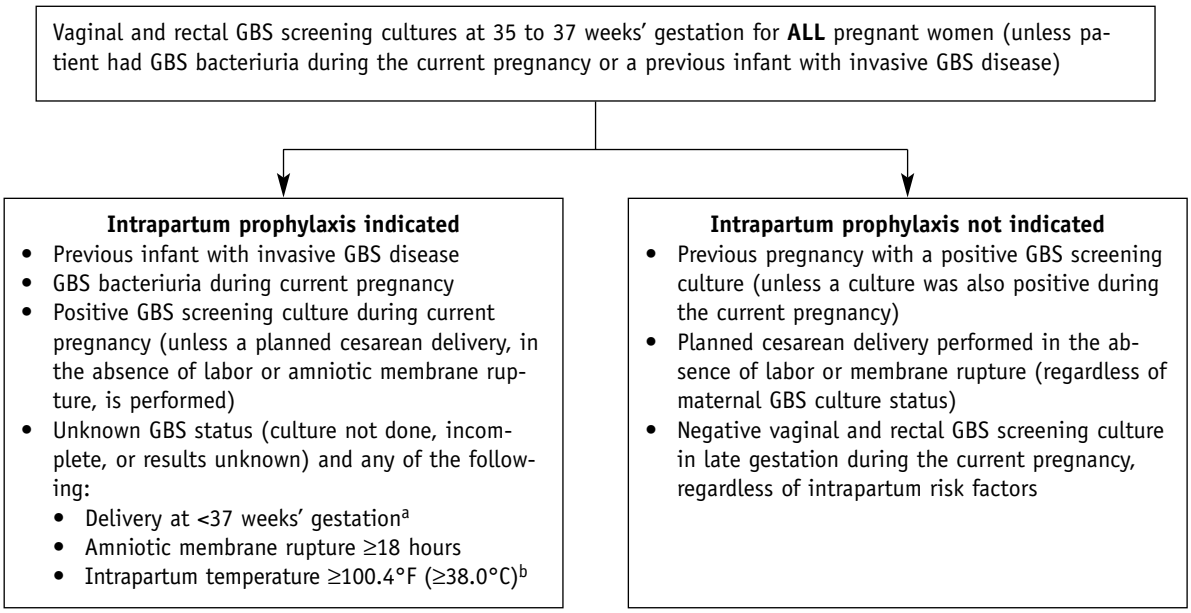
Birth may be accomplished in bed in a delivery room fully equipped for neonatal resuscitation and regulation of hypothermia. The pediatrician should be present for the birth, and appropriate cultures of the baby (gastric aspirate, skin, ears) and a cord pH should be obtained. Cultures may also be taken from the uterus, both maternal and fetal sides of the placenta, and the umbilical cord. Intravenous antibiotic therapy is continued for the mother until her symptoms of infection subside and her temperature is normal for more than 24 to 48 hours, after which she may be given oral antibiotics.

Group B Streptococcus

Group B streptococcus (GBS) is a beta-hemolytic gram-positive bacteria that is commonly found in the intestinal tract [56]. Approximately 10 to 30 percent of pregnant women have vaginal or rectal colonization of GBS. Intrauterine infection is the result of an ascending infection from vaginal colonization of GBS in the pregnant woman. GBS can cause chorioamnionitis, endometritis, urinary tract infections, and wound infections, and it has been implicated in preterm labor/delivery and in premature rupture of the membranes. In the newborn, early-onset disease with GBS is the leading cause of neonatal morbidity and mortality including sepsis, meningitis, and pneumonia. Early-onset disease is defined as within the first week of life. The newborn can become infected in utero or during passage through the birth canal. Vertical transmission from mother to baby primarily occurs after the onset of labor or after the membranes rupture [50]. A positive fetal fibronectin (fFN) test not only is the best predictor of spontaneous preterm labor but also has a strong association with subsequent chorioamnionitis and neonatal sepsis [21].

Prevention of early-onset GBS disease is through universal screening and intrapartum antibiotic prophylaxis. Universal screening at 35 to 37 weeks' gestation and collection of specimens for GBS testing for vaginal and rectal colonization was discussed in Chapter 22, pages 583–584. Figure 29-2 outlines which pregnant women are and are not indicated to receive intrapartum antibiotic prophylaxis. Note the following:

1. A previous pregnancy with a positive GBS screening culture does not automatically mean that a woman should receive intrapartum an-



[a] If onset of labor or rupture of amniotic membrances occurs at <37 weeks' gestation and there is a significant risk for preterm delivery (as assessed by the clinician), a suggested algorithm for GBS prophylaxis management is provided (Figure 29-3).

[b] If amnionitis is suspected, broad-spectrum antibiotic therapy that includes an agent known to be active against GBS should replace GBS prophylaxis.

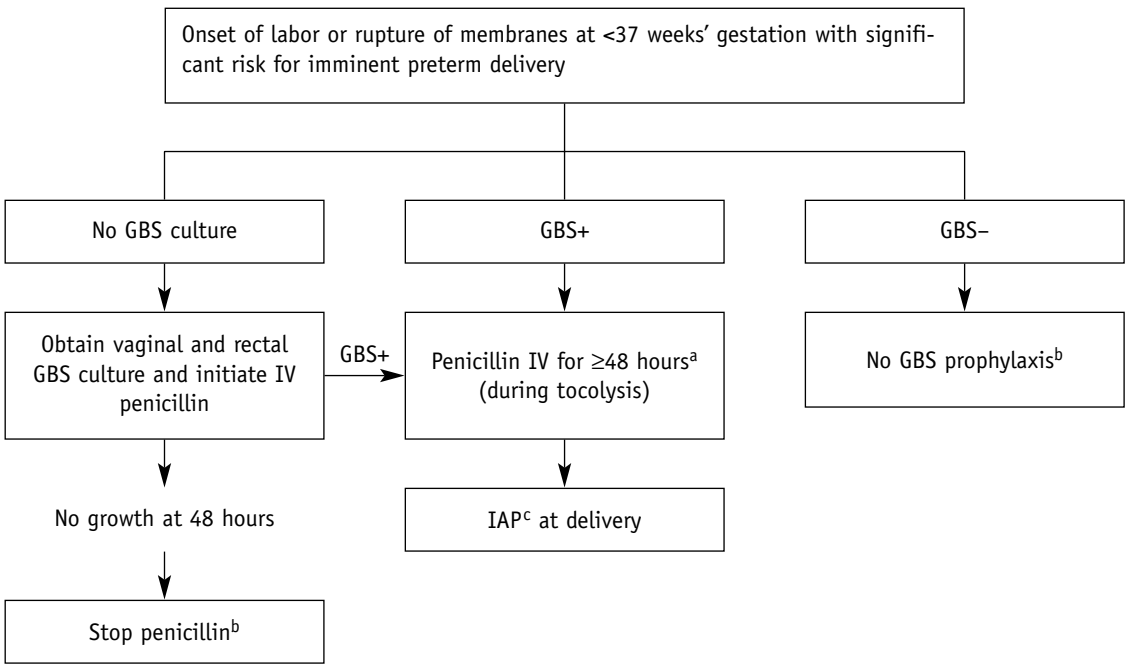
FIGURE 29-2 Indications for intrapartum antibiotic prophylaxis to prevent prenatal GBS disease under a universal prenatal screening strategy based on combined vaginal and rectal cultures collected at 35 to 37 weeks' gestation from all pregnant women.

Source: From Centers for Disease Control and Prevention. Prevention of perinatal group B streptococcal disease. *MMWR* (No. RR-11) 4:8 (August 16) 2002.

tibiotic prophylaxis with this pregnancy unless she again has a positive screening test [50].

2. A woman who had a previous baby with GBS disease should, however, automatically receive intrapartum antibiotic prophylaxis with this pregnancy and does not need to be screened at 35 to 37 weeks' gestation [50].
3. There are three risk factors that effect decisions about intrapartal antibiotic prophylaxis. These are: (1) delivery at less than 37 weeks' gestation, (2) rupture of the membranes for 18 hours or more, and (3) maternal temperature of 100.4°F (38.0°C) [50].
   a. If any one of these risk factors exist and the woman's GBS status is not known, she should receive intrapartal antibiotic prophylaxis [50].
   b. If the woman's GBS screening test was within the past 5 weeks and is negative, intrapartal antibiotic prophylaxis is not indicated [50].
   c. If the onset of labor or rupture of membranes occurs at less than 37 weeks' gestation and preterm delivery of less than 37 weeks is likely, the midwife should determine whether or not to administer intrapartal antibiotic prophylaxis. Figure 29-3 provides a possible algorithm that can be used [50].
4. A woman with GBS bacteriuria during this pregnancy should receive intrapartal antibiotic prophylaxis. She does not need to be screened at 35 to 37 weeks' gestation [50].
5. A woman who is having a planned cesarean section still needs to be screened at 35 to 37 weeks so her GBS status will be known and she can be treated accordingly in the event she starts labor or her membranes rupture prior to the cesarean birth. If her GBS test is positive but the cesarean section is performed before either starting labor or her membranes rupture, she is at low risk for having a baby with early-onset GBS disease and does not need intrapartal antibiotic prophylaxis [50].

The regimens for intrapartal antibiotic prophylaxis are given in Table 29-2. As penicillin is the drug of choice, alternate regimens are also given for women who are allergic to penicillin.



[a] Penicillin should be continued for a total of at least 48 hours, unless delivery occurs sooner. At the physician's discretion, antibiotic prophylaxis may be continued beyond 48 hours in a GBS culture-positive woman if delivery has not yet occurred. For women who are GBS culture positive, antibiotic prophylaxis should be reinitiated when labor likely to proceed to delivery occurs or recurs.

[b] If delivery has not occurred within 4 weeks, a vaginal and rectal GBS screening culture should be repeated and the patient should be managed as described, based on the result of the repeat culture.

[c] Intrapartum antibiotic prophylaxis.

FIGURE 29-3 Sample algorithm for GBS prophylaxis for women with threatened preterm delivery. This algorithm is not an exclusive course of management. Variations that incorporate individual circumstances or institutional preferences may be appropriate.

Source: From Centers for Disease Control and Prevention. Prevention of perinatal group B streptococcal disease. *MMWR* (No. RR-11) 4:12 (August 16) 2002.

Umbilical Cord Prolapse

Prolapse of the umbilical cord is a disaster requiring prompt and knowledgeable diagnosis and action on the part of the midwife while awaiting the arrival of the physician for final resolution of the problem by cesarean section.

There are two types of umbilical cord prolapse: frank and occult. In frank cord prolapse the cord slips through the cervix. In occult cord prolapse the cord slips down alongside the presenting part but does not protrude through the cervix. The danger in either type of cord prolapse is fetal hypoxia resulting from compression of the cord between the presenting part and the pelvis. Frank prolapse of the cord can occur without threatening life when there is a transverse lie or footling breech, because there is no compression of the cord. The route of delivery, however, is the same (cesarean section).

The precipitating causes of cord prolapse include the following:

1. Ruptured membranes and a breech presentation, compound presentation, transverse lie, small fetus (less than 2000 grams), or second-born twin [57]. Multiple gestation, preterm labor, and an excessively long umbilical cord are predisposing factors.
2. Adminstration of an enema if the membranes are ruptured and the presenting part is an unengaged head, a compound presentation, an unengaged breech or footling breech, or a shoulder
3. Amniotomy if there is an unengaged head, a compound presentation, a noncephalic presentation, or a small fetus whose presenting part (either cephalic or breech) does not fill the pelvis
4. Vaginal examination causing inadvertent rupture of the membranes in the presence of tense, bulging membranes and an unengaged head, a compound presentation, or noncephalic presentation
5. Spontaneous rupture of the membranes with an unengaged head, compound presentation, or noncephalic presentation
6. Displacement of the vertex during fetal assessment or obstetric manipulation (e.g., manual rotation of the head; placement of forceps other

TABLE 29-2 Recommended Regimens for Intrapartum Antimicrobial Prophylaxis for Perinatal GBS Disease Prevention[a]

Recommended	Penicillin G, 5 million units IV initial dose, then 2.5 million units IV every 4 hours until delivery
Alternative	Ampicillin, 2 g IV initial dose, then 1 g IV every 4 hours until delivery
If penicillin allergic[b]	
Patients not at high risk for anaphylaxis	Cefazolin, 2 g IV initial dose, then 1 g IV every 8 hours until delivery
Patients at high risk for anaphylaxis[c]	
GBS susceptible to clindamycin and erythromycin[d]	Clindamycin, 900 mg IV every 8 hours until delivery OR Erythromycin, 500 mg IV every 6 hours until delivery
GBS resistant to clindamycin or erythromycin or susceptibility unknown	Vancomycin,[e] 1 g IV every 12 hours until delivery

[a] Broader-spectrum agents, including an agent active against GBS, may be necessary for treatment of chorioamnionitis.

[b] History of penicillin allergy should be assessed to determine whether a high risk for anaphylaxis is present. Penicillin-allergic patients at high risk for anaphylaxis are those who have experienced immediate hypersensitivity to penicillin including a history of penicillin-related anaphylaxis; other high-risk patients are those with asthma or other diseases that would make anaphylaxis more dangerous or difficult to treat, such as persons being treated with beta-adrenergic-blocking agents.

[c] If laboratory facilities are adequate, clindamycin and erythromycin susceptibility testing should be performed on prenatal GBS isolates from penicillin-allergic women at high risk for anaphylaxis.

[d] Resistance to erythromycin is often but not always associated with clindamycin resistance. If a strain is resistant to erythromycin but appears susceptible to clindamycin, it may still have inducible resistance to clindamycin.

[e] Cefazolin is preferred over vancomycin for women with a history of penicillin allergy other than immediate hypersensitivity reactions, and pharmacologic data suggest it achieves effective intra-amniotic concentrations. Vancomycin should be reserved for penicillin-allergic women at high risk for anaphylaxis.

Source: From Centers for Disease Control and Prevention. Prevention of perinatal group B streptococcal disease. *MMWR* (No. RR-11) 4:10 (August 16) 2002.

than outlet forceps; fetal scalp electrode application; attempted external cephalic version; intrauterine pressure catheter insertion) [58]

Any time the membranes rupture, your first action should be to check the fetal heart and then to perform a vaginal examination to feel for a prolapsed cord. A thorough vaginal examination includes not only feeling around the presenting part, the cervical edge at the juncture of the presenting part and the external cervical os, and in the vagina for a frank cord but also completely checking each of the vaginal fornices and feeling around and through the thinned-out lower uterine segment to palpate for an occult cord. Sometimes you will feel the cord in the vagina. At other times you may be summoned by auxiliary personnel or signicant others because "something came out between her legs." Vaginal examination will differentiate a cord from a mucus plug, a prolapsed foot, or a prolapsed arm.

The following actions are taken in the presence of a prolapsed cord:

1. Place your entire hand into the woman's vagina and hold the presenting part up off the umbilical cord at the pelvic inlet
2. Do not under any circumstances attempt to replace the cord—you won't be able to replace it, manipulation may cause cord spasm, and you may accidentally cause further cord compression.
3. Inform the woman of what has happened and elicit her cooperation.
4. Summon help. Warn the woman and, if necessary, yell to get attention and bring people to help.
5. Have your consulting physician be given a *STAT* call.
6. Direct others to get the woman into a position in which gravity will aid in keeping the baby away from the pelvic inlet and pressing on the cord: knee-chest or Trendelenburg position.
7. If the cord is protruding from the vagina, direct others to wrap it loosely with gauze soaked with warm normal saline.
8. Do not palpate for or rely on cord pulsations as an indicator of fetal life or well-being.
9. Ultrasound can be used to detect fetal heart movement if fetal heart tones cannot be heard.
10. Direct others to prepare for an emergency cesarean section.
11. Do not under any circumstances remove your hand from the woman's vagina or from the presenting part until the baby is delivered (probably by cesarean section).

Your first action is the one that will save the baby's life. Thereafter, you are inextricably joined to the mother until the baby is delivered and you can

safely remove your hand from the woman's vagina. This will call for some gymnastics, physical discomfort, and unusual positions on your part as you accompany the woman from wherever she is to the operating room, is prepared for surgery (you are under the drapes now), and the baby is born. Then you can remove your hand from the mother's vagina.

An alternative method can be used with an *unengaged* presenting part. This method is to insert a #16 Foley catheter, fill the bladder with 500 cc of sterile water or normal saline, and clamp the catheter while your hand is in the vagina displacing the fetal head off the umbilical cord. The full bladder then displaces the presenting part and alleviates the cord compression. This technique can also be used when the presenting part is engaged if the woman is a multipara. It will be necessary, however, for you to displace the presenting part out of the pelvis with your hand before filling the bladder. Pressure on the presenting part should be evenly distributed during this maneuver. Once the bladder is filled you should again check the woman vaginally to determine that the presenting part is indeed displaced. The fetal heart should be continually electronically monitored. If bradycardia recurs, reinsert your hand into the vagina to ensure that the fetal head is off the cord. Some physicians combine filling the bladder with an intravenous infusion of 50 mg ritodrine in 500 mL of D_5W [59] or 0.25 mg terbutaline sulfate subcutaneously [60] to stop the uterine contractions. The ritodrine is then discontinued before induction of anesthesia and the bladder is emptied prior to opening the peritoneal cavity during the cesarean section.

Cephalopelvic Disproportion

Cephalopelvic disproportion (CPD), or fetopelvic disproportion, is a disproportion between the size of the fetus and the size of the pelvis, in which a particular pelvis is not large enough to accommodate passage of a particular fetus through it to vaginal birth. The determination of CPD is relative. A pelvis that is adequate for passage of a 5-pound baby may not be large enough for passage of a 7-pound baby, or a pelvis large enough for a 7-pound baby may not be large enough for an 8-pound baby. Therefore, the adequacy of the pelvis must be evaluated in relation to the particular fetus that is to pass through it.

Evaluation of the bony pelvis and the types of pelves are discussed in Chapter 61. The discussion includes the findings that indicate pelvic adequacy as well as the normal average lengths of the diameters of the pelvis. No single finding determines adequacy or inadequacy. Rather, the total pelvis (its measurements, architecture, shape, and various dimensions) should be taken into account in relation to the fetus (its size, presentation, position, variety, and normality).

The following may indicate the possibility of cephalopelvic disproportion:

1. Excessively large fetus
2. The woman's general body type and specific characteristics [61]:
   a. shoulders wider than hips, regardless of height
   b. short, square stature
   c. short, broad hands and feet (shoe size is informative)
3. History of pelvic fracture
4. Spinal deformity, for example, scoliosis or kyphosis (note posture)
5. Unilateral or bilateral lameness (observe for limp and for marked lordosis)
6. Other orthopedic deformities—for example, rickets, pinned hip
7. Platypelloid pelvis
8. Malpresentation or malposition
9. Dysfunctional labor, such as failure to progress and uterine dysfunction

The midwife initially evaluates a woman's pelvis during her first antepartal visit and again on entry into labor. Any question the midwife has of the possibility of cephalopelvic disproportion is noted on the woman's chart for reevaluation on entry into labor. Clinical pelvimetry should again be performed when you first see the woman in labor to detect a truly contracted pelvis in relation to the actual size of this baby, and to anticipate where delay in descent and rotation might occur. Therapeutic measures, such as changes in maternal position, can then be initiated early enough to facilitate the mechanisms of labor.

Engagement and descent usually occur predominantly in the posterior pelvis and are associated with normal progressive labor and vaginal birth. The cervix is usually felt posteriorly in the vagina. There is a higher incidence of abnormal labor and operative delivery when engagement and descent is predominantly in the forepelvis and the cervix is in an anterior or forward position in the vagina [62, p. 542].

It is quite unusual to find a pelvis so severely contracted that labor is absolutely contraindicated.

The only true test for cephalopelvic disproportion is a trial of labor. If the pelvis is obviously contracted to the point that it is only adequate for delivery of an extremely small fetus, discuss planning a possible cesarean section with your consulting physician.

All women who have failure to progress or an arrest of labor should be evaluated for cephalopelvic disproportion. This evaluation includes the following:

1. Abdominal palpation to determine fetal lie, presentation, position, flexion, engagement and station of the presenting part, and estimated fetal weight. (A common clinical phenomenon occurs in estimating the fetal weight in an arrested labor: the longer the arrest, the larger the baby seems to become when the clinician is estimating the fetal weight. Usually, your initial estimation before the arrest is the most accurate, since it carries the least situational bias.)
2. Assessment of uterine contractions for frequency, duration, intensity, and changes in uterine activity from what was previously noted. A dysfunctional labor pattern is often seen in a labor complicated by CPD.
3. Pelvic examination to evaluate position of the presenting part, engagement, station, degree of flexion, synclitism/asynclitism, formation and degree of caput, molding, and progress or lack thereof in cervical dilatation and descent of the presenting part.
4. Clinical pelvimetry to determine where in the pelvis the disproportion is occurring

Cephalopelvic disproportion may be evidenced by a dysfunctional labor pattern, failure to progress, poorly flexed head, or an arrest of internal rotation and descent (i.e., deep transverse arrest [see next section]). Cephalopelvic disproportion may or may not be accompanied by the formation of caput and molding. Dysfunctional labor caused by cephalopelvic disproportion may result in the following tragedies:

1. Fetal damage—for example, brain damage
2. Fetal or neonatal death
3. Intrauterine infection
4. Uterine rupture
5. Maternal death

Suspected CPD should be discussed with your consulting physician. The primary management plan when CPD is a possibility is careful evaluation of the woman's pelvis and contractions and her fetus as detailed above, a trial of labor, efforts to maximize maternal pelvic space with positioning that matches this particular pelvic architecture with the way this particular fetus is coming through the pelvis [63], avoiding maternal exhaustion (see section later in this chapter), careful monitoring of fetal well-being, and calling for the cesarean section if there is evidence that the baby is poorly tolerating the effort to get through the pelvis or there is a combination of failure to progress, arrested labor, and hypotonic uterine dysfunction along with suspected CPD before deep transverse arrest occurs. Remember that the goal is a healthy baby and a healthy mother—not a damaged baby and a grief-stricken traumatized mother. There are times when obstetric heroics with forceps or a vacuum extractor to satisfy the goal of a vaginal birth is not worth the price paid. Midwives should be just as well known for calling for a cesarean section when it is truly indicated as we are for promoting and facilitating vaginal birth.

Deep Transverse Arrest

Deep transverse arrest is associated with platypelloid and android pelvic types because of flat posterior pelvic configuration throughout the depth of these pelves. Additionally, platypelloid pelves are also flat in the forepelvis and android pelves have convergent side walls and prominent ischial spines. These factors inhibit the mechanism of labor of internal rotation which brings the sagittal suture from being in the transverse diameter to being in the anteroposterior diameter of the mother's pelvis. Careful clinical pelvimetry during the initial examination enables you to anticipate a potential problem.

A deep transverse arrest should be considered when there is a prolonged second stage. Signs and symptoms include the following:

1. Sagittal suture of the fetal head is in the transverse diameter of the mother's pelvis
2. Development of second stage hypotonic uterine dysfunction
3. Extensive molding of the fetal head
4. Formation of considerable caput succedaneum
5. Lack of descent of the fetal head

The above signs and symptoms are late indicators of deep transverse arrest. If you have identified the potential for deep transverse arrest from your initial clinical pelvimetry, you need to pay particular attention to facilitating the woman's efforts during second stage. Facilitation includes helping the

woman assume positions that promote pushing (e.g., squatting, kneeling) and making sure she enters second stage in a well-hydrated state. In order to prevent exhaustion from pushing, encourage the woman to push only with the peak of the contraction and when she feels like pushing.

It is also important to evaluate the woman's progress accurately. Extensive molding and caput formation may be misleading when evaluating station and descent. Ascertain engagement abdominally with Leopold's fourth maneuver. By vaginal examination, evaluate the degree of molding and caput, locate the parietal bones by palpating past the caput, and note whether the biparietal diameter has passed through the pelvic inlet. Also estimate the amount (depth) of caput by palpating past it to skull bone and ascertain the station of the actual lowermost part of the presenting part.

The primary management plan for deep transverse arrest is prevention when you suspect from your original evaluation of the mother's pelvis that this may be a possibility. Since deep transverse arrest and subsequent obstructed labor are manifestations of cephalopelvic disproportion, prevention of deep transverse arrest, attentive monitoring, careful evaluation, and alert management is the same as for CPD. Delay may be costly. Cesarean section at full dilatation with little amniotic fluid (most likely the membranes have ruptured either spontaneously or artificially) and an engaged head also has serious potential morbidity to both mother and baby as does augmenting labor and using forceps or a vacuum extractor [64]. A timely cesarean section before morbidity by any route of birth becomes inevitable is a far better management plan in the presence of a baby having difficulty maneuvering through a contracted pelvis.

Uterine Dysfunction

Uterine dysfunction is a diagnosis made by observing a prolongation of any phase or stage of labor beyond its expected length. It is identified by a lack of progress in cervical effacement or dilatation or in descent of the presenting part.

Uterine activity can be measured in two ways:

1. *By abdominal palpation and vaginal examination:* This is done by palpation of the contractions and determination during vaginal examination of the progress of labor as defined by progressive effacement, dilatation, and descent of the presenting part.
2. *Biophysically:* This is done by inserting an intrauterine pressure catheter to measure the frequency and pressure of each contraction at each phase and stage of labor (see Chapter 64).

Measurement of progress in effacement, dilatation, and descent—the result of effective uterine contractions—is still the most accurate way to recognize uterine dysfunction.

Uterine dysfunction may reflect a biochemical problem in the woman caused, for example, by stress, which results in alterations of endorphins and catecholamine production, which in turn affect uterine activity. Uterine dysfunction may also reflect the presence of another complication, in effect being a symptom of either cephalopelvic disproportion (e.g., pelvic contracture, hydrocephaly), fetal malpresentations and malpositions (e.g., shoulder, face), or soft-tissue dystocias such as myomata or vaginal or uterine septa. There is also some thought that a gradual and continuous aging process of the myometrium begins around age 25 and may contribute to a slower and more complicated labor process in women over the age of 35 [65].

There are two types of uterine dysfunction: hypotonic and hypertonic. They are differentiated from each other by signs and symptoms, underlying contraction physiology, when they occur in labor, and the effect of each on the mother and the fetus. The two things they have in common are that the contractions are ineffective and cervical dilatation and fetal descent are arrested.

Hypotonic Uterine Dysfunction

In hypotonic uterine dysfunction, contractions have a normal gradient pattern (greatest in the fundus and decreasing to weakest in the lower uterine segment and cervix [see Figure 26-2]) but a very poor tone or intensity (less than 15 mm Hg of pressure), which is too little pressure to dilate the cervix. In this situation the woman feels great because she has no pain and is able to rest. However, labor is prolonged, which increases the risk of maternal distress, hemorrhage, and, if the membranes are ruptured, intrauterine infection. The fetus usually experiences no distress unless the condition is allowed to go on over a long period of time and intrauterine infection develops.

The signs and symptoms of hypotonic uterine dysfunction are as follows:

1. History: contractions not currently painful; labor progressed well into the active phase of the first stage of labor or the second stage and then stopped.

2. Physical examination: contractions infrequent, of short duration and mild intensity
3. Pelvic examination: lack of progress in cervical dilatation or fetal descent (station) because the contractions are ineffective

If a problem is suspected or evident, you should do a complete assessment and discuss the situation with your consulting physician. A complete assessment consists of the following:

1. Assessment of contractions: frequency, length, interval, intensity, and changes from what was previously observed
2. Assessment for maternal exhaustion (see section later in this chapter)
3. Assessment of fetal well-being
4. Assessment of maternal environment; note any stress factors
5. Assessment of presentation, position, engagement, and station
6. Assessment for cephalopelvic disproportion: molding, caput formation, flexion, synclitism/asynclitism, and pelvic adequacy
7. Assessment of progress of labor: effacement, dilatation, and descent of the presenting part

There are various management options for a woman whose labor is complicated by hypotonic uterine dysfunction. The use of these options depends on whether other parameters are within the range of normal. These parameters, which should be evaluated before implementing a management plan, include the following:

1. Reassuring fetal heart rate pattern/absence of fetal distress
2. Clear amniotic fluid if the membranes are ruptured
3. Membranes intact or recently ruptured and absence of signs and symptoms of chorioamnionitis
4. No signs and symptoms of maternal exhaustion
5. Adequate pelvis

The management options are as follows and can be used singly or in combination:

1. Modification of the environment to decrease maternal stress.
2. Correction of maternal exhaustion and dehydration through rest and fluid intake.
3. Discussion with the woman to detect any underlying fears or concerns either for herself or as they relate to the baby or delivery. Epidural anesthesia will sometimes produce positive results if the woman's fear of pain of the birth process cannot be overcome by education, support, and communication.
4. Ambulation.
5. Hydrotherapy: shower, tub, or time in a jacuzzi; but no more than 1 to 2 hours in the tub or jacuzzi if there is no progress [66].
6. Enema: the purpose of the enema must be weighed against the following factors in making a decision about using an enema:
   a. Station/location of the presenting part: if the presenting part is unengaged or above the ischial spines, there is a risk of prolapse of the umbilical cord accompanying expulsion of the enema. The risk is less (though still present) if the membranes are intact.
   b. Whether the membranes are ruptured: if the membranes are ruptured, there is an increased risk of possible intrauterine infection. Extreme care should be taken in cleansing the perineal area following expulsion of the enema.
   c. Presence of any complications that would contraindicate an enema: examples include vaginal bleeding with suspected abruptio placentae or placenta previa (avoid bringing either of these conditions to a life-threatening crisis), preterm labor (avoid stimulating labor), breech presentation (danger of a prolapsed cord), severe preeclampsia (need for the woman to be as quiet and undisturbed as possible).

   Soapsuds enemas, because they are irritating, are thought to be more effective for stimulating labor than just warm tap water or a Fleet enema. The old "3H" enema (high, hot, and a hell of a lot) should be avoided. The water should be body temperature for comfort, the tube should be inserted the usual distance for giving an enema, and the fluid should be given gently and slowly with the tubing pinched off during any contractions. The amount can vary, with 500 to 1000 cc used for stimulating contractions, depending on the woman's tolerance.

   Someone should be with or near the woman while she is expelling the enema in case of strong expulsive contractions, rupture of the membranes, prolapse of the umbilical cord, or birth of the baby. The fetal heart tones should be checked after the enema is expelled. If this measure is effective, improved uterine activity should occur within an hour or so.
7. Rupture of membranes (see Chapter 26, p. 778). If this measure is effective, improved uterine activity should occur within 2 hours.
8. Nipple stimulation (see Chapters 23 and 25).
9. Pitocin stimulation if the above management is

unsuccessful in accomplishing progress in labor (see Chapter 25). One study showed that a high-dose oxytocin regimen—an initial 4 mU/min increased by 4 mU/min every 15 minutes until adequate uterine contractility is achieved—was more effective with fewer operative deliveries than a low-dose regimen [67].

In incorporating the above options into a management plan, you should establish an estimated time period for anticipated correction of the uterine dysfunction and communicate the plan to your consulting physician. If any of the clinical parameters are abnormal (e.g., presence of fetal distress, meconium, prolonged rupture of membranes, maternal exhaustion, malposition) immediate collaboration with your consulting physician and a more aggressive management approach is appropriate.

Hypertonic Uterine Dysfunction

In hypertonic uterine dysfunction, contractions have a distorted gradient pattern, with the midportion of the uterus contracting more forcefully than the fundus and with portions of hypertonicity throughout the uterus (see Figure 26-2). In this situation, the mother becomes literally exhausted, with an increased likelihood of maternal distress and an increased risk of infection if the membranes are ruptured and the woman has undergone repeated vaginal examinations. Fetal intolerance of labor may quickly develop from uteroplacental insufficiency caused by hypertonicity of the uterus and may result in increased perinatal and infant morbidity and mortality. As hypertonic uterine dysfunction occurs primarily during the latent phase of labor, and because a prolonged latent phase is at times difficult to distinguish from false labor, there is some thought that hypertonic uterine dysfunction may be a form of false labor. These fine delineations have not yet been clearly determined.

The signs and symptoms of hypertonic uterine dysfunction are as follows:

1. History: usually occurs in primigravidas; contractions feel excessively painful for the period of labor and the severity of the contractions by palpation; occurs early in labor during the latent phase
2. Physical examination: contractions are frequent and irregular in tonicity
3. Pelvic examination: there is a lack of progress in cervical effacement and dilatation and in fetal descent (station) because the contractions are ineffective and labor never really commences

The midwife collaborates with the consulting physician when the condition is first suspected. Management usually begins with stopping this discoordinate labor and inducing rest with a combination of morphine and a barbiturate. Most women will awaken in normal, coordinated labor.

Maternal Exhaustion (Maternal Distress; Ketoacidosis)

Maternal exhaustion (maternal distress) should be guarded against because deterioration in the woman's condition is dangerous both to her and to her unborn baby. Checking her urine for ketones, maintaining hydration from the start of labor, and being prompt about seeking physician help if labor is not progressing should prevent the development of maternal exhaustion. In other words, if the midwife is providing good management, severe maternal distress should not occur.

The signs and symptoms of maternal exhaustion/distress are as follows:

1. History: the woman feels weak, apathetic, sick, and anxious; labor is prolonged; she complains of dehydration (dry lips, dry mouth, parched throat).
2. Physical examination: the woman looks distressed and is restless; she has a rising pulse, elevated temperature, circumoral pallor, vomiting.
3. Laboratory tests: observe urine for concentration and examine it for ketones.

The midwife should already have collaborated with the consulting physician regarding abnormal length of any phase or stage of labor. Management should include correction of the fluid and electrolyte imbalance.

Uterine Rupture

Uterine rupture, fortunately, is a rare event. Etiological factors in uterine rupture encompass a number of injuries to or defects of the uterus occurring either before or during the present pregnancy. The most common causes are previous surgery to the fundus or corpus of the uterus, such as a classical cesarean section; previous removal of intrauterine myomata that invaded the myometrium; injudicious use

of oxytocin induction or augmentation of labor, especially for women of high parity; induction of labor in women with a previous cesarean section using any method but especially the use of prostaglandins [7]; and a single-layer closure of a previous lower segment incision for cesarean section [8]. Spontaneous rupture can also occur as a result of abnormal presentations, especially in the thinned-out lower uterine segment of a grand multipara.

Given the approximately 5 percent maternal mortality and the approximately 50 percent fetal mortality resulting from uterine rupture, the life of the mother and the baby may depend on the speed with which the rupture is recognized and action is taken. Therefore, everyone responsible for care of the woman during labor should be familiar with the signs and symptoms of uterine rupture and the immediate emergency steps to take.

Signs and symptoms of uterine rupture may be either dramatic or quiet. Regardless, change in the fetal heart rate pattern, especially recurrent late decelerations, may be an early sign of impending uterine rupture [68]. Late decelerations reflect uteroplacental insufficiency and can have causes other than uterine rupture. However, the fetal heart rate pattern of late decelerations due to uterine rupture are not relieved by repositioning, stopping administration of any oxytoxic, and administration of oxygen. The most ominous pattern is that of recurrent late decelerations followed by prolonged decelerations and terminal bradycardia [68, 69].

In dramatic rupture of the uterus, the woman experiences a sharp, shooting pain in her lower abdomen at the height of a severe contraction. She feels that something has given way inside of her and may cry out that "something tore." Contrary to previous teaching, uterine contractions usually do not stop [41, p. 650]. Vaginal bleeding may be observed either as a slight amount or as a hemorrhage. Findings on abdominal palpation are changed from previous findings, as follows:

1. The presenting part is now movable above the pelvic inlet.
2. There may be dramatic repositioning or relocation of the fetus in the mother's abdomen with corresponding loss of station.
3. The fetal parts are more easily palpated than before.
4. The fetal movements may become violent and then reduce to no fetal movements.
5. A round, firm (contracted) uterus may be felt beside the fetus (the fetus is felt outside of the uterus).

The woman may exhibit the signs and symptoms of shock—elevated pulse (rapid and thready); decreased blood pressure; pallor; cold, clammy skin; apprehensiveness, feeling of impending doom or death; air hunger (shortness of breath); restlessness; and visual disturbances.

In a quiet uterine rupture in which the uterus ruptures silently (without the dramatic clinical picture), the woman may or may not have some vomiting; other manifestations include increased tenderness over the abdomen, severe suprapubic pain, hypotonic uterine contractions, lack of further progress in labor, and a feeling of faintness. Eventually she will evidence hematuria, vaginal bleeding, some pain, and the signs of progressive shock from blood loss with a rising and rapid pulse rate, and pallor. The contractions may continue but they have no effect on the cervix; or no contractions may be felt. The fetal heart tones may be lost.

Signs and symptoms of uterine rupture may mimic the signs and symptoms of other catastrophes. Bleeding into the peritoneum may irritate the diaphragm and cause referred pain to the chest thus mimicking the signs and symptoms of an amniotic fluid or pulmonary embolus. Another confounding possible diagnosis is abruptio placentae. Pain medication, especially epidural block, may mask any pain related to uterine rupture [41].

The midwife should have the consulting physician and pediatrics notified immediately and initiate the following measures:

1. Start two intravenous infusion routes with 16-gauge intracatheters: one for electrolyte solutions (e.g., lactated Ringer's solution) and the other for the blood transfusion (keep the infusion line open with normal saline until the blood is obtained).
2. Notify the blood bank of your need for a *STAT* blood transfusion. Estimate the number of units needed as well as the probable need for fresh frozen plasma.
3. Administer oxygen.
4. Make all preparations for immediate abdominal surgery (laparotomy and most likely hysterectomy).

Blood Transfusion Reaction

The midwife may become involved with blood transfusions as a result of obstetric complications such as postpartal hemorrhage, placenta accreta,

placenta previa, or abruptio placentae. The following steps should be taken when administering blood in order to minimize the risk of a blood transfusion reaction:

1. When initially drawing a specimen for blood typing and crossmatch, make sure the specimen is properly labeled with the correct name and chart number.
2. When you receive a unit of blood, check the name and unit number against the name and unit number of the woman to whom it is to be given. They should be the same.
3. Compare the woman's blood type with that on the unit of blood to be administered. They should be the same except in an extreme emergency, when it may be necessary to administer O-negative blood to a woman who is Rh positive.
4. Compare the unit number with the number on the vial of blood that is taped to the bag of blood. Both numbers should be the same.
5. Avoid giving blood that is ice cold unless the situation is life threatening. The resulting chills may be mistaken as a sign of a blood transfusion reaction.

A blood transfusion reaction can arise from a variety of possible complications during receipt of a blood transfusion: air embolism, anaphylactic shock, circulatory overload, febrile reactions, hemolytic reactions, hyperkalemia, hypocalcemia, hypothermia, and septic shock.

This presentation identifies all the possible signs and symptoms of all the possible complications, since it is the midwife's responsibility to recognize that a reaction is taking place and to so inform the physician. It is the physician's responsibility to diagnose which blood transfusion complication it is and determine the appropriate management.

Subjective signs and symptoms of a blood transfusion reaction include the following:

Lumbar and leg pain
A feeling of fullness in the head
Vertigo
Headache
A feeling of chest constriction
Feeling cold
Vague muscle weakness extending from extremities into trunk
Nausea
Apprehensiveness
Muscle cramps
Paresthesia of hands, feet, and tongue; also of fingers and around the mouth

Objective signs and symptoms of a blood transfusion reaction include the following:

Fever
Chills
Shortness of breath
Tachycardia
Hypotension
Decreased urine output
Skin rash (urticaria)
Edema
Diarrhea
Slow, irregular pulse
Convulsions
Respiratory stridor, rales
Spasms of the hands and feet
Hyperactive reflexes
Neck vein distention

The woman may also have bronchospasm, shock, and paralysis of the respiratory muscles and myocardium, leading to cardiac arrest.

In the presence of a blood transfusion reaction the appropriate immediate actions are as follows:

1. Stop the transfusion.
2. Flush the IV tubing and keep the IV route open with normal saline.
3. Notify the consulting physician of the reaction so the physician can diagnose which complication has occurred and determine its management.
4. Notify the blood bank and save the unit of blood that caused the reaction for further analysis. Most blood banks have clearly outlined procedures to take when there is a transfusion reaction. They may also want to obtain blood and urine samples from the woman.

References

1. Murtland, T. L. *An Exploration of Vaginal Birth After Cesarean and Nurse-Midwifery Care*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1985.
2. Rosen, M. G., Dickinson, J. C., and Westhoff, C.L. Vaginal birth after cesarean: a meta-analysis of morbidity and mortality. *Obstet. Gynecol.* 77:465–470, 1991.

3. Committee on Obstetric Practice. Vaginal delivery after a previous Cesarean birth. *ACOG Committee Opinion*, No. 143, 1994.

4. Flamm, B., Newman, L., Thomas, S., Fallon, D., and Yoshida, M. Vaginal birth after cesarean delivery: results of a 5-year multicenter collaborative study. *Obstet. Gynecol.* 76:750–754, 1990.

5. Phelan, J., Clark, S., Diaz, F., and Paul, R. Vaginal birth after cesarean. *Am. J. Obstet. Gynecol.* 157:1510–1515, 1987.

6. McMahon, M., Luther, E., Bowes, W., and Olshan, A. Comparison of trial of labor with an elective second cesarean section. *N. Eng. J. Med.* 335:689–695, 1996.

7. Lydon-Rochelle, M., Holt, V., Easterling, T., and Martin, D. Risk of uterine rupture during labor among women with a prior cesarean delivery. *N. Eng. J. Med.* 345(1):3–8 (July 5) 2001.

8. Bujold, E., Bujold, C., Hamilton, E. F., Harel, F., and Gauthier, R. J. The impact of a single-layer or double-layer closure on uterine rupture. *Am. J. Obstet. Gynecol.* 186(6):1326–1330 (June) 2002.

9. Cowan, R. K., Kinch, R. A., Ellis, B., and Anderson, R. Trial of labor following Cesarean delivery. *Obstet. Gynecol.* 83(6):933–936 (June) 1994.

10. Flamm, B. L., Goings, J. R., Liu, Y., and Wolde-Tsadik, G. Elective repeat cesarean delivery versus trial of labor: a prospective multicenter study. *Obstet. Gynecol.* 83(6):927–932 (June) 1994.

11. Naef, R. W. III, Ray, M. A., Chauhan, S. P., et al. Trial of labor after cesarean delivery with a lower-segment, vertical uterine incision: is it safe? *Am. J. Obstet. Gynecol.* 172(6):1666–1674 (June) 1995.

12. Halperin, M. E., Moore, D. C., and Hannah, W. J. Classical versus low-segment transverse incision for preterm cesarean section: maternal complications and outcome of subsequent pregnancies. *Br. J. Obstet. Gynaecol.* 95:990–996, 1988.

13. Hook, B., Kiwi, R., Amini, S., Fanaroff, A., and Hack, M. Neonatal morbidity after elective repeat cesarean section and trial of labor. *Pediatrics* 100:348–353, 1997.

14. Wing, D., and Paul, R. Vaginal birth after cesarean section: selection and management. *Clin. Obstet. Gynecol.* 42:836–848, 1999.

15. Zelop C., Shipp, T. D., Repke, J. T., et al. The effect of previous vaginal delivery on the risk of uterine rupture during a subsequent trial of labor. *Am. J. Obstet. Gynecol.* 183:1184–1186, 2000.

16. Abitbol, M. M., Castillo, I., Taylor, U. B., et al. Vaginal birth after Cesarean section: the patient's point of view. *Am. Fam. Physician* 47(1):129–134 (January) 1993.

17. American College of Obstetricians and Gynecologists, Committee on Practice Bulletins. Assessment of Risk Factors for Preterm Birth. *ACOG Practice Bulletin* No. 31. Washington, DC: ACOG, October 2001.

18. Rawlings, J. S., Rawlings, V. B. and Read, J. A. Prevalence of low birth weight and preterm delivery in relation to the interval between pregnancies among white and black women. *N. Eng. J. Med.* 332(2):69–74 (January 12) 1995.

19. Wheeler, D. G. Preterm birth prevention. *J. Nurse-Midwifery* 39(2 suppl.):73S (March/April) 1994.

20. Liberman, E. Low birth weight—not a black-and-white issue. *N. Eng. J. Med.* 332(2):117–118 (January 12) 1995.

21. Goldenberg, R. L., Hauth, J. C., and Andrews, W. W. Mechanisms of disease: intrauterine infection and preterm delivery. *N. Eng. J. Med.* 342(20):1500–1507 (May 18) 2000.

22. Covington, D. L., Hage, M., Hall, T., and Mathis, M. Preterm delivery and the severity of violence during pregnancy. *J. Reprod. Med.* 46(12):1031–1039 (December) 2001.

23. Iams, J. D., Newman, R. B., Thom, E. A., et al. Frequency of uterine contractions and the risk of spontaneous preterm delivery. *N. Eng. J. Med.* 346(4):250–255 (January 24) 2002.

24. Meis, P. J., Goldenberg, R. L., Mercer, B., et al. The preterm prediction study: significance of vaginal infections. *Am. J. Obstet. Gynecol.* 173(4):1231–1235 (October) 1995.

25. Subtil, D., Denoit, V., Le Goueff, F., Husson, M. O., Trivier, D., and Puech, F. The role of bacterial vaginosis in preterm labor and preterm birth: a case-control study. *Eur. J. Obstet. Gynecol. Reprod. Biol.* 101(1):41–46 (February 10) 2002.

26. March of Dimes Birth Defects Foundation. *Current Medical Topic: Fetal Fibronectin*. Accessed online in September 2002 at www.modtimes.org/Health Library.

27. Iams, J. D. The length of the cervix and the risk of spontaneous premature delivery. *N. Eng. J. Med.* 334(9):567–572 (February 29) 1996.

28. Groom, K. M., Sherman, A. H., and Bennett, P. R. Ultrasound-indicated cervical cerclage: outcome depends on preoperative cervical length and presence of visible membranes at time of cerclage. *Am. J. Obstet. Gynecol.* 187(2):445–449 (August) 2002.

29. Enkin, M., Keirse, M. J. N. C., Neilson, J., et al. *A Guide to Effective Care in Pregnancy and Childbirth*, 3rd ed. Oxford, England: Oxford University Press, 2000.

30. Althuisius, S. M., Dekker, G. A., van Geijn, H. P., Bekedam, D. J. and Hummel, P. Cervical incompetence prevention randomized cerclage trial (CIPRACT): study design and preliminary results. *Am. J. Obstet. Gynecol.* 183(4):823–239 (October) 2000.

31. Rust, O. A., Atlas, R. O., Reed, J., van Gaalen, J., and Balducci, J. Revisiting the short cervix detected by transvaginal ultrasound in the second trimester: why cerclage therapy may not help. *Am. J. Obstet. Gynecol.* 185(5):1098–1105 (November) 2001.

32. Klebanoff, M. A. Failure of metronidazole to prevent preterm delivery among pregnant women with asymptomatic *Trichomonas vaginalis* infection. *N. Eng. J. Med.* 345(7):487–493 (August 16) 2001.

33. Creasy, R. K., and Iams, J. D. Preterm labor and delivery. In Creasy, R. K., and Resnik, R. (Eds.) *Maternal-Fetal Medicine*, 4th ed. Philadelphia, PA: W.B. Saunders, 1999, ch. 32.

34. The Canadian Preterm Labor Investigators Group. Treatment of preterm labor with the beta-adrenergic agonist ritodrine. *N. Eng. J. Med.* 327(5):308–312 (July 30) 1992.

35. Leveno, K. J., and Cunningham, F. G. Beta-adrenergic agonists for preterm labor. *N. Eng. J. Med.* 327(5):349–351 (July 30) 1992.

36. Mittendorf, R., et al. Association between the use of antenatal magnesium sulfate in preterm labor and adverse health outcomes in infants. *Am. J. Obstet. Gynecol.* 186(6):1111–1118 (June) 2002.

37. Gyetvai, K., Hannah, M. E., Hodnett, E. D., and Ohlsson, A. Tocolytics for preterm labor: a systematic review. *Obstet. Gynecol.* 94(5 suppl. 1):869–877 (November) 1999.

38. Economy, K. E., and Abuhamad, A.Z. Calcium channel blockers as tocolytics. *Semin. Perinatol.* 25(5):264–271 (October) 2001.

39. Tsatsaris, V., Papatsonis, D., Goffinet, F., Dekker, G., and Carbonne, B. Tocolysis with nifedipine or beta-adrenergic agonists: a meta-analysis. *Obstet. Gynecol.* 97(5, pt. 2):840–847 (May) 2001.

40. King, J. F., Glenady, V. J., Papatsonis D. N. M., Dekker, G. A., and Carbonne B. Calcium channel blockers for inhibiting preterm labour (Cochrane Review). In *The Cochrane Library*, Issue 3. Oxford, England: Update Software, 2002.

41. Cunningham, F. G., Gant, N. F., Leveno, K. J., et al. *Williams Obstetrics*, 21st ed. New York: McGraw-Hill, 2001.

42. National Institutes of Health. *The Effect of Antenatal Steroids for Fetal Maturation on Perinatal Outcomes*. Consensus Statement, February 28–March 2, 1994, pp. 1–18.

43. Guinn, D. A. Single vs. weekly courses of antenatal corticosteroids for women at risk of preterm delivery: a randomized controlled trial. *JAMA* 286(13):1581–1587 (October 3) 2001.

44. Macones, G. A., Berlin, M., and Berlin, J. A. Efficacy of oral beta-agonist maintenance therapy in preterm labor: a meta analysis. *Obstet. Gynecol.* 85(2):313–316 (February) 1995.

45. Mercer, J. S. Current best evidence: a review of the literature on umbilical cord clamping. *J. Midwifery Womens Health* 46(6):402–414 (November/December) 2001.

46. Mercer, J. S. Cord of prevention. *Advance for Nurses (New England)* 2(16):14–16 (August 5) 2002.

47. Newman, R. B., Goldenberg, R. L., Moawad, A. H., et al. Occupational fatigue and preterm premature rupture of membranes. *Am. J. Obstet. Gynecol.* 184(3):438–446 (February) 2001.

48. Bennett, S. L., et al. Ferning and nitrazine testing of amniotic fluid at all gestational ages. SPO Abstract 236. *Am. J. Obstet. Gynecol.* 164:312, 1991.

49. Ghidini, A., and Romero, R. Premature rupture of membranes: steps in diagnosis. *Contemp. OB/GYN* 38(12):25–36 (December) 1993.

50. Centers for Disease Control and Prevention. Prevention of perinatal Group B Strepotococcal disease. *MMWR* 51(No. RR-11) 4 (August 16) 2002.

51. Garite, T. J. Premature rupture of the membranes. In Creasy, R. K., and Resnik, R. (Eds.) *Maternal-Fetal Medicine*, 4th ed. Philadelphia, PA: W.B. Saunders, 1999, ch. 40.

52. Goncalves, L. F., Chaiworapongsa, T., and Romero, R. Intrauterine infection and prematurity. *Ment. Retard. Dev. Disabilities Res. Rev.* 8(1):3–13, 2002.

53. Wu, Y. W. Systematic review of chorioamnionitis and cerebral palsy. *Ment. Retard. Dev. Disabilities Res. Rev.* 8(1):25–29, 2002.

54. Sperling, R. S., Ramamurthyr, S., and Gibbs, R. S. A comparison of intrapartum versus immediate postpartum treatment of intraamniotic infection. *Obstet. Gynecol.* 70:861, 1987.

55. Gibbs, R. S., Dinsmoor, M. J., Newton, E. R., and Ramamurthy, R. S. A randomized trial of

intrapartum vs. immediately postpartum treatment of intra-amniotic infection. *Obstet. Gynecol.* 72:823, 1988.

56. American College of Nurse-Midwives. *Early-Onset Group B Strep Infection in Newborns: Prevention and Prophylaxis*. ACNM Clinical Bulletin No. 2. Washington, DC: ACNM, January 1997.

57. Critchlow, C. W., Leet, T. L., Benedetti, T. J., and Daling, J. R. Risk factors and infant outcomes associated with umbilical cord prolapse: a population-based case-control study among births in Washington State. *Am. J. Obstet. Gynecol.* 170(2):613–618, 1994.

58. Usta, I. M., Mercer, B. M., and Sibai, B. M. Current obstetrical practice and umbilical cord prolapse. *Am. J. Perinatol.* 16(9):479–484, 1999.

59. Katz, Z. Shoham, Z., Lancet, M., et al. Management of labor with umbilical cord prolapse: a 5-year study. *Obstet. Gynecol.* 72(2):278–281 (August) 1988.

60. Griese, M. E., and Prickett, S. A. Nursing management of umbilical cord prolapse. *JOGNN* 22(4):311–315 (July/August) 1993.

61. Hamlin, R. H. J. *Stepping Stones to Labour Ward Diagnosis*. Adelaide, Australia: Rigby, 1959.

62. Bowes, W. A. Jr., Clinical aspects of normal and abnormal labor. In Creasy, R. K., and Resnik, R. (Eds.) *Maternal-Fetal Medicine*, 4th ed. Philadelphia, PA: W.B. Saunders, 1999, ch. 34.

63. Simkin, P., and Ancheta, R. *The Labor Progress Handbook: Early Interventions to Prevent and Treat Dystocia*. Oxford, England: Blackwell Scientific, 2000.

64. Murphy, D. J. Failure to progress in the second stage of labour. *Curr. Opin. Obstet. Gynecol.* 13(6):557–561 (December) 2001.

65. Main, D. M., Main, E. K., and Moore, D. H. II. The relationship between maternal age and uterine dysfunction: a continuous effect throughout reproductive life. *Am. J. Obstet. Gynecol.* 182(6):1312–1320 (June) 2000.

66. Bowman, T. A. Water babies. *Advance for Nurses (New England)* 1(1):12–14 (June 18) 2001.

67. Xenakis, E. M., Langer, O., Piper, J. M., Conway, D., and Berkus, M. D. Low-dose versus high-dose oxytocin augmentation of labor—a randomized trial. *Am. J. Obstet. Gynecol.* 173(1):1874–1878 (December) 1995.

68. Ayres, A. W., Johnson, T. R., and Hayashi, R. Characteristics of fetal heart rate tracings prior to uterine rupture. *Int. J. Gynaecol. Obstet.* 74(3):235–240 (September) 2001.

69. Leung, A. S., Leung, E. K., and Paul, R. H. Uterine rupture after previous cesarean delivery: maternal and fetal consequences. *Am. J. Obstet. Gynecol.* 169(4):945–950 (October) 1993.

• • • Additional References

Cram, L. F., Zapata, M. I., Toy, E. C., and Baker, B. III. Genitourinary infections and their association with preterm labor. *Am. Fam. Physician* 65(2):241–248 (January 15) 2002.

Flamm, B. L. Vaginal birth after cesarean: reducing medical and legal risks. *Clin. Obstet. Gynecol.* 44(3):622–629 (September) 2001.

Flenady, V., and King, J. Antibiotics for prelabour rupture of membranes at or near term (Cochrane Review). *The Cochrane Library*, Issue 3. Oxford, England: Update Software, 2002.

Goldenberg, R. L., Iams, J. D., Das, A., et al. The preterm prediction study: sequential cervical length and fetal fibronectin testing for the prediction of spontaneous preterm birth. *Am. J. Obstet. Gynecol.* 182(3):636–643 (March) 2000.

Iams, J. D., Goldenberg, R. L., Mercer, B., et al. The preterm prediction study: recurrence risk of spontaneous preterm birth. *Am. J. Obstet. Gynecol.* 178(5):1035–1040 (May) 1998.

Leitich, H., Brunbauer, M., Kaider, A., Egarter, C., and Husslein, P. Cervical length and dilatation of the internal cervical os detected by vaginal ultrasonography as markers for preterm delivery: a systematic review. *Am. J. Obstet. Gynecol.* 181(6):1465–1472 (December) 1999.

Leitich, H., Egarter, C., Kaider, A., Hohlagschwandtner, M., Berghammer, P., and Husslein, P. Cervicovaginal fetal fibronectin as a marker for preterm delivery: a meta-analysis. *Am. J. Obstet. Gynecol.* 180(5):1169–1176 (May) 1999.

Meis, P. J., Goldenberg, R. L., Mercer, B., et al. The preterm prediction study: significance of vaginal infections. *Am. J. Obstet. Gynecol.* 173(4):1231–1235 (October) 1995.

Miles, A. L., Monga, M., Waller, D. K., Dande, D., and Pschirrer, E. R. Risk factors for symptomatic uterine rupture during a trial of labor: the 1990s. *Am. J. Perinatol.* 17(7):385–389, 2000.

Sheiner, E., Levy, A., Feinstein, U., Hallak, M., and Mazor, M. Risk factors and outcome of failure to progress during the first stage of labor: a population-based study. *Acta Obstet. Gynecol. Scand.* 81(3):222–226 (March) 2002.

CHAPTER

30

Management of Selected Obstetric Complications and Deviations from Normal

Every midwife will inevitably be confronted with complications or deviations from normal that demand immediate action. The midwife must know how to manage the following obstetric complications and deviations from normal until they are resolved or until a collaborating physician can take over:

1. Shoulder dystocia
2. Face presentation
3. Breech presentations
4. Multiple gestation
5. Third stage hemorrhage
6. Immediate postpartal hemorrhage
7. A newborn that needs resuscitation

Management of the first four conditions is described in this chapter; management of third stage hemorrhage, immediate postpartum hemorrhage, and resuscitation of the newborn are described in Chapters 32, 34, and 38, respectively.

Midwives may be confronted with emergencies in any setting. Theoretically and ideally, all of these complications and deviations from normal should have been diagnosed or anticipated before delivery and before they actually occur. Situational circumstances, however, dictate that this will not always be the case. Rarely is a midwife confronted with any of these because of failure to have properly diagnosed or anticipated the problem.

Management of Shoulder Dystocia

The definition of shoulder dystocia is critical to determining the most effective sequence of management steps and maneuvers. The diagnostic entity known as shoulder dystocia refers to cephalic presentations in which the anterior shoulder is wedged above the symphysis pubis instead of entering the true pelvis. This occurs when the shoulders attempt to enter the true pelvis with the bisacromial diameter in the anteroposterior diameter of the pelvic inlet instead of in either the more roomy right or left oblique diameter of the pelvic inlet, which is the method of pelvic entry during the normal mechanisms of labor (see Chapter 28). The oblique diameter of 12.75 centimeters is larger than the anteroposterior diameter of 10.6 centimeters for the obstetric conjugate of the pelvic inlet (see Figures 61-3 and 61-4). The posterior shoulder usually has descended past the sacral promontory and entered the true pelvis. Very rarely, the posterior shoulder is also jammed above the sacral promontory along with the anterior shoulder. Thus the key to the definition of shoulder dystocia, and to the resolution of the problem, is the location of the anterior shoulder wedged above the symphysis pubis.

However, while this definition is anatomically correct, the diagnosis of shoulder dystocia in the clinical situation is subjectively and simultaneously

or retrospectively based on what can be observed at the time of occurrence. Some authors have suggested defining shoulder dystocia by the length of time from delivery of the head to delivery of the body or by which and how many maneuvers have to be used to free the shoulders and deliver the baby [1, 2]. Others look for some combination of "turtle sign," head-to-body delivery length of time, maneuvers needed, and predisposing factors. Complicating the diagnostic picture are two other closely related types of dystocia: snug shoulders and bed dystocia. The midwife needs to make a differential diagnosis between shoulder dystocia (the real thing), snug shoulders, and bed dystocia.

The clinical picture of shoulder dystocia has been vividly described by Morris as follows:

> The delivery of the head with or without forceps may have been quite easy, but more commonly there has been a little difficulty in completing the extension of the head. The hairy scalp slides out with reluctance. When the forehead has appeared it is necessary to press back the perineum to deliver the face. Fat cheeks eventually emerge. A double chin has to be hooked over the posterior vulval commissure, to which it remains tightly opposed. Restitution seldom occurs spontaneously, for the head seems incapable of movement as a result of friction with the girdle of contact of the vulva. On the other hand, gentle manipulation of the head sometimes results in a sudden 90 degree restitution as the head adjusts itself *without descent* [italics added] to the anteroposterior position of the shoulders.
>
> Time passes. The child's head becomes suffused. It endeavors unsuccessfully to breathe. Abdominal efforts by the mother or by her attendants produce no advance; gentle head traction is equally unavailing.
>
> Usually equanimity forsakes the attendants. They push, they pull. Alarm increases. Eventually
>
> > By greater strength of muscle
> > Or by some infernal juggle
>
> the difficulty appears to be overcome, and the shoulders and trunk of a goodly child are delivered. The pallor of its body contrasts with the plum-colored cyanosis of the face, and the small quantity of freshly expelled meconium about the buttocks. It dawns upon the attendants that their anxiety was not ill-founded, the baby lies limp and voiceless, and too often remains so despite all efforts at resuscitation. [3]

The retraction of the head against the perineum, and seemingly back into the vagina if it were possible, is called the *turtle sign*.

Snug shoulders are often given the misnomer "mild" shoulder dystocia and most likely do not meet the definition of the impingement (or impaction) of the anterior shoulder or both shoulders above the pelvic brim. Snug shoulders can occur with a large baby, an adequately shaped pelvis, and a somewhat obese mother, which together comprise a soft tissue dystocia. The head is born very slowly but the midwife does not need to push the perineum back manually in order for the head to be born. The baby's face is fat but the baby does not really exhibit the turtle sign as the head goes through both restitution and external rotation. The shoulders are tight and take more effort to deliver, but making sure the shoulders are in the oblique diameter of the pelvis, a little suprapubic pressure, and an exaggerated lithotomy position readily take care of the problem, as does having the mother get into the hands-knees position. The 1-minute Apgar score is rarely less than 4 and usually not less than 6. It's enough to scare you but it's not the real thing.

Bed dystocia occurs when the woman is in a semi-Fowler's or similar propped-up position and the baby is being born downward into the bed. Bed dystocia is especially common with a soft bed that sags under the woman's buttocks. In such a situation there is no room for delivery of the shoulders. This, however, is not shoulder dystocia. The problem is readily rectified by slipping something under the woman's hips that elevates them and by reducing the upright angle of her position in the bed; or by bringing her buttocks to the edge of the bed; or by turning her on her side or into the hands-knees position. It is an error to record such an event as an incidence of shoulder dystocia.

The incidence of shoulder dystocia is generally reported as being less than 1 percent but may occur from 0.2 to 2 percent of vaginal cephalic deliveries [4]. An accurate figure, however, probably does not exist. The problem in accurately establishing the incidence of shoulder dystocia is threefold:

1. Some reports are not clear if the incidence they cite is based on all deliveries or if their denominator excludes those babies who weighed less than 2500 grams. If babies weighing less than 2500 grams are included in the denominator, the incidence, and thus risk, of shoulder dystocia would appear lower than it actually is.
2. Some reports are not clear if the incidence they cite is based on all deliveries, including cesarean

sections, or just on vaginal deliveries, or just on vaginal cephalic deliveries. If cesarean sections are included in the denominator, the incidence and risk of shoulder dystocia are not accurately reflected.

3. Many practitioners have a problem in making a differential diagnosis of shoulder dystocia from snug shoulders and from bed dystocia.

The incidence of morbidity and mortality resulting from shoulder dystocia and its management (or mismanagement) is approximately 15 percent and increases with the severity of the shoulder dystocia and the number of maneuvers used to deliver the shoulders to approximately 40 percent [5]. Fetal and newborn complications include death (intrapartal death between delivery of the head and delivery of the shoulders, resulting from anoxia; or neonatal death resulting from injuries sustained during delivery of the shoulders), brain damage, fractured clavicle(s), and brachial plexus (Erb's) palsy. It should be noted that brachial plexus injuries may occur without antecedent shoulder dystocia [2, 6]. Maternal complications include extensive perineal and vaginal lacerations, emotional distress resulting from a traumatic delivery, and emotional shock and grief if the baby is either damaged or dead.

The amount of time you have between delivery of the head and delivery of the shoulders before infant morbidity or mortality is likely to occur depends on how much the baby has already been compromised. The amount of compromise may or may not have been evaluated by the time of delivery, and the evaluation may be more or less complete and accurate. Some practitioners claim a margin of safety up to 5 minutes, or even 10 minutes if there has been no previous compromise. A more conservative time frame, which is to be through the steps of management of shoulder dystocia with delivery of the baby within 3 minutes, gives the baby its best chance for both survival and a minimum of brain damage due to hypoxia. This time frame requires instant recognition of the problem, preferably having anticipated it, and unhesitating swift action.

The best preparation for management of shoulder dystocia is to have anticipated it. The possibility of shoulder dystocia should be anticipated whenever you note any of the following findings or conditions:

1. Large fetus, as determined by palpation or ultrasound diagnosis of macrosomia. In macrosomia ("large body") the bisacromial diameter of the shoulders may become larger than the critical diameters of the head and the chest and shoulder circumference is larger than the head circumference. It should be noted, however, that birth weight alone is not predictive for shoulder dystocia [7]. There is a 50 to 60 percent occurrence of shoulder dystocia in infants who weigh *less* than 4000 grams [2].
2. Maternal diabetes, particularly gestational or Type I class A diabetes, because of the possibility of macrosomia. Infants of diabetic mothers have a greater shoulder-head circumference ratio than do infants of nondiabetic mothers even though the birth weight is the same [4].
3. Postdates, because the baby continues to grow and get larger with an increase in macrosomia between 40 and 42 weeks' gestation. There is a greater shoulder-head circumference ratio as growth of the biparietal diameter slows but not of the shoulders and chest [4].
4. Obstetric history of large babies.
5. Family history of large siblings.
6. Maternal obesity. A large baby combined with the extra tissue found in an obese mother cuts down on the space in the passageway. This is probably more frequently the problem in the diagnosis of "snug shoulders."
7. Varney's predictive factor of an estimated fetal weight 1 pound or more greater than the woman's largest previous baby [8]. This situation is one in which you can have the worst shoulder dystocia, because frequently it is not anticipated, especially if the woman's first baby was 5 or 6 pounds and this baby is estimated at the average 7 to $7^1/_2$ pounds.
8. Obstetric history of a difficult delivery or previous shoulder dystocia.
9. Cephalopelvic disproportion:
   a. pelvic shape that shortens the anterior-posterior diameters
   b. deformed pelvis (e.g., the result of an accident or ricketts)
10. Desultory active phase of the first stage of labor. The active phase just squeaks along, the woman barely dilating another centimeter within reasonable time limits for evidence of progress. Such a labor pattern could reflect cephalopelvic disproportion which, in the event of a vaginal delivery, would portend shoulder dystocia.
11. Prolonged second stage of labor, which includes both excruciatingly slow descent of the head and the failure to descend seen in deep transverse arrest.

12. Indication of the need for midpelvic rotation and/or delivery with either forceps or vacuum extractor. This is the predictive factor that most likely will be combined with a large fetus, prolonged second stage of labor, and cephalopelvic disproportion, and that most strongly indicates consideration of a cesarean section. The incidence of shoulder dystocia increases dramatically when increased birth weight is combined with prolonged second stage labor and midpelvic delivery [9].

When confronted with a shoulder dystocia you can take unhesitating swift action only if you have learned and drilled a set of steps to follow and become confident both that they will work and that you are able to do them. In addition you must develop a mind-set that is contrary to normal practice for midwives. This mind-set includes recognizing that you are going to hurt the woman. This is not the time for the gentle approach, delicacy in handling maternal tissues, and lengthy explanations. You need to be aggressive with your hands and with your mind. You also need to recognize that you are no longer facilitating natural, normal processes but facilitating a birth in a process that is no longer normal. This is *not* the time to be waiting for the next contraction before doing something. You must implement your set of steps instantly.

The danger of shoulder dystocia is in large part attributable to clinicians' not knowing how to manage the emergency properly. It is important that the midwife know how to manage this situation because, even if you anticipate it, you cannot make a diagnosis until after the fetal head is born. This gives little time to resolve the problem before the baby is either damaged or dead. If you learn, drill, and review the following protocol en route to each labor and birth situation, you need not fear shoulder dystocia because you will know precisely what to do. You also need to ensure that the nurses in the hospital setting know what to do in the event of a shoulder dystocia and offer in-service education if needed. If birth is in the home or birth center, it is equally essential that the birth assistant also know, frequently drill, and review these steps en route to a birth.

The following steps should be taken to manage this emergency situation of shoulder dystocia. The first six steps occur concurrently; the rest occur in sequence.

1. *Stay calm.* You know what to do and will effectively manage this situation.
2. *Request that your consulting physician be called immediately.* If you anticipated the possibility of a shoulder dystocia, you should have previously alerted the physician of your potential need for him or her. Most likely you will have delivered the baby by the time the physician arrives. If you don't need the physician's help in delivering the baby, you still want the physician to be present because there is a good chance that the baby will need resuscitation and that the mother will have an immediate postpartum hemorrhage.
3. *Request readiness for a full-scale newborn resuscitation effort.*
4. *Request readiness for an immediate postpartum hemorrhage.* Many of the causes of shoulder dystocia also overdistend the uterus and predispose the woman to immediate postpartum hemorrhage. See Chapter 34 for management. Include a request for a straight catheter.
5. *Briefly tell the mother that there is a problem with delivery of the baby's shoulders, that you and the baby need her cooperation, and that you will be doing things that will hurt her.* Tell her that she must *not* push now.
6. *Place the woman in an exaggerated lithotomy position (McRoberts maneuver).* The McRoberts maneuver is the most effective first maneuver to make for the alleviation of shoulder dystocia with the least amount of injury to the baby [2, 4, 10].

   Gonik et al. explain the effectiveness of the McRoberts maneuver as follows (see Figure 30-1):

   > The exaggerated flexion of the patient's legs results in a straightening of the sacrum relative to the lumbar spine with consequent rotation of the symphysis pubis cephalad and a decrease in the angle of inclination. . . . Although this maneuver does not change the dimensions of the true pelvis, rotation of the symphysis superiorly frees the impacted anterior shoulder without manipulation of the fetus. [11]

   The knee-chest position is the same as the exaggerated lithotomy position, only upside down. The McRoberts maneuver also gives you more room for manipulations. If the woman is in lithotomy position or you have brought her to the edge of a bed, position her so her buttocks overhang the edge of the table or bed. Alternatively, if the woman is in the middle of a bed, then place an inverted bedpan (or a delivery pan, or a softball or baseball base—which some midwives carry with them to home births—or anything firm and several inches

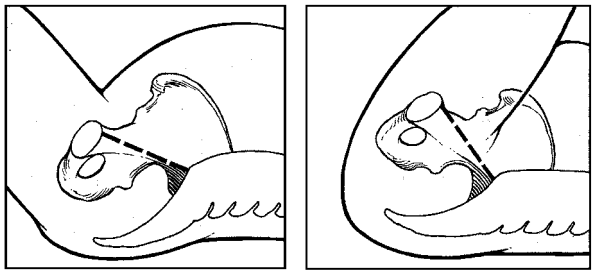


FIGURE 30-1 Angle of the pelvis with the woman's legs down and with her legs in exaggerated lithotomy position.

Source: From Gabbe, S. G., Nieble, J., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 2nd ed. New York: Churchill Livingstone, 1991, p. 568. Reproduced by permission.

thick) underneath her buttocks. Either way, have her bring her legs up, back, and out and have her hang on to them with her hands on her knees or behind her thighs (as she did when pushing) if there are no extra hands to help keep her legs flexed.

7. *Check the position of the shoulders. Rotate them into one of the oblique diameters of the pelvis* if they are in either the transverse or anteroposterior diameter of the mother's pelvis.

   Again, instruct the mother not to push. To rotate the shoulders, place all of the fingers of one of your hands on one side of the baby's chest (e.g., right side) and all of the fingers of your other hand on the baby's back on the opposite side (left side) and then press with the amount of force necessary to move the baby. It is important that your entire hand be used rather than just two fingers of each hand because you most likely won't have the necessary strength in two fingers to move the baby. Using all of your fingers on both sides gives you maximum strength. It also gives you a wider area on which to exert and equalize pressure, thereby decreasing the risk of injury to the baby, which is possible when all the force is concentrated on a smaller area.

   Under no circumstances make the mistake of thinking that moving the head will move the shoulders. All you will do is twist the baby's neck; this may result in injury of the brachial or cervical nerve plexus or fracture of the cervical vertebrae.

8. *Have someone else apply suprapubic pressure while you exert your usual downward and outward pressure on the side of the baby's head* (see Chapters 70 and 71). Pressure on the baby's head should be firm but not excessive. Excessive force or traction on the baby's head may result in nerve palsy.

   Suprapubic pressure is most effective if the person applying it stands on a footstool in order to get greater force behind the downward push. This person places both hands palm down, one on top of the other, in the abdominal midline just above the symphysis pubis and then pushes straight downward into the lower abdomen. Suprapubic pressure can be directed to adduct the shoulders to a lesser bisacromial diameter and help them move from their anteroposterior position above the symphysis pubis to an oblique diameter. You need to instruct the person applying suprapubic pressure as to the position of the baby and which way to direct the pressure so that it is applied against the back of the shoulder and then laterally and downward. The baby will have delivered after this step if the condition was a mild shoulder dystocia.

   Under no circumstances should you allow fundal pressure to be given. Fundal pressure will only further impact the shoulders, waste time, possibly cause injury to the fetus, and possibly rupture the uterus with disastrous consequences for both mother and baby.

9. If the baby has not delivered, take the time (approximately 40 to 45 seconds) to give yourself every piece of knowledge, advantage, and bit of room to deliver the shoulders:
   - **a.** *Catheterize the woman to empty her bladder* if you don't know if she entered delivery with an empty bladder. It takes very little urine for the bladder to become an obstruction and impede descent of the anterior shoulder. To save precious time it is better to ensure that a woman's bladder is empty at the start of delivery if there is any anticipation of a possible shoulder dystocia.
   - **b.** *Ascertain the need to cut or enlarge the episiotomy.* This decision requires clinical judgment and depends on the tightness or laxity of the woman's perineum and the ease with which you can insert your hands for necessary manipulations [12].
   - **c.** *Do a vaginal examination to rule out other causes of labor dystocia after the head is born.* This requires the insertion of your entire examining hand as far as you can. Other causes of labor dystocia to be ruled out at this time are
     - **(1)** short umbilical cord (relative or absolute)
     - **(2)** enlargement of the thorax or abdomen of the fetus such as might be caused by tumors, gross deformities, or severe edema

(3) locked twins
(4) conjoined twins
(5) Bandl's retraction ring

A midwife should never confront the last three causes of labor dystocia. Locked or conjoined twins should be diagnosed prior to the start of labor and delivery and Bandl's retraction ring is the hallmark of neglected labor.

10. *If the labor dystocia is diagnosed as resulting from shoulder dystocia, attempt again to deliver the baby with McRoberts and directed suprapubic pressure* while you exert firm, but not excessive, downward and outward pressure on the side of the baby's head. The baby will have delivered after this step if the condition was a moderate shoulder dystocia.

11. (Steps 11 and 12 are reversible.) *If the baby has not delivered, do the corkscrew maneuver, utilizing the screw principle of Woods* (Figure 30-2). To do this maneuver, place your hands in the same manner as you did for rotation of the shoulders in Step 7. Rotate the baby 180°, thereby substituting the posterior shoulder for the anterior shoulder. Always rotate the body of the baby so that the back is rotated anteriorly (back up). This means that you alternately rotate the baby 180° clockwise and then 180° counterclockwise (or vice versa) until the baby is screwed out, but without being twisted upon itself. It also means that as you begin the maneuver your hand on the baby's back will be on the anterior shoulder pushing forward and down and your hand on the baby's chest will be pushing backward toward the posterior shoulder and up.

In order to make the best use of natural forces you will need to switch the placement of your hands after the baby has rotated 90° before continuing on through the last 90°. For example, if the baby is positioned with its back to the mother's right in an ROT position, then initially your right hand will be pressing against the baby's chest for the posterior shoulder and your left hand will be pressing against the baby's back for the anterior shoulder. After 90° rotation, which places the bisacromial diameter in the transverse diameter of the mother's pelvis, reposition your hands by exchanging their positions. This means that your left hand will now be pressing upward against the chest on the right side of the baby, and your right hand will now be pressing downward against the back on the left side of the baby for the final 90° rotation of the baby's body. The baby's body has now been rotated 180° in a clockwise direction and the posterior shoulder substituted for the anterior shoulder.

If the baby is still undeliverable, rotate the baby another 180°, again substituting the present posterior shoulder for the anterior shoulder. The direction of this rotation will now be counterclockwise, in effect rotating the baby back the way it originally came, only further down and out of the pelvis. This is accomplished by placing your hands so that your left hand is pressing against the baby's chest for the posterior shoulder and your right hand is pressing against the baby's back for the anterior shoulder for the first 90° of the rotation. You then switch your hands so that your left hand is now pressing downward against the right side of the baby's back and your

FIGURE 30-2 Woods screw principle. A = anterior shoulder; P = posterior shoulder; X = symphysis pubis; Y = sacral promontory; Z = coccyx.

Source: From Woods, C. E. A principle of physics as applicable to shoulder dystocia. *Am. J. Obstet. Gynecol.* 45:798, 1943. Reproduced with permission.

right hand is now pressing upward against the left side of the baby's chest for the final 90° rotation of the baby's body. Continue rotating the baby's body at least three to four times.

12. *If the baby still has not delivered, deliver the posterior arm* (see Figure 30-3). Delivery of the posterior arm is accomplished by placing your entire hand deep into the vagina behind the posterior shoulder. Following the arm down from the shoulder, find the elbow and lower arm. If the arm is extended, press in the antecubital space to cause the arm to flex (Figure 30-3, top), or if the arm is jammed, splint the lower arm down from the elbow and sweep it up and across the baby's abdomen and chest in its normal range of motion until you can grasp the baby's hand and deliver the entire arm.

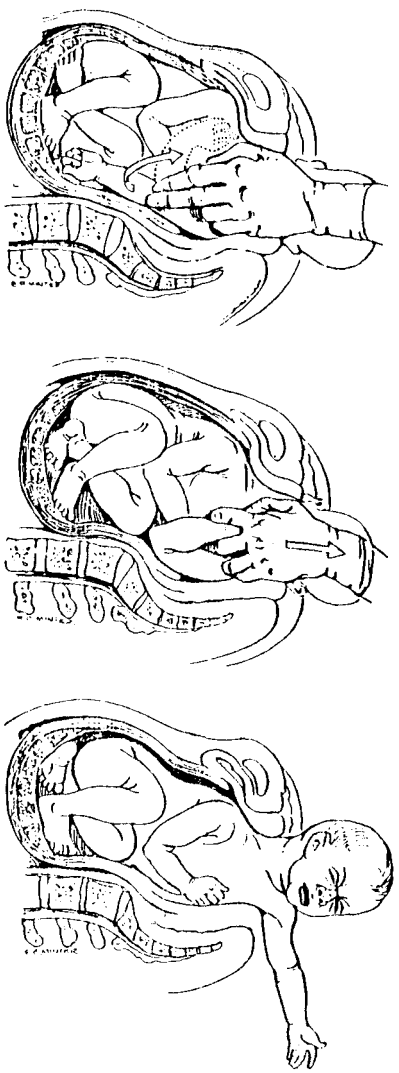


FIGURE 30-3 Delivery of the posterior shoulder.

Source: From Mazzanti, G. A. Delivery of the anterior shoulder: A neglected art. *Obstet. Gynecol.* 13(5):606, 1959. Reproduced by permission.

In doing this maneuver, resist any temptation to hook your fingers under the baby's axilla or into the armpit. This will not help you deliver the posterior shoulder as readily as the maneuver described and most likely will cause nerve plexus injury.

13. *Attempt to deliver the baby now by the combination of McRoberts, suprapubic pressure, and downward and outward pressure on the side of the baby's head* (see Step 8).

14. *If the baby has not delivered, rotate the baby's body 180°* (as described in Step 11). This will substitute the now delivered posterior shoulder for the anterior shoulder.

If the baby did not deliver after either Step 8 or Step 10, it will have delivered after Steps 11, 12 and 13, or 14 if the condition was a severe shoulder dystocia. In an exceptionally rare situation (which the majority of midwives will not see in an entire career), the baby will not have delivered and you then proceed to the next step.

15. *Traditionally the next step was to break the baby's clavicle*, and for some it may still be the next step. The danger, however, in breaking the clavicle is the possibility of puncturing the underlying lung with the broken ends of the bone and causing pneumothorax or of injuring the subclavian vessels. The anterior clavicle is broken first in order to collapse the anterior shoulder and dislodge it from behind the symphysis pubis.

16. *For other practitioners the next step is to use the Zavanelli maneuver to replace the head back into the vagina followed by delivery of the baby by cesarean section* (see Figure 30-4). To

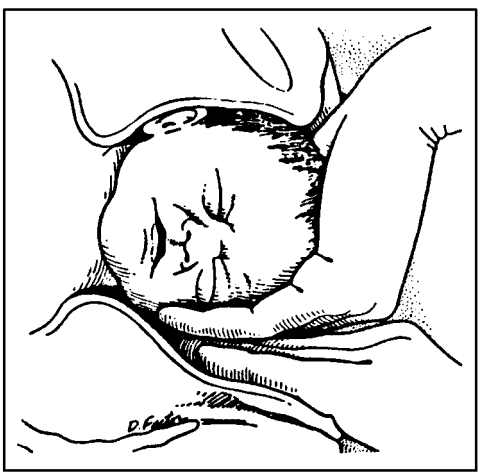


FIGURE 30-4 Zavanelli maneuver.

Source: From O'Leary, J. A., and Gunn, D. L. Option for shoulder dystocia—cephalic replacement. *Contemp. OB/GYN* 157–159 (January) 1986. Reproduced by permission.

replace the head, reverse the mechanisms of labor and depress the posterior vaginal wall while supporting the head [13]. While the Zavanelli maneuver has been successful in a number of desperate cases [14], it is not always easy to perform and there have been cases in which the maneuver failed and symphysiotomy was necessary [15, 16].

The Zavanelli maneuver is a final option, unless you found an obstructive tumor on vaginal examination in Step 9c. In such a situation you would go directly to the Zavanelli maneuver, as it is not possible to deliver the baby vaginally.

For snug shoulders, an alternative management method has been used with success [17, 18]. With this approach, you first turn the woman completely over on her side with her back at a right angle toward you. If delivery does not readily occur in the side-lying position, help the woman into a hands-knees position. The posterior shoulder, which is now uppermost, should deliver readily.

However, it is difficult to ascertain at the beginning of a shoulder dystocia situation just how severe the problem is or even if it is a case of shoulder dystocia or of snug shoulders. The hands-knees methodology will often work for cases of snug shoulders, but it will not always work for a case of real shoulder dystocia. Problems with the hands-knees position in the presence of shoulder dystocia include the following:

1. You are unable to use suprapubic pressure. If you try suprapubic pressure when the woman is in the hands-knees position you lose force and power as you try to exert pressure upward.
2. Gravity works against you with the hands-knees position. Remember the anterior shoulder is wedged above the symphysis pubis; thus, having the woman adopt a hands-knees position causes the contents of the abdomen to hang down above the symphysis pubis, which only exaggerates the situation.
3. Unless the woman is already in the hands-knees position, you may waste precious time if you go through the process of getting her into the hands-knees position only to be unable to deliver the baby when she is in that position and have to reposition her in order to do the steps listed above for management of shoulder dystocia. It is easier to get a woman into the hands-knees position when she is on a large bed or on the floor. It is more difficult and time consuming to get a woman into the hands-knees position if she has had an epidural. Since the methodology presented for management of shoulder dystocia (Steps 1 through 16) will work for both snug shoulders and shoulder dystocia, it should be the method used in all cases unless the woman is already in the hands-knees position for giving birth. In such an event the hands-knees position for delivery of the shoulders can be tried first.

Delivery of an Infant with a Face Presentation

Many babies with face presentations begin labor in a brow presentation and convert to a face presentation during descent. The diagnosis of a face presentation is based on the following:

1. *Abdominal palpation (Leopold's third and fourth maneuvers)*: With hyperextension of the head, the occiput becomes the cephalic prominence, is easily palpable, and is located on the same side of the mother's abdomen as the hyperextended "hollowed" or arched back; the head may feel larger than you would anticipate as compared to a well-flexed head.
2. *Pelvic examination:* You may be unable to identify both fontanels clearly or may feel only the anterior fontanel if the baby is in a hyperextended presentation. With a brow presentation, you will feel the brow and possibly the anterior fontanel, but no other common identifying landmarks. In a face presentation, you will be able to feel the baby's eyes, nose, mouth, and chin, although initially the presenting part may feel soft and lumpy, similar to a breech presentation, rather than firm and smooth. On further examination and palpation, the landmarks of the face become evident. If the membranes are ruptured, the baby may even suck your finger as you approach the mouth.

Once you have diagnosed a face presentation, do not apply an internal electrode, as this device will damage the baby's face or may be inadvertently applied to an eyelid. You also need to be very careful with your vaginal examinations so as not to injure the baby's eyes.

In order to appropriately manage the delivery of a baby in a face presentation, you need to know the mechanisms of labor for this malpresentation, especially the mechanisms that vary from normal and the implications these have for the outcome. The mechanisms of labor for a face presentation are as follows:

1. *Extension:* The arbitrarily chosen point on the fetus used to determine the position in a face

presentation is the chin (mentum), which is palpable because the head is extended rather than flexed. Why some form of interference occurs in approximately 0.5 percent of all deliveries that causes the head to deflex is not understood. Whatever the reason, a fetus that was LOP or ROP, for example, converts, respectively, to RMA or LMA at the start of labor and enters the pelvis face first.

2. *Engagement:* Engagement takes place when the trachelobregmatic (submentalbregmatic) diameter (9.5 cm) has passed through the pelvic inlet. Approximately 70 percent of all face presentations engage as either mentum anterior or mentum transverse varieties. The remaining 30 percent engage as a posterior variety. The axis of the face (midchin to midbrow, bisecting the nose) is used as the fetal diameter in relation to the mother's pelvis in determining in which oblique diameter of the pelvis engagement takes place.
3. *Descent occurs throughout:* Further extension occurs when resistance is encountered and the brow and occiput are forced toward the back of the baby while the chin becomes the lowermost part of the presenting part and leads the way in descent through the mother's pelvis.
4. *Internal rotation:* Internal rotation usually occurs late in labor when descent enables the entire face to be well applied to the pelvic floor. Rotation of the chin is either anterior or posterior as follows:
   a. rotation of the chin anteriorly (Figure 30-5):
      45° for RMA and LMA to MA
      90° for RMT and LMT to MA
      135° for RMP and LMP to MA
   b. rotation of the chin posteriorly:
      45° for RMP and LMP to MP

   If the chin rotates posteriorly into a mentum posterior position, the mechanisms of labor cease at this point because the baby cannot deliver vaginally from this position (Figure 30-6). This is because the length of the neck of the fetus is only about half as long as the length of the sacrum. Therefore it is not possible for the chin to escape from the vaginal floor over the perineum, thereby allowing the remainder of the head to be born by flexion. The midwife must recognize this condition immediately before impaction of the head takes place with its extremely poor prognosis for the fetus. Delivery is by cesarean section by the physician.
5. *Birth of the head:* When the chin rotates to mentum anterior, birth of the head is by a double mechanism of extension followed by flexion. Extension is maintained until the chin is born by escaping beneath the symphysis pubis. The submental area beneath the chin impinges beneath the symphysis pubis and becomes the

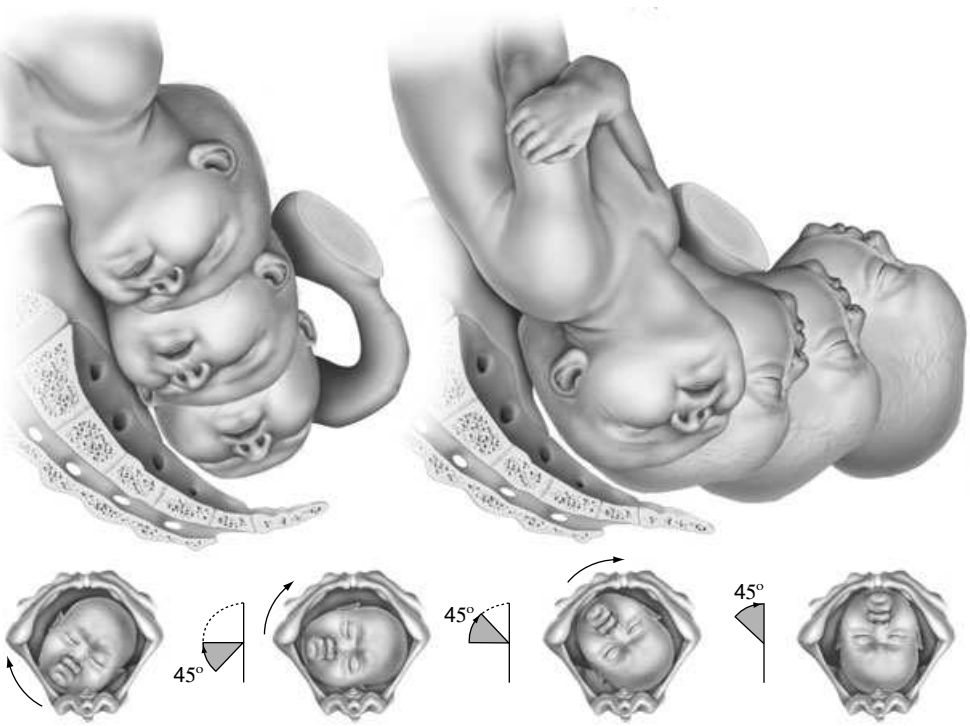


FIGURE 30-5 Mechanisms of labor for a baby in right mentoposterior position. Note engagement in ROP, descent throughout, internal rotation 135° to mentum anterior, and birth of the head first by extension and then by flexion.

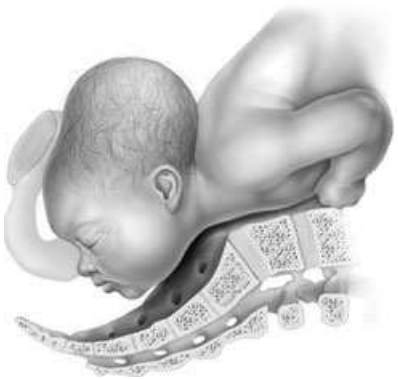


FIGURE 30-6 Face presentation with chin directly posterior (MP). Unless rotation to mentum anterior (MA) occurs, vaginal birth is not possible.

pivotal point for the delivery of the rest of the head by flexion. The rest of the head is born sequentially starting with the mouth, then the nose, eyes, brow, anterior fontanel, and posterior fontanel, and ending with the occiput as the head flexes.

6. *Restitution:* Restitution takes place 45° in the direction from which the head rotated during internal rotation. For example, if internal rotation was from RMT to MA, then restitution is 45° to the RMA (or LOP) position.
7. *External rotation:* External rotation takes place another 45° in the same direction as restitution, for example, to the RMT (or LOT) position.
8. *Birth of the shoulders and body:* This occurs by lateral flexion via the curve of Carus.

Management of a face presentation includes the following:

1. Recognize that the position is a face presentation and notify the consulting physician of this malpresentation.
2. Reevaluate the adequacy of the pelvis and consult with the physician if there is a question of possible cephalopelvic disproportion to rule out this condition.
3. Closely monitor the mechanism of labor of internal rotation. The midwife must immediately inform the physician if rotation is to a direct mentum posterior position.
4. For delivery of the head:
   a. It may be necessary to apply pressure on the fetal brow to maintain extension until the chin is born. This is done by pressing on the posterior end of the perineal body as the vulvovaginal orifice distends. You need to protect your gloved hand from contamination from the rectum during this maneuver by covering it with a towel.
   b. Control the head, thereby allowing the gradual flexion and birth of the remainder of the head. Most face presentations deliver spontaneously with little need for extensive hand maneuvers.
5. Delivery of the shoulders and body is the same as for other cephalic presentations.
6. Request that the pediatrician/neonatal nurse practitioner attend the delivery. If there is extensive edema of the neck (trachea), nose, and mouth, respiratory function may be compromised.
7. Reassure parents, family, and significant others that the position of the head and neck of the baby (neck extended, head fallen backwards), the long molded head, and the extensive swelling and distortion of the features of the face normally improve noticeably in a day or two and completely disappear in a few days.

Delivery of an Infant with a Breech Presentation

The findings of an international study comparing planned vaginal delivery with planned cesarean section for breech presentation reported in 2000 [19, 20] led the American College of Obstetricians and Gynecologists to issue a Committee Report stating that: "Patients with persistent breech presentation at term in a singleton gestation should undergo planned cesarean delivery" [21]. The multicenter randomized controlled trial demonstrated a significant reduction in perinatal mortality, neonatal mortality, or serious neonatal morbidity with the planned cesarean section group and no difference between the two groups in maternal mortality or serious maternal morbidity. A 2001 Cochrane Review of randomized trials comparing planned cesarean section with planned vaginal delivery for breech presentation affirmed "greatly reduced" perinatal and neonatal mortality and neonatal morbidity but found a modestly increased maternal morbidity [22]. Emphasis is now being placed on the reduction of breech presentation in term singleton gestations by external cephalic version with research focusing on how to improve the success rate, primarily with tocolytic agents [20, 23, 24].

Although there will inevitably be a reduction in the numbers of women at term with breech presentation and a reduction in the number of vaginal deliveries of those who have a breech presentation at term, there are still times when a midwife might be

confronted with delivery of a breech presentation. These times include those women with no prenatal care who present in late active labor, those women who make an informed choice for vaginal delivery, and those women for whom the second twin is in a nonvertex presentation [21].

The midwife must know how to manage the delivery of a baby with a breech presentation because chances are that someday an unexpected or emergency situation will arise, even in a medical center, where a woman with a breech presentation may be an object of competition among obstetric residents for teaching and learning purposes.

An emergency breech delivery should not be caused by lack of a diagnosis by a midwife caring for the woman during the antepartal period or during labor. Expected and planned for delivery of a breech presentation by a midwife should always involve close collaboration with, and immediate availability of, the consulting physician. This is essential because of the potential problems in breech delivery: difficulty in delivery of the aftercoming head and need for extensive resuscitation measures for the newborn.

The midwife facilitates the mechanisms of labor of a breech presentation, follows the principle of nonintervention as long as progress is visible, and does manual extraction manipulations as indicated. Inasmuch as there is a direct relationship between the mechanisms of labor and the hand maneuvers for delivery of a breech, these are presented side by side in Table 30-1. The table presents

TABLE 30-1 Correlation of Mechanisms of Labor and Hand Maneuvers for Delivery of a Breech Presentation

Mechanism of Labor	Hand Maneuvers
1. Descent occurs throughout. **2.** Engagement of the hips takes place in an RSA position with the sacrum in the left anterior portion of the mother's pelvis and the bitrochanteric diameter in the right oblique diameter of the mother's pelvis.	**1, 2, 3.** Normally you will not need to intervene in the first three mechanisms of labor. In the event that the breech does not descend, cephalopelvic disproportion and hydrocephalus must be ruled out. It is possible, however, that failure to descend may be due to a splinting effect caused when it is a frank breech and the extension of the legs across the baby's abdomen prevents the fetus from maneuvering and arrests progress. In such an event, use of the Pinard maneuver will break up the breech and enable you to bring down the feet and legs, thereby changing a frank breech presentation to a footling breech presentation. This is done as follows (see Figure 30-7):

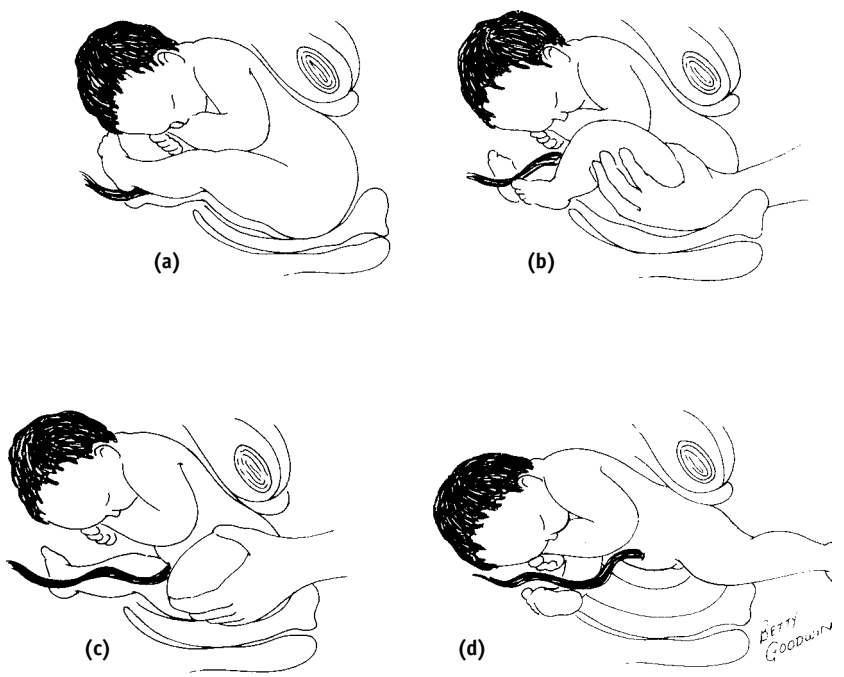


FIGURE 30-7 Pinard maneuver. (a) frank breech; (b) leg abducted and flexed at knee by pressing in popliteal fossa; (c) foot and leg are brought down and delivered; (d) procedure is repeated for other leg and foot.

TABLE 30-1 Correlation of Mechanisms of Labor and Hand Maneuvers for Delivery of a Breech Presentation (*continued*)

Mechanism of Labor	Hand Maneuvers
3. Internal rotation of the buttocks 45° from RSA to RST. This brings the anterior hip, which descended more rapidly than the posterior hip and initiated internal rotation when it encountered resistance from the pelvic floor, 45° forward (anterior) to underneath the pubic arch. The bitrochanteric diameter is now in the anteroposterior diameter of the mother's pelvis.	**a.** With your vaginal hand (left hand if the baby is in a left sacrum position, right hand if the baby is in a right sacrum position) follow the posterior side of a thigh up from the buttocks to the popliteal fossa behind the knee. Your thumb will be on the anterior side of the thigh. **b.** Move the leg laterally away from the midline and the baby's body while pressing in the popliteal fossa. This will cause the leg to flex at the knee, thereby bringing the foot, which was at the level of the baby's face and out of reach, down to where you can grasp it. **c.** Bring the leg down by drawing it across the baby's abdomen in its natural range of motion and down for its delivery. **d.** Repeat for the other thigh, leg, and foot.
4. Birth of the buttocks by lateral flexion. When born spontaneously, the posterior hip is born first; the anterior hip impinges beneath the symphysis pubis and serves as the pivoting point for the lateral flexion necessary for the posterior hip to follow the curve of Carus to birth. The baby's body then straightens out as the anterior hip is born. The legs and feet usually follow the birth of the breech and are also born spontaneously.	**4.** You should deliberately avoid using any hand maneuvers at this point—keep your hands off the baby. The one exception is if the baby is in a frank breech presentation and the extended legs prevent the necessary lateral flexion for birth of the buttocks. In such an event, the Pinard maneuver is used for delivery of the feet and legs and then the buttocks. The legs and feet may not be born spontaneously if it is a frank breech presentation. In such an event, the Pinard maneuver will cause delivery of the legs and feet. Because 70 percent of breech deliveries are frank breech presentations, it is important to know how to do Pinard's maneuver inasmuch as it is the solution for three possible times of arrest during descent and delivery of the buttocks. However, prior to using this maneuver to deliver the buttocks, legs, and feet (i.e., during descent), you must clearly rule out cephalopelvic disproportion.
5. (a) External rotation of the buttocks 45° from RST to RSA and (b) engagement of the shoulders with the bisacromial diameter in the right oblique diameter of the mother's pelvis (the same as for engagement of the buttocks). These two mechanisms occur simultaneously, with the external rotation of the buttocks being visible evidence of the entry of the shoulders into the true pelvis as the body untwists and aligns itself with the descending shoulders. Descent of the shoulders after their engagement is rapid.	**5.** Continue a hands-off approach. The rationale for this management is as follows: **a.** There is no need to facilitate the progress of the mechanisms of labor until the baby is born up to the umbilicus. After that, the remainder of the baby needs to be born in 3 to 5 minutes to avoid any anoxia from compression of the umbilical cord against the pelvic brim with resulting possible brain damage. **b.** Traction exerted on the baby prior to birth up to the umbilicus may cause (1) the arms to fly up in a reflex action, thereby extending them above, over, or behind the head and causing later difficulties in the delivery, and/or (2) the head to deflex, which may cause dangerous problems with birth of the head. **c.** Natural progress using the bulk of the breech maintains cervical dilatation and lessens the possibility that the cervix may clamp around the baby's head or neck. It is a good time to request a warm towel to use next. When the baby is born up to the umbilicus you do two things: **d.** Pull down a good-sized loop of umbilical cord to prevent stress on its insertion in the umbilicus during the rest of the delivery. **e.** Place the warm towel around the baby from just below the umbilicus down. This helps keep the baby warm and gives you a nonslippery hold on the baby, which is essential both for safety and to allow you to exert the traction now needed.

TABLE 30-1 Correlation of Mechanisms of Labor and Hand Maneuvers for Delivery of a Breech Presentation (*continued*)

Mechanism of Labor	Hand Maneuvers
6. Internal rotation of the shoulders 45°, bringing the bisacromial diameter of the fetus from the right oblique diameter to the anteroposterior diameter of the mother's pelvis. This is evidenced externally when the delivered body also rotates and the sacrum returns to an RST position from an RSA position.	**6.** After birth of the umbilicus, you exert downward and outward traction while facilitating internal rotation of the shoulders by rotating the body so the sacrum again rotates from RSA to RST. To do this safely without injury to internal organs or structures (e.g., kidneys, adrenal glands) resulting from the pressure you apply in order to exert traction, the placement of your hands on bone is vitally important. **a.** Grasp the baby on its hips with your thumbs on either sacroiliac region and your fingers on the corresponding iliac crests (see Figure 30-8). **b.** Continue this traction until you can see not only the lower half of the scapula of the anterior shoulder but *also its corresponding axilla*.
7. Birth of the shoulders by lateral flexion. When born spontaneously, the anterior shoulder impinges beneath the symphysis pubis and serves as the pivotal point for the lateral flexion necessary for delivery of the posterior shoulder via the curve of Carus. Birth of the anterior shoulder then follows as the body straightens out.	**7.** It does not matter which shoulder is delivered first. The following methodology is in accord with the mechanisms of labor: **a.** Grasp the feet of the baby in one hand with your index finger between the legs and your middle finger and thumb each encircling a leg (see Figure 30-9[a]). **b.** Holding the baby by its feet, exert upward traction for the entire body and draw the baby's abdomen toward the mother's inner thigh. Be careful to keep the back from turning upward so that the head will enter the pelvis in the transverse diameter.

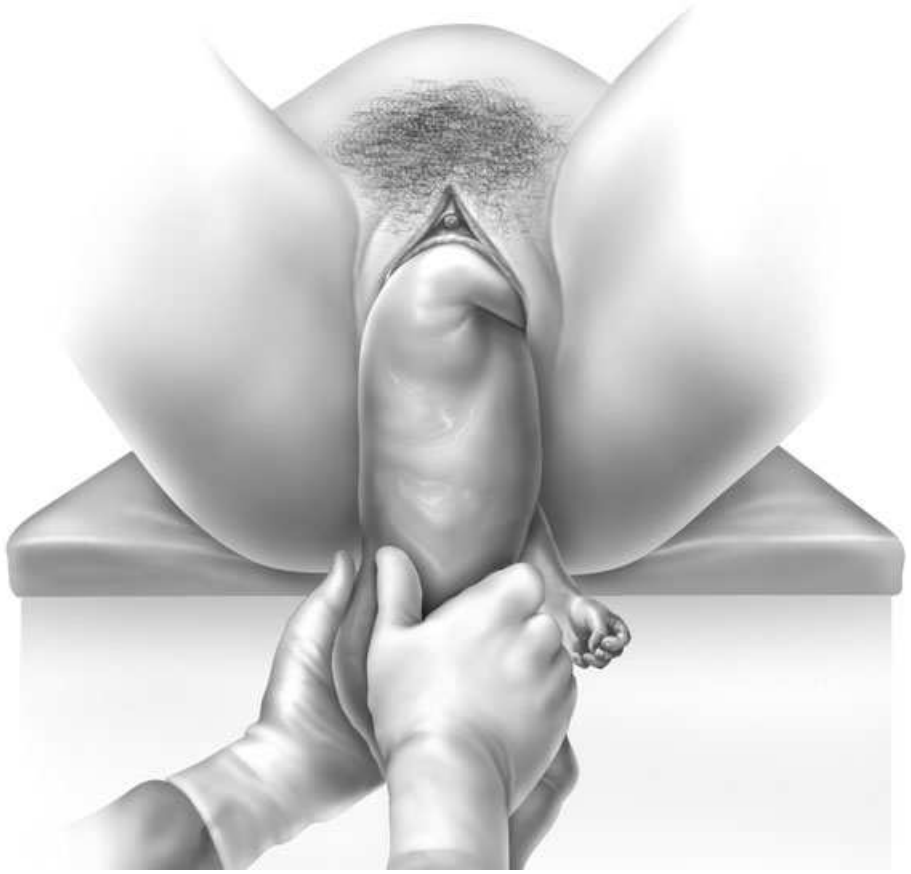


FIGURE 30-8 Breech presentation. Birth of the anterior shoulder by downward traction. Note placement of hands on the baby's hips (Step 6).

TABLE 30-1 Correlation of Mechanisms of Labor and Hand Maneuvers for Delivery of a Breech Presentation (*continued*)

Mechanism of Labor	Hand Maneuvers
	c. This draws the posterior shoulder over the perineum to birth, followed by the arm and hand of the same side. **d.** If necessary, such as when the arm has become extended, deliver the arm first, as follows: **(1)** Insert the fingers of your vaginal hand (in this instance of the baby's sacrum being to the right, you would be holding the baby's feet with your right hand and your left hand would be the vaginal hand) and follow the humerus of the posterior arm until you feel the elbow. **(2)** Use these fingers now as a splint for the arm and sweep it across the baby's chest downward to delivery. (See Figure 30-9[b].) **e.** Now exert downward traction on the baby for delivery of the anterior shoulder, arm, and hand. To exert this downward traction, again place your hands on the baby's hips as you did in Step 6 (see Figure 30-8). **f.** Again, if necessary, such as when the arm has become extended, deliver the arm first, as described in Step 7d. **g.** If there is a nuchal arm (the arm is entended from the shoulder but flexed at the elbow so that the lower arm is wedged behind the head), attempts to deliver it the same way as for extended arms as in Steps 7d and 7f will not work. Delivery of a nuchal arm is as follows: **(1)** Grasp the baby by placing your hands on the baby's hips as you did for Step 6.

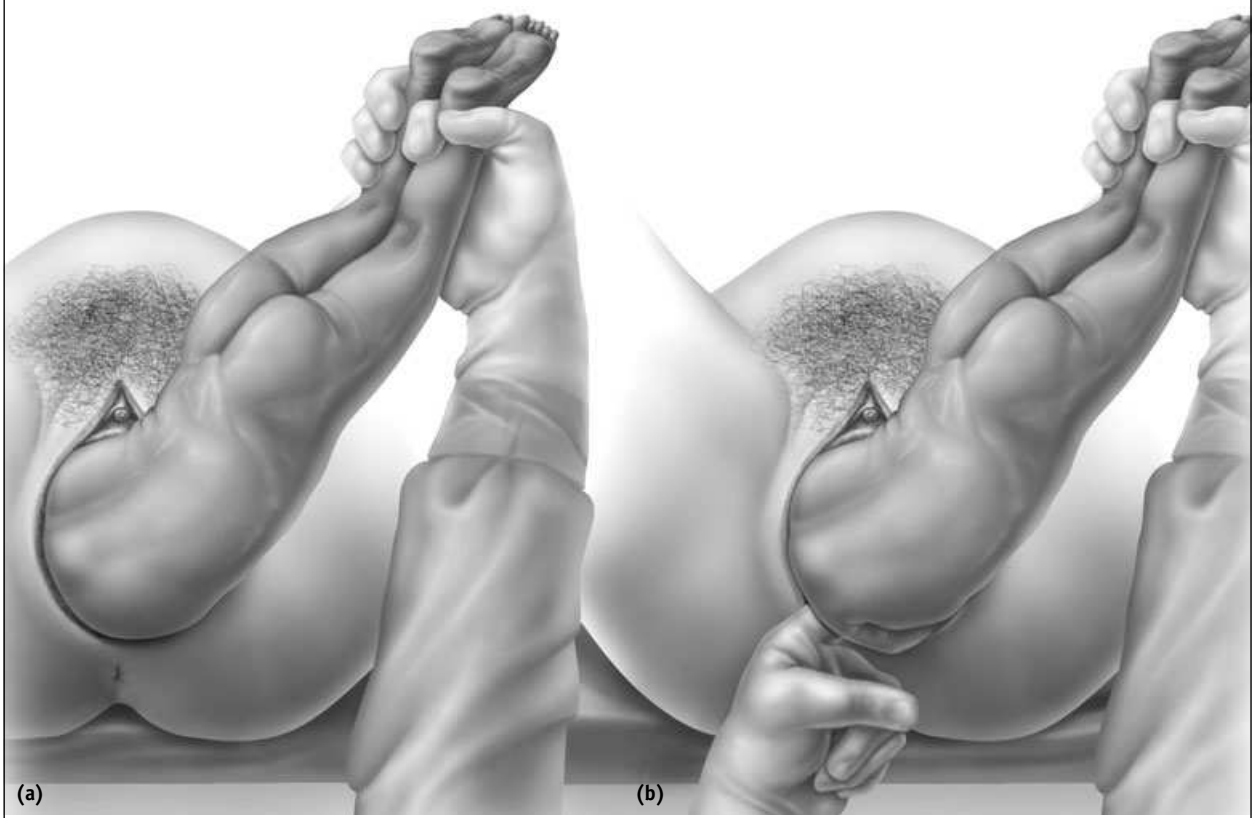


FIGURE 30-9 Breech presentation: (a) birth of the posterior shoulder by upward traction; (b) freeing the posterior arm.

TABLE 30-1 Correlation of Mechanisms of Labor and Hand Maneuvers for Delivery of a Breech Presentation (*continued*)

Mechanism of Labor	Hand Maneuvers
	(2) Rotate the baby's body 90–180° in the direction in which the hand behind the head is pointing until the arm is dislodged from behind the head. This is accomplished by the friction of the body rotating against the vaginal outlet in a direction that forces the elbow toward the face and places the arm in a position from which it can now be delivered. **(3)** Deliver the arm as for an extended arm as described in Step 7d. **(4)** If both arms are nuchal arms, then repeat this process for the other arm, rotating the baby in the direction indicated, after delivery of the first arm. **h.** If all else fails (a rare circumstance), break the arm by hooking a finger over it and pulling on it. Such trauma is indicated when weighed against the baby's life. Such a fracture usually heals well without deformity.
8. Engagement of the head takes place with the sagittal suture in either the transverse or left oblique diameter of the mother's pelvis and the occiput in the right side of the pelvis. The head enters the pelvis as the shoulders near the outlet and may engage prior to or after internal rotation of the shoulders—which explains why engagement is in either the transverse or oblique diameter of the pelvic inlet.	**8.** Suprapubic pressure should be applied to maintain the normal flexion of the baby's head. You need to request that someone else apply the pressure because your hands are well occupied with delivery of the shoulders. Suprapubic pressure is continued until the head is born.
9. Internal rotation of the head 45° or 90°, bringing the sagittal suture from the left oblique or transverse diameter, respectively, into the anteroposterior diameter of the mother's pelvis with the occiput directly anterior and the brow in the hollow of the sacrum of the mother's pelvis. This rotation is evidenced externally because the delivered body also rotates, thereby bringing the bisacromial diameter of the shoulders into the horizontal plane of the mother and the sacrum into a direct anterior position (i.e., the back of the baby is upward and the baby is facing down).	**9.** Facilitate rotation of the head to an occiput anterior position: **a.** Grasp the baby by placing your hands on the baby's hips as you did for Step 6. **b.** Monitor the rotation of the head by observing the external rotation of the body. **c.** *Do not allow the head to rotate to an occiput posterior position* as evidenced by rotation of the back posteriorly. If this rare event should begin to occur, counteract by rotating the baby so its back is anterior. Rotation of the head posteriorly so that the occiput is posterior and the chin is facing the symphysis pubis makes delivery of the head extremely difficult and dangerous. Fortunately this posterior rotation is quite rare.
10. Birth of the head by flexion.	**10.** It is vital to keep the head flexed at this time by continuing suprapubic pressure and by using the Mauriceau-Smellie-Veit maneuver. This maneuver is performed as follows (see Figure 30-10): **a.** One hand is introduced into the vagina palmar side up beneath the baby's face. **(1)** Place the index finger of this hand in the baby's mouth and press the back of the finger against the maxilla (upper jaw bone), i.e., against the roof of the mouth. **(2)** This finger is used to help keep the head in flexion and should never be used for traction.

TABLE 30-1 Correlation of Mechanisms of Labor and Hand Maneuvers for Delivery of a Breech Presentation (*continued*)

Mechanism of Labor	Hand Maneuvers
	(3) Take care not to allow the finger to slip and apply pressure and/or traction against the mandible (lower jaw bone) and the base of the tongue, as this could cause serious injury. **(4)** Use the rest of this hand to support the body of the baby, which is positioned astride your arm. **b.** Your other hand is placed on the baby's upper back with your index finger hooked over one shoulder on one side of the neck and your middle finger hooked over the other shoulder on the other side of the neck. **(1)** This hand will be used for exerting traction. **(2)** Place your hooking fingers as far as possible away from the neck to avoid pressure on the cervical or brachial nerve plexuses. **(3)** Grasp the shoulders with your thumb and remaining fingers. **c.** Modifications of the Mauriceau-Smellie-Veit maneuver include the following [25, 26]: **(1)** Placement of the index and fourth fingers of the lower hand on the upper jaw (malar bones) on either side of the nose with the middle finger in the baby's mouth. Another alternative is to put the index and fourth finger on the infraorbital ridge and the middle finger in the mouth, but you must be *extremely* careful not to misplace your fingers and damage the baby's eyes. These modifications allow you to exert traction with your lower hand.

FIGURE 30-10 Breech presentation. Birth of the head using the Mauriceau-Smellie-Veit maneuver and suprapubic pressure.

TABLE 30-1 Correlation of Mechanisms of Labor and Hand Maneuvers for Delivery of a Breech Presentation (*continued*)

Mechanism of Labor	Hand Maneuvers
	(2) Extension of one or two fingers (index or index and middle fingers) of the upper hand up the back of the baby's neck under the symphysis pubis and up the occiput, thereby splinting the baby's neck, keeping the head from extending, and facilitating flexion.
	d. Apply downward and outward traction with your hand on the baby's shoulders until you can see the suboccipital region (hair line) under the symphysis pubis.
	e. Now apply upward traction while elevating the body of the baby so that the chin, mouth, nose, eyes, brow, anterior fontanel, posterior fontanel, and occiput follow the curve of Carus and are born in sequence as the head remains flexed for birth.
	f. Birth of the head is controlled by the pressure of your hands. If this step proceeds too fast and the head pops out, intracranial damage may result; and if it is too slow, hypoxia becomes a concern.

maneuvers for a fetus in a specific position; that is, the position of the fetus upon entry of the buttocks into the pelvis is RSA (right sacrum anterior). The arbitrarily chosen point on the fetus for determining position in breech presentations is the sacrum. The fetal diameter used to determine the relationship of the baby to the diameter of the mother's pelvis is the bitrochanteric diameter at the upper ends of the femurs as measured at the level of the hip joint (acetabulum). It helps to visualize the mechanisms of labor if you remember that they *are in sequence for birth of the buttocks, birth of the shoulders, and birth of the head*, in that order.

Before the actual delivery begins, the following should have taken place:

1. Careful abdominal examination or, if necessary, sonography or x-ray to rule out hyperextension of the head, hydrocephalus, or a footling or kneeling breech.
2. Complete cervical dilatation.
3. Elimination of any question about the adequacy of the pelvis.
4. Emptying of the bladder.
5. Cutting of an episiotomy if you determine the need for one. Whether the woman needs an episiotomy depends on the estimated fetal weight and the relaxation of the perineum. If an episiotomy is to be performed, provide local anesthesia and choose the type of incision that will give you the most room for manipulative maneuvers. You can cut an episiotomy at any time during the delivery, even after the buttocks are delivered, if you determine the need for additional room to complete the birth.
6. Determination of an effective maternal pushing effort.
7. Preparations for a full-scale newborn resuscitation effort.
8. The woman should be positioned so there is plenty of room for lateral flexion and downward traction—that is, she should be in the lithotomy position either in stirrups or at the edge of a bed.
9. Your consulting physician should have been notified and should either be present or immediately available.

If this is an in-hospital emergency situation in which you are delivering a woman you have not seen before and have not previously had time to examine, your first action should be to inform the attending nursing staff of the situation and request that in addition to a *STAT* call being placed for the consulting physician, an anesthesiologist or nurse anesthetist and a pediatrician or neonatal clinical nurse specialist or practitioner should also be called to stand by in case they are needed.

Delivery of a Woman with Multiple Gestation

The midwife should manage the labor and delivery of a woman with multiple gestation only in the hospital in collaboration with a consulting obstetrician so that the midwife can be assured of the obstetrician's presence for help with the potential problems of neonatal resuscitation, prematurity (higher inci-

dence in multiple gestation), immediate postpartal hemorrhage (resulting from an overdistended uterus), malpresentation of the second twin (higher incidence of malpresentations in multiple gestation), delay in resumption of labor for delivery of the second twin, or the need for cesarean section such as with locked twins. Even if not in a practice where the midwife manages the birth of twins collaboratively with a consulting obstetrician, the midwife may at some point during her or his career be confronted with an emergency delivery of multiple-gestation infants. This situation should not arise because of the midwife's failure to diagnose multiple gestation while caring for the woman during the antepartal period. In the event of an emergency, the midwife must know what to do to effect safe delivery of all viable fetuses.

This discussion will be limited to the planned collaborative delivery of twins; the process is repeated for however many fetuses there are. Following are the cardinal rules and essential steps for assisting the labor and delivery of a woman with multiple gestation:

1. Medication during labor should be limited to ataractics (e.g., Vistaril) because of the gestation and size of the fetuses. They are often preterm or small-for-gestational-age. Either condition makes medication (analgesics and sedatives) hazardous for them.
2. The woman should have a patent IV, and a type, antibody screen, and crossmatch drawn.
3. The woman's bladder should be empty at the start of the actual delivery.
4. The consulting obstetrician should be notified and present at the start of the actual delivery.
5. Anesthesia personnel should be notified and on standby.
6. The pediatrician should be notified and present. There should be at least one person per baby present who is skilled in newborn resuscitation.
7. The woman should be in lithotomy position to allow plenty of room for manipulations.
8. Nursing personnel should be alerted as far in advance as possible because they must prepare multiples of equipment, supplies, forms, and so forth.
9. Preparation for full-scale resuscitation should be completed at the start of the actual delivery.
10. Nursing personnel should be alerted to the probability of an immediate postpartum hemorrhage.
11. Whether the woman requires an episiotomy depends on the estimated fetal weights, the anticipated need for manipulation if there are fetal malpresentations, and the relaxation of the perineum. If an episiotomy is to be performed, choose the type of incision that will give you the most room for manipulative maneuvers and, in the event of small size or prematurity, will reduce the possibility of intracranial damage. You can cut an episiotomy at any time during the delivery, for example, after the first twin is born and during the delivery of the second twin, if necessary.
12. The presentation and position of all babies should be known prior to the start of the actual delivery.
13. The first twin is delivered in accord with its presentation and position.
14. Have an assistant direct the second twin into position abdominally as you deliver the first twin.
15. Quickly and securely clamp and cut the cord. There must be no delay in this action because whether these are monozygotic twins most likely will not have been diagnosed prior to delivery. The second twin may exsanguinate by bleeding through the cord if they are. Monozygotic (single-ovum) twins usually have one placenta, one chorion, and two amnions (Figure 30-11).
16. Determine the presentation and position of the second twin and evaluate the size of this baby. Ultrasound guidance is helpful.
17. The fetal heart should be closely monitored and the vagina constantly scrutinized for any sign of bleeding (indicates placental separation) while waiting for labor to resume. As long as there is no bleeding or evidence of fetal distress, haste is not indicated. This does not mean, however, that you are not doing anything. The optimum time for the second twin to be born is between 3 and 15 minutes after delivery of the first twin, which allows the baby to come through the just fully dilated cervix before it starts to close again. Also, you wish to deliver the second twin before the placenta starts to separate, a condition that demands quick action in order to obtain a viable second baby.
18. Whether or not labor resumes within this period of time, the presenting part is guided into the true pelvis by a combination of abdominal pressure and vaginal manipulations. Care is first taken to rule out a presenting umbilical cord.
19. Once the presenting part is fixed into the pelvis, rupture the membranes. Leave your hand in the vagina to ascertain whether the cord has pro-

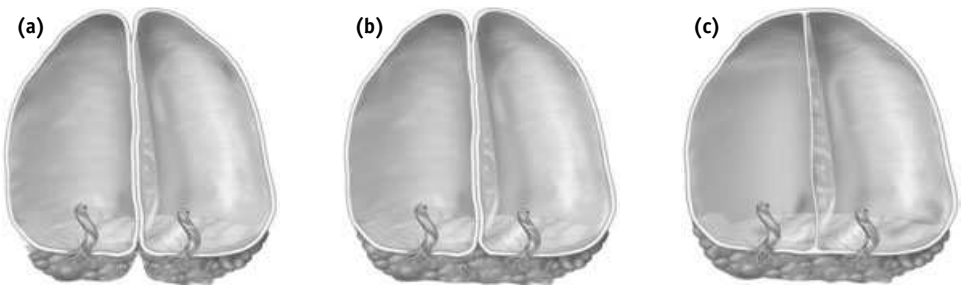


FIGURE 30-11 Membranes and placenta in twin pregnancies. (a) two amnions, two chorions, and two placentas: either dizygotic or monozygotic twins (zygotic division occurred within the first three days after fertilization); (b) same as (a) except the two placentas fused into one placenta; (c) two amnions, one chorion, and one placenta: monozygotic twins (zygotic division occurred between the fourth and eighth days after fertilization).

lapsed. There is less chance of a prolapsed cord if the membranes are ruptured with no pressure (contractions or fundal) behind them and if they are leaked rather than torn. If labor has not resumed up to this point, rupturing the membranes may stimulate contractions to resume.

20. If contractions still have not resumed, an intravenous solution of 1000 mL D_5W or D_5RL with 10 IU of Pitocin should be hung and started at a slow drip (approximately 30 mU/min).
21. Delivery is conducted as usual.
22. Third stage hemorrhage or immediate postpartum hemorrhage is likely. (See Chapters 32 and 34 for management of these emergencies.)

References

1. Spong, C. Y., Beall, M., Rodrigues, D., and Ross, M. G. An objective definition of shoulder dystocia: prolonged head-to-body delivery intervals and/or the use of ancillary obstetric maneuvers. *Obstet. Gynecol.* 86(3):433–436 (September) 1995.
2. Gherman, R. B., and Goodwin, T. M. Shoulder dystocia. *Curr. Opinion Obstet. Gynecol.* 10(6):459–463 (December) 1998.
3. Morris, W. I. C. Report of societies. *J. Obstet. Gynaecol. Br. Empire* 62:302, 1955.
4. Baskett, T. F. Shoulder dystocia. *Best Pract. Res. Clin. Obstet. Gynaecol.* 16(1):57–68, 2002.
5. McFarland, M. B., Langer, O., Piper, J. M., and Berkus, M. D. Perinatal outcome and the type and number of maneuvers in shoulder dystocia. *Int. J. Gynecol. Obstet.* 55:219–224, 1996.
6. Jennett, R. J., and Tarby, T. J. Brachial plexus palsy: an old problem revisited again. Part 2: Cases in point. *Am. J. Obstet. Gynecol.* 176(6):1354–1356 (June) 1997.
7. Kees, S., Margalit, V., Schiff, E., Mashiach, S., and Carp, H. J. Features of shoulder dystocia in a busy obstetric unit. *J. Reprod. Med.* 46(6):583–588 (June) 2001.
8. Sosman, L. *Verification of Varney's Predisposing Factor for Shoulder Dystocia.* Master's thesis. New Haven, CT: Yale University School of Nursing, 1989.
9. Benedetti, T. J., and Gabbe, S. G. Shoulder dystocia: a complication of fetal macrosomia and prolonged second stage of labor with midpelvic delivery. *Obstet. Gynecol.* 52(5):526–529 (November) 1978.
10. Gherman, R. B., Goodwin, T. M., Souter, I., Neumann, K., Ouzounian, J. G., and Paul, R. H. The McRoberts' maneuver for the alleviation of shoulder dystocia: how successful is it? *Am. J. Obstet. Gynecol.* 176(3):656–661 (March) 1997.
11. Gonik, B., Stringer, C. A., and Held, B. An alternate maneuver for management of shoulder dystocia. *Am. J. Obstet. Gynecol.* 145(7):882–884 (April 1) 1983.
12. Piper, D. M., and McDonald, P. Management of anticipated and actual shoulder dystocia: interpreting the literature. *J. Nurse-Midwifery* 39(2 suppl.):91S–105S (March/April) 1994.
13. Sandberg, E. C. The Zavanelli maneuver: a potentially revolutionary method for the resolution of shoulder dystocia. *Am. J. Obstet. Gynecol.* 152(4):479–484 (June 15) 1985.
14. Sandberg, E. C. The Zavanelli maneuver: 12 years of recorded experience. *Obstet. Gynecol.* 93(2):312–317 (February) 1999.

15. Vollebergh, J. H. A., and van Dongen, P. W. J. The Zavanelli manoeuvre in shoulder dystocia: case report and review of published cases. *Eur. J. Obstet. Gynecol. Reprod. Biol.* 89:81–84, 2000.
16. Goodwin, T. M., Banks, E., Millar, L. K., and Phelan, J. P. Catastrophic shoulder dystocia and emergency symphysiotomy. *Am. J. Obstet. Gynecol.* 177(2):463–464 (August) 1997.
17. Meenan, A. L., Gaskin, I. M., Hunt, P., and Ball, C. A. A new (old) maneuver for the management of shoulder dystocia. *J. Fam. Pract.* 32:625–629, 1991.
18. Bruner, J. P., Drummond, S. B., Meenan, A. L., and Gaskin, I. M. All-fours maneuver for reducing shoulder dystocia during labor. *J. Reprod. Med.* 43:439–443, 1998.
19. Hannah, M. E., Hannah, W. J., Hewson, S. A., Hodnett, E. D., Saigal, S., and Willan, A. R. Planned caesarean section versus planned vaginal birth for breech presentation at term: a randomised multicentre trial. *Lancet* 356(9239):1375–1383 (October 21) 2000.
20. Young, P. F., and Johanson, R. B. The management of breech presentation at term. *Curr. Opinion Obstet. Gynecol.* 13(6):589–593 (December) 2001.
21. American College of Obstetricians and Gynecologists. Mode of term single breech delivery. ACOG Committee Opinion No. 265. *Obstet. Gynecol.* 98(6):1189–1190 (December) 2001.
22. Hofmeyr. G. J., and Hannah, M. E. Planned caesarean section for term breech delivery (Cochrane Review). In *The Cochrane Library*, Issue 2. Oxford, England: Update Software, 2002.
23. Hofmeyr, G. J., and Kulier, R. External cephalic version for breech presentation at term (Cochrane Review). In *The Cochrane Library*, Issue 2. Oxford, England: Update Software, 2002.
24. Hofmeyr, G. J. External cepahlic version for breech presentation before term (Cochrane Review). In *The Cochrane Library*, Issue 2. Oxford, England: Update Software, 2002.
25. Hoffman, J. B. A suggested modification for the delivery of the after-coming head in breech presentations. *Obstet. Gynecol.* 15(2):223–225 (February) 1960.
26. Myers, S. A. A new technique for flexion of the aftercoming head during breech delivery. *Am. J. Obstet. Gynecol.* 155(1):33–34 (July) 1986.

• • • Bibliography

Acker, D. B., Sachs, B. P., and Friedman, E. A. Risk factors for shoulder dystocia in the average-weight infant. *Obstet. Gynecol.* 67(5):614–618 (May) 1986.

American College of Obstetricians and Gynecologists. Mode of term single breech delivery. ACOG Committee Opinion No. 265. *Obstet. Gynecol.* 98(6):1189–1190 (December) 2001.

Barnum, C. G. Dystocia due to the shoulders. *Am. J. Obstet. Gynecol.* 50:439–442, 1945.

Barrett, J. F. R., and Ritchie, W. K. Twin delivery. *Best Pract. Res. Clin. Obstet. Gynaecol.* 16(1):43–56, 2002.

Baskett, T. F. Shoulder dystocia. *Best Pract. Res. Clin. Obstet. Gynaecol.* 16(1):57–68, 2002.

Benedetti, T. J. Dystocia: Causes, consequences, correct response. *Contemp. OB/GYN* 36:37 (October) 1991.

Benedetti, T. J. Shoulder dystocia. *Contemp. OB/GYN* 40(3):39–43 (March) 1995.

Benedetti, T. J., and Gabbe, S. G. Shoulder dystocia: a complication of fetal macrosomia and prolonged second stage of labor with midpelvic delivery. *Obstet. Gynecol.* 52(5):526–529 (November) 1978.

Bruner, J. P., Drummond, S. B., Meenan, A. L., and Gaskin, I. M. All-fours maneuver for reducing shoulder dystocia during labor. *J. Reprod. Med.* 43:439–443, 1998.

Chez, R. A., and Benedetti, T. J. How to manage shoulder dystocia during delivery. *Contemp. OB/GYN* 19:203–209 (February) 1982.

Cunningham, F. G., Gant, N. F., Leveno, K. J., et al. *Williams Obstetrics*, 21st ed. New York: McGraw-Hill, 2001.

Gabbe, S. G., Nieble, J. R., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2001.

Gherman, R. B., and Goodwin, T. M. Shoulder dystocia. *Curr. Opinion Obstet. Gynecol.* 10(6):459–463 (December) 1998.

Gherman, R. B., Goodwin, T. M., Souter, I., Neumann, K., Ouzounian, J. G., and Paul, R. H. The McRoberts' maneuver for the alleviation of shoulder dystocia: how successful is it? *Am. J. Obstet. Gynecol.* 176(3):656–661 (March) 1997.

Gonik, B., Stringer, C. A., and Held, B. An alternate maneuver for management of shoulder dystocia. *Am. J. Obstet. Gynecol.* 145(7):882–884 (April 1) 1983.

Goodwin, T. M., Banks, E., Millar, L. K., and Phelan, J. P. Catastrophic shoulder dystocia and emergency symphysiotomy. *Am. J. Obstet. Gynecol.* 177(2):463–464 (August) 1997.

Gross, S. J., Shime, J., and Farine, D. Shoulder dystocia: predictors and outcome. *Am. J. Obstet. Gynecol.* 156(2):334–336 (February) 1987.

Hannah, M. E., Hannah, W. J., Hewson, S. A., Hodnett, E. D., Saigal, S., and Willan, A. R. Planned caesarean section versus planned vaginal birth for breech presentation at term: a randomised multicentre trial. *Lancet* 356(9239):1375–1383 (October 21) 2000.

Harris, B. A., Jr. Shoulder dystocia. *Clin. Obstet. Gynecol.* 27(1):106–111 (March) 1984.

Hoffman, J. B. A suggested modification for the delivery of the after-coming head in breech presentations. *Obstet. Gynecol.* 15(2):223–225 (February) 1960.

Hofmeyr, G. J. External cepahlic version for breech presentation before term (Cochrane Review). In *The Cochrane Library*, Issue 2. Oxford, England: Update Software, 2002.

Hofmeyr. G. J., and Hannah, M. E. Planned caesarean section for term breech delivery (Cochrane Review). In *The Cochrane Library*, Issue 2. Oxford, England: Update Software, 2002.

Hofmeyr, G. J., and Kulier, R. External cephalic version for breech presentation at term (Cochrane Review). In *The Cochrane Library*, Issue 2. Oxford, England: Update Software, 2002.

Jennett, R. J., and Tarby, T. J. Brachial plexus palsy: an old problem revisited again. Part 2: Cases in point. *Am. J. Obstet. Gynecol.* 176(6):1354–1356 (June) 1997.

Kees, S., Margalit, V., Schiff, E., Mashiach, S., and Carp, H. J. Features of shoulder dystocia in a busy obstetric unit. *J. Reprod. Med.* 46(6):583–588 (June) 2001.

Kochenour, N. K., and Clark, S. L. Shoulder dystocia. *Contemp. OB/GYN* 9–12 (January) 1994.

Mazzanti, G. A. Delivery of the anterior shoulder: a neglected art. *Obstet. Gynecol.* 13(5):603–607 (May) 1959.

McFarland, M. B., Langer, O., Piper, J. M., and Berkus, M. D. Perinatal outcome and the type and number of maneuvers in shoulder dystocia. *Int. J. Gynecol. Obstet.* 55:219–224, 1996.

Meenan, A. L., Gaskin, I. M., Hunt, P., and Ball, C. A. A new (old) maneuver for the management of shoulder dystocia. *J. Fam. Pract.* 32:625–629, 1991.

Modanlou, H. D., et al. Large-for-gestational-age neonates: anthropometric reasons for shoulder dystocia. *Obstet. Gynecol.* 60(4):417–423 (October) 1982.

Morris, W. I. C. Report of societies. *J. Obstet. Gynaecol. Br. Empire* 62:302, 1955.

Myers, S. A. A new technique for flexion of the aftercoming head during breech delivery. *Am. J. Obstet. Gynecol.* 155(1):33–34 (July) 1986.

Nocon, J. J., McKenzie, D. K., Thomas, L. J., and Hansell, R. S. Shoulder dystocia: an analysis of risks and obstetric maneuvers. *Am. J. Obstet. Gynecol.* 168(6):1732–1739 (June) 1993.

O'Leary, J. A. Cephalic replacement for shoulder dystocia: present status and future role of the Zavanelli maneuver. *Obstet. Gynecol.* 82(5):847–850 (November) 1993.

O'Leary, J. A. *Shoulder Dystocia and Birth Injury.* New York: McGraw-Hill, 1992.

O'Leary, J. A., and Gunn, D. L. Option for shoulder dystocia—cephalic replacement. *Contemp. OB/GYN* 157–159 (January) 1986.

O'Leary, J. A., and Leonetti, H. B. Shoulder dystocia: prevention and treatment. *Am. J. Obstet. Gynecol.* 162(1):5–9 (January) 1990.

Piper, D. M., and McDonald, P. Management of anticipated and actual shoulder dystocia: interpreting the literature. *J. Nurse-Midwifery* 39(2 suppl.):91S–105S (March/April) 1994.

Rubin, A. Management of shoulder dystocia. *JAMA* 189(11):141–143 (September 14) 1969.

Sandberg, E. C. The Zavanelli maneuver: a potentially revolutionary method for the resolution of shoulder dystocia. *Am. J. Obstet. Gynecol.* 152(4):479–484 (June 15) 1985.

Sandberg, E. C. The Zavanelli maneuver extended: progression of a revolutionary concept. *Am. J. Obstet. Gynecol.* 158(6-1):1347–1353 (June) 1988.

Sandberg, E. C. The Zavanelli maneuver: 12 years of recorded experience. *Obstet. Gynecol.* 93(2):312–317 (February) 1999.

Smeltzer, J. S. Prevention and management of shoulder dystocia. *Clin. Obstet. Gynecol.* 29(2):229–308, 1986.

Sosman, L. *Verification of Varney's Predisposing Factor for Shoulder Dystocia*. Master's thesis. New Haven, CT: Yale University School of Nursing, 1989.

Spong, C. Y., et al. An objective definition of shoulder dystocia: prolonged head-to-body delivery intervals and/or the use of ancillary obstetric maneuvers. *Obstet. Gynecol.* 86(3):433–436 (September) 1995.

Stein, A. Breech delivery: A cooperative nurse-midwifery medical management approach. *J. Nurse-Midwifery* 31(2):93–97 (March/April) 1986.

Swartz, D. P. Shoulder girdle dystocia in vertex delivery: clinical study and review. *Obstet. Gynecol.* 15(2):194–206, 1960.

Vollebergh, J. H. A., and van Dongen, P. W. J. The Zavanelli manoeuvre in shoulder dystocia: case report and review of published cases. *Eur. J. Obstet. Gynecol. Reprod. Biol.* 89:81–84, 2000.

Winn, H. N., Cimino, J., Powers, J., et al. Intrapartum management of nonvertex second-born twins: a critical analysis, *Am. J. Obstet. Gynecol.* 185(5):1204–1208 (November) 2001.

Woods, C. D. A principle of physics as applicable to shoulder dystocia. *Am. J. Obstet. Gynecol.* 45:796–804, 1943.

Young, P. F., and Johanson, R. B. The management of breech presentation at term. *Curr. Opinion Obstet. Gynecol.* 13(6):589–593 (December) 2001.

CHAPTER

31

The Normal Third Stage of Labor

The third stage of labor starts upon completion of the birth of the baby and ends with the birth of the placenta. It is known as the placental stage of labor. The third stage of labor lasts on average between 5 and 10 minutes. However, it is within the range of normal for the third stage to last up to 30 minutes. The risk of hemorrhage increases when third stage is longer than 30 minutes, especially between 30 and 60 minutes [1–3].

Database for the Third Stage of Labor

The components of the database for determining the well-being of the woman during the third stage of labor are as follows:

1. Continuing evaluation of any previous significant findings
2. Evaluation of the progress of labor
3. Continuing evaluation of the mother
4. Screening for signs and symptoms of third stage hemorrhage. (This topic is discussed in Chapter 32.)

The midwife must understand the processes of the third stage of labor and parameters of normal for this period in order to evaluate the database.

Although the midwife also conducts an initial evaluation and manages the care of the baby during the third stage of labor, for the sake of clarity these tasks are not covered in this chapter but are instead discussed in the chapters pertaining to the neonate. The Leboyer methodology is a continuum of actions taken during and immediately after birth that coincide with the third stage of labor. This methodology was detailed in Chapter 28.

Evaluation of the Progress of Labor

The third stage of labor consists of two sequential phases: (1) placental separation and (2) placental expulsion. Both separation and expulsion are brought about by contractions, which begin again after a brief pause following the birth of the baby. The contractions had been approximately every 2 to $2^{1}/_{2}$ minutes apart during the second stage of labor. After the birth of the baby, the next contraction may not occur for 3 to 5 minutes. Contractions then follow every 4 to 5 minutes until the placenta has separated and been expelled. After that, the empty uterus contracts down on itself and remains contracted if the muscle tone is good. If the muscle tone is not good, a woman will have increased lochial flow and recurrent uterine contractions as the uterus relaxes. This causes afterbirth pains.

Placental separation is the result of the abrupt decrease in size of the uterine cavity during and following the delivery of the baby, as the uterus contracts down on the reduced uterine contents. This decrease in uterine size necessarily means a concomitant decrease in the area of placental attachment. The placenta, however, remains the same size. The placenta first accommodates to this decrease in uterine size by becoming thicker, but at the site of attachment it is unable to withstand the stress and buckles. The result is separation of the placenta from the uterine wall, which takes place in the spongiosa layer of the decidua. As the placenta separates, a hematoma forms between the separating placenta and the remaining decidua as a result of bleeding into the intervillous space. This is known as the retroplacental hematoma and may vary considerably in size. Although this hematoma is the result rather than the cause of placental separation, it

does facilitate the completion of placental separation.

After the placenta has separated it descends into the lower uterine segment or into the upper vaginal vault, causing the following clinical signs of placental separation to become evident:

1. Sudden trickle or small gush of blood
2. Lengthening of the amount of umbilical cord visible at the vaginal introitus
3. Change in the shape of the uterus from discoid to globular as the uterus now contracts on itself
4. Change in the position of the uterus: It rises in the abdomen because the bulk of the placenta in the lower uterine segment or upper vaginal vault displaces the uterus upward

Placental expulsion begins with the descent of the placenta into the lower uterine segment. The placenta then passes through the cervix into the upper vaginal vault, from whence it is expelled. Expulsion of the placenta is by one of two mechanisms. The Schultz mechanism is by far the more common of the two, although both are considered normal.

The *Schultz mechanism* of placental expulsion is delivery of the placenta with the fetal side presenting. This presentation is thought to result when separation begins centrally with corresponding formation of a central retroplacental clot, which weights the placenta so the central portion descends first. This, in effect, inverts the placenta and amniotic sac and causes the membranes to peel off the remainder of the decidua and trail behind the placenta. The majority of bleeding occurring with this mechanism of labor is not visible until the placenta and membranes are delivered, since the inverted membranes catch and hold the blood.

The *Duncan mechanism* of placental expulsion is delivery of the placenta with the maternal side presenting. This presentation is thought to result when separation first takes place at the margin or periphery of the placenta. Blood escapes between the membranes and uterine wall and is visible externally. The placenta descends sideways and the amniotic sac, therefore, is not inverted but trails behind the placenta for delivery.

The memory aid for correctly identifying the mechanisms of placental expulsion is based on the appearance of the two different sides of the placenta. The fetal side is shiny and glistening because its covering is the fetal membranes, whereas the maternal side is rough and red-looking—hence the sayings "shiny Schultz" and "dirty Duncan."

Continuing Evaluation of the Mother

Many of the normal physiological changes occurring during the first and second stages of labor come to an end when the placenta is expelled, and the woman's vital signs return to prelabor levels during the third stage:

1. *Blood pressure:* Both systolic and diastolic pressures start to return to prelabor levels.
2. *Pulse:* The pulse rate gradually returns to prelabor level.
3. *Temperature:* Body temperature continues to be slightly elevated.
4. *Respirations:* Breathing returns to normal.
5. *Gastrointestinal activity:* If not affected by drugs, gastric motility and absorption begin to return to normal activity. It is unusual for a woman to experience any nausea and vomiting during the third stage.

During the third stage of labor the mother's interest in her baby is apparent if the baby is on her abdomen. In the event the baby is not with the mother, she will express her interest and concern with questions: "Is my baby all right?" "What is it?" "How much does she/he weigh?" She wants to see for herself that her baby is all right and usually is eager to touch and hold her baby (Figure 31-1). She is elated, proud of herself, relieved, and very tired. She also has concerns for herself and may ask if she needs stitches. Prepared mothers are also usually interested in the placenta.

Mothers or couples may want to use the Leboyer approach to childbirth and transition of the baby from intrauterine to extrauterine life. This approach was detailed in Chapter 28.

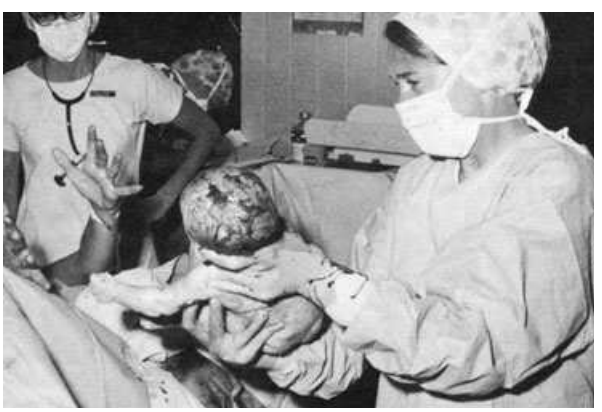


FIGURE 31-1 Midwife handing baby to mother immediately after birth.

Management Plan for the Third Stage of Labor

This part of the chapter strictly addresses the obstetric management of care of the mother during the third stage of labor. Although not alone in providing care, the midwife is responsible while managing third stage to also initiate or delegate care of the baby (i.e., drying the baby, providing for warmth, ensuring a clear airway) and early mother-baby-family bonding and relationships. This material is presented elsewhere.

How the placental stage of labor is managed can make considerable difference in the amount of blood the mother loses [1]. The Bristol third stage trial in England, where use of oxytocin with delivery of the anterior shoulder is common, showed that there is less blood loss with the active management of the third stage of labor than when third stage is managed physiologically [4]. Active management was defined as giving oxytocin immediately after delivery of the anterior shoulder, clamping the cord immediately after delivery of the baby, and using controlled cord traction for delivery of the placenta. Later studies confirmed a significantly lower blood loss with active management of third stage even in populations at low risk for postpartum hemorrhage [5, 6]. The midwife needs to be sure that there is only one baby to be delivered before administering oxytocin after delivery of the anterior shoulder [7].

Mismanagement of third stage is the largest single cause of third stage hemorrhage. Mismanagement of third stage can also be the cause of uterine inversion and its attendant life-threatening shock. Such disastrous complications can be readily avoided by strict adherence to the following rules:

1. Guard the uterus to keep yourself and anyone else from massaging it prior to placental separation.
2. Do not massage the uterus before placental separation except when partial separation has occurred by natural processes and excessive bleeding is evident (see Chapter 32).
3. Do not pull on the umbilical cord before the placenta separates; *never* pull on the cord with an *uncontracted* uterus.
4. Do not try to deliver the placenta prior to its complete separation except in the emergency situation of third stage hemorrhage (see Chapter 32).
5. Become expert in diagnosing placental separation.
6. If not using active management of third stage with administration of any oxytocin immediately after birth of the anterior shoulder, then discipline yourself in the art of patient waiting and in not feeling pressured into unwise interference with natural processes.

Placental Separation

During initial care of the baby, the midwife must keep one eye on the mother's perineum in order to watch for signs of placental separation and for excessive bleeding. (By the same token, when the midwife is managing third stage, she or he must keep one eye on the baby to continually evaluate the baby's well-being.)

The first step in managing third stage is to evaluate the progress of labor and the mother's condition. One hand is placed on the mother's abdomen to feel, without massaging, the shape and position of the uterus and determine whether it is contracted.

If cord blood is to be collected, now is the time to obtain the specimens. Blood for cord blood gases, if needed, has to be processed promptly. This is obtained by drawing blood directly from a cord artery and, separately, from the cord vein into heparinized syringes. Cord blood is then carefully drained into a small sterile bowl by holding onto the cord while releasing the clamp on the cord. After reclamping the cord, a syringe without a needle is filled with the blood in the basin and subsequently inserted into a blood tube. Blood for cord blood gases cannot be taken from the basin of cord blood as that contains a mixture of venous and arterial blood.

Some midwives fairly routinely "drain the placenta" by simply taking the clamp off the umbilical cord and catching the blood either in a foot basin or a placental pan. The rationale for this action is that draining the placenta decreases its volume, thereby facilitating its separation from the uterine wall. This rationale is of questionable validity but there are no known dangers to draining the placenta. It is worth trying if separation is slow and enough time has passed that you are beginning to be concerned. The only problem is that blood from the placenta can significantly inflate the estimation of the total blood loss unless it is collected separately.

After specimens of cord blood have been collected, the cord is wound around the clamp until the clamp is at the vaginal introitus so that traction can be effectively exerted on the cord when needed; or, if you have another clamp, you can place it on

the cord at the introitus. (Do not release your only clamp on the cord to move it to the introitus or you will have blood spraying everywhere—not a good idea in this day of HIV/AIDS.) This clamp is held with one hand while the other hand continues to guard the uterus.

"Guarding the uterus" means exactly what the words imply. While your hand is in a position to continually ascertain the shape, position, and consistency of the uterus it is also in a position to keep anyone else from massaging the uterus, thereby guarding it and the mother from the complications that can result from such an action. Normal placental separation from the uterine wall is accomplished by the effect of uterine contractions, as detailed earlier in this chapter. If the uterus is massaged before the placenta's separation from the uterine wall, the massage may cause partial separation of the placenta, resulting in hemorrhage. The danger of a partial separation is that a portion of the placenta is still attached to the uterus, and the uterus is unable to contract sufficiently to ligate and collapse the bleeding vessels interwoven through the muscle fibers in the area where separation has occurred. Hemorrhage results. Management of this complication is discussed in Chapter 32.

If you are unsure whether the placenta has separated, you can check by using a modification of the Brandt-Andrews maneuver. Hold the cord taut at the vaginal introitus with one hand, using the clamp for leverage. Bring the tips of your fingers on your abdominal hand, with your fingers close against each other, straight down into the lower abdomen just above the symphysis pubis and watch what happens to the umbilical cord (Figure 31-2). If the cord recedes into the vagina, then the placenta is not separated. If the cord has a feeling of give and remains the same length or extends beyond its position at the vaginal introitus, then the placenta has separated and you may proceed with facilitating placental expulsion. This modified procedure differs from the Brandt-Andrews maneuver in that you make no effort to press on the uterus to hold or push it anteriorly (up in the abdomen), as you would to facilitate expulsion after separation. The modification carries no risk of unintended massage of the uterus prior to separation.

If you are still unsure whether the placenta is separated, there is another method you can use to determine the location of the placenta. Again hold the cord tautly with one hand at the vaginal introitus, and with your other hand follow the cord into

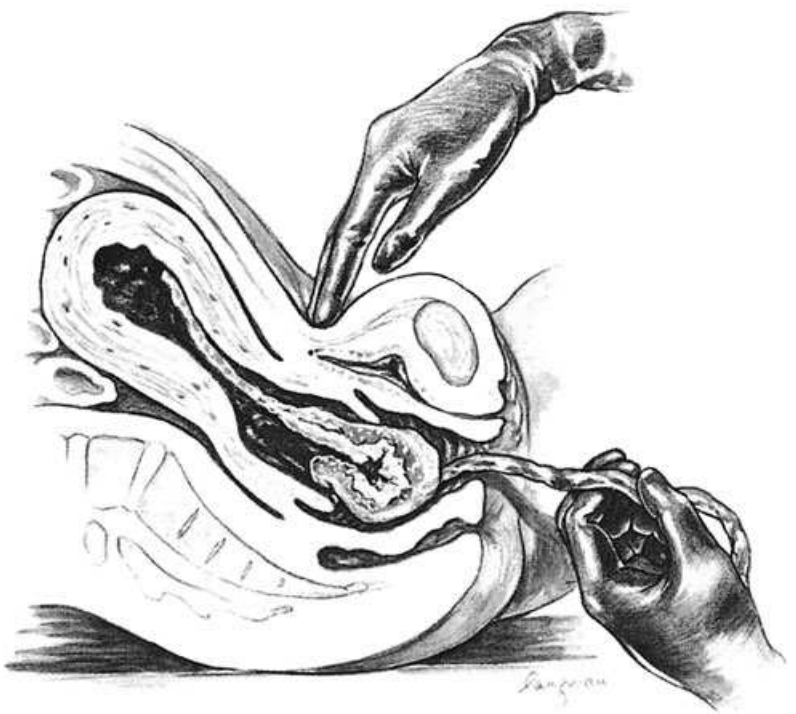


FIGURE 31-2 Checking for placental separation.

Source: From Greenhill, J. P., and Friedman, E. A. *Biological Principles and Modern Practice of Obstetrics*. Philadelphia, PA: Saunders, 1974. Reproduced by permission.

the vagina with your examining fingers until you can feel either where the cord inserts into the placenta or where it extends through the cervix and into the uterus beyond your reach. In the latter instance you can assume that the placenta has not separated. In the former instance you will probably find the placenta in or at the cervical os or in the upper vaginal vault and obviously separated. This technique should not be used routinely, but reserved for when there is true doubt or concern, because of both the increased risk of introducing infection every time you put your fingers inside the vagina and the possible additional discomfort to the woman. Generally you do not need to use this technique, but it is handy to know. It is better, however, to sharpen your diagnostic ability by scrupulous attention to the signs of placental separation.

Placental Expulsion

Once you are sure the placenta has separated, you may facilitate the mother's efforts to expel it by using a combination of the Brandt-Andrews maneuver and controlled cord traction. Use your abdominal hand to ensure that the uterus is contracted and brace the body of the uterus by placing the palmar surface of your hand just above the symphysis pubis and pressing against the uterus, lifting it with a slight upward direction toward the umbilicus. At the same time the other hand exerts traction on the cord, using the clamp around which the excess cord is wrapped for leverage. At the same time you ask the woman to push. It is important to remember that the placenta follows the curve of Carus just as the fetus did. Therefore, you should first exert traction on the cord downward and then upward as the placenta comes into view for the actual delivery.

Never exert traction on the cord at any time unless the uterus is contracted. If the uterus is not contracted and the placenta or membranes are adhering to the uterine wall, inversion of the uterus is a potential danger. In such circumstances cord traction may bring not only the placenta but also the attached uterine wall. This is an obstetric disaster and is discussed in Chapter 32. Inversion is prevented by checking to make sure the uterus is contracted before exerting any degree of cord traction and by not attempting to deliver the placenta by pulling on the cord before being absolutely sure placental separation has occurred.

Likewise, pulling on the cord can cause the cord to detach from the placenta (evulsion), thereby requiring manual removal of the placenta and exposing the woman to unnecessary trauma and an increased risk of intrauterine infection.

Bracing of the uterus during the expulsion of the placenta and being scrupulously careful not to use the uterus as a piston to push the placenta through the vaginal canal has important gynecological implications. Using the uterus as a piston stretches the cardinal ligaments and may potentiate uterine prolapse in later life, especially if done vigorously or repeated with each childbearing experience. Not using the uterus as a piston thus becomes a preventive measure to uterine prolapse.

It should be noted that placental expulsion is not a problem requiring facilitative efforts by the midwife if the mother uses a natural position such as squatting. Positioning the woman in a flat or slightly elevated recumbent position negates both the down and outward direction of the vagina and the effect of gravity, which are the natural facilitative forces when the woman is in an upright position.

A basin is placed below the perineum to catch blood and to hold the placenta when it is delivered. If the woman is in a lithotomy position the pan is braced between the woman's buttocks and the midwife's body, leaving both hands free to manage the third stage of labor. Use of the placenta basin to catch the blood makes it possible to measure the majority of the blood loss and also minimizes mess.

As the placenta is delivered, it is either allowed to slide gently down the side of the placenta basin, which is positioned more on its side at the vaginal introitus for this purpose, or is delivered into the midwife's hands at the vaginal introitus. Either way the principle involved is not to let the placenta drop any distance from the level of the vaginal introitus since this might cause the after-coming membranes, which may still be peeling off the uterine wall as the placenta is delivered, to tear and break off and be retained (see Figure 31-3).

The third stage has ended if the membranes immediately follow the placenta and are delivered with the placenta. However, sometimes the membranes trail behind and threaten to break off if tension is applied to them. In such an instance, they may be teased out in one of two ways.

One way is to take a clamp (a large Kelly clamp is preferable; a large ring forceps will do) and place it on the membranes at the vaginal introitus. If the mother is not in bed in dorsal position, one hand continues to support the placenta, or the basin with the placenta in it, in order to prevent tension on the membranes. Otherwise your hand can be on the

FIGURE 31-3 Delivery of the placenta.
Source: Photograph by Artemis/Harriette Hartigan.

mother's abdomen stabilizing the uterus. Your other hand manipulates the clamped membranes by gently rocking them up and down and side to side while exerting the slightest bit of traction on them (see Figure 31-4). You will be able to judge the appropriate amount of traction because you will feel when the steady "give" of the membranes being teased out becomes a "tearing give" instead. As the membranes are gradually teased out, the clamp moves away from the vaginal introitus. You should, therefore, periodically reclamp the membranes at the introitus whenever the clamp moves an inch or two away from the introitus because you have better control manipulating the membranes the closer the clamp is to the vaginal introitus. The process is continued until the membranes are delivered.

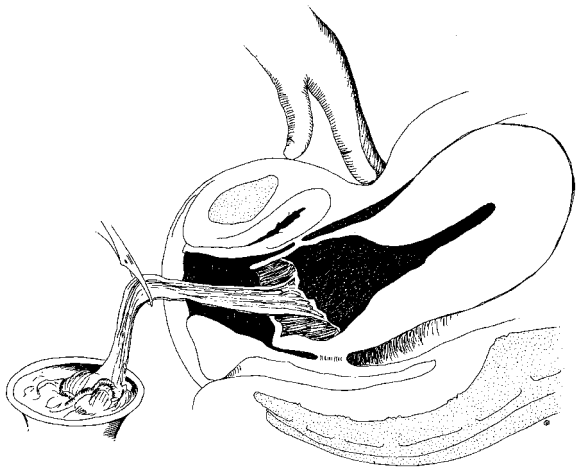


FIGURE 31-4 Teasing out the membranes.
Source: From *Oxorn-Foote Human Labor and Birth*, 5th ed. Norwalk, CT: Appleton-Century-Crofts, 1986, p. 143. Reproduced by permission.

The other way to tease out the membranes is to hold the placenta in your hands and turn it over and over. This causes the membranes to twist and gradually teases them out until they are delivered. This method may be more difficult for inexperienced hands because the placenta is slippery and it is not as easy to control the amount of tension on the membranes as it is with the first method.

If the membranes do break off while you are trying to tease them out, third stage is considered ended. Sometimes the torn end of the membranes may be visualized during the cervical inspection and more can be teased out. The generally accepted management if a portion of the membranes is retained is that uterine exploration to remove them is not warranted. Uterine exploration is traumatic to the woman and increases the risk of intrauterine infection. Retention of a portion of the membranes is not a cause of hemorrhage, as is retention of placental fragments. The retained portion of the membranes will eventually be expelled with the lochia; however they should be expelled as soon as possible as their retention does increase the risk of endometritis. To achieve this more rapid expulsion, a full methylergonovine (Methergine) series should be ordered for the woman: Methergine 0.2 mg every 4 hr for 6 doses. Some midwives follow this initial series with 0.2 mg Methergine t.i.d. for 3 days. If the estimated portion of membranes retained was a large amount, some midwives also give an immediate dose of Methergine 0.2 mg intramuscularly. Methergine is contraindicated if the woman is hypertensive.

Evaluation of the Mother

The mother's blood pressure and pulse should be taken at least once during the third stage and more often if the third stage is longer than average or the blood pressure and pulse are either bordering on or in abnormal ranges. This monitoring not only follows through on evaluation of any previous elevations but is necessary as a means of screening for shock in the event of hemorrhage.

References

1. Brucker, M. C. Management of the third stage of labor: an evidence-based approach. *J. Midwifery Womens Health* 46(6):381–392 (November/December) 2001.
2. Combs, C. A., and Laros, R. K. Jr. Prolonged third stage of labor: morbidity and risk factors. *Obstet. Gynecol.* 77:863–867, 1991.
3. Dombrowski, M. P., Bottoms, S. F., Saleh, A. A., Hurd, W. W., and Romero, R. Third stage of labor: analysis of duration and clinical practice. *Am. J. Obstet. Gynecol.* 172(4, pt. 1):1279–1284 (April) 1995.
4. Prendiville, W. J., Harding, J. E., Elbourne, D. R., and Stirrat, G. M. The Bristol third stage trial: active versus physiological management of third stage of labour. *Br. Med. J.* 297:1295–1300 (November 19) 1988.
5. Rogers, J., Wood, J., McCandlish, R., Ayers, S., Truesdale, A., and Elbourne, D. Active versus expectant management of third stage of labour: the Hinchingbrooke randomised controlled trial. *Lancet* 351(9104):693–699 (March 7) 1998.
6. Prendiville, W. J., Elbourne, D., and McDonald, S. Active versus expectant management in the third stage of labour (Cochrane Review). In *The Cochrane Library*, Issue 2. Oxford, England: Update Software, 2002.
7. Long, P. Bleeding and the third stage of labor. *NAACOG's Clin. Issues* 2(3):385–395, 1991.

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CHAPTER

32

Third Stage Complications and Management

Third stage complications relate to the placenta and its attachment to the uterus. With the exception of a placenta that is retained for reasons other than placenta accreta, all are life-threatening. The midwife must know what to do to maintain the woman or resolve the problem while awaiting the physician. Third stage complications discussed in this chapter are retained placenta, third stage hemorrhage, placenta accreta, and uterine inversion.

Retained Placenta

A retained placenta is a placenta that has not separated and creates no visible hemorrhage. The definition of retained placenta is based on the length of time that elapses between the birth of the baby and the expected delivery of the placenta. Some clinicians intervene after 5 minutes. Most midwives will wait half an hour for the placenta to deliver before saying it is retained.

Gestational age is associated with length of third stage. Decreasing gestational age is associated with a longer third stage. The frequency of manual removal of the placenta is also associated with preterm delivery. Hemorrhage is increased with both decreasing gestational age and increased manual removal [1].

Natural interventions the midwife may initiate when there is a retained placenta include putting the baby to breast, nipple stimulation, having the woman assume a squatting position, and providing privacy for the couple for noncoital lovemaking. Other actions include ensuring an empty bladder (by means of catheterization if the woman has a full bladder and is unable to void) and administering an intraumbilical oxytocin injection with a solution of 10 IU of Pitocin diluted with 20 cc of normal saline into the umbilical vein [2, 3].

During the period of time it takes to implement these interventions, the midwife monitors the woman's vital signs; checks for other signs of shock, visible external bleeding, and hidden internal bleeding (increased fundal height); and notifies the consulting physician of the situation.

If the placenta still has not delivered, the next step is manual removal. This should be done in-hospital, necessitating transfer of the woman if she is in an out-of-hospital setting. The in-hospital setting is the proper setting for nonemergency manual removal of the placenta, both for reasons of safety and to enable the woman to receive anesthesia or deep analgesia for a painful procedure. The procedure for manual removal of the placenta is discussed in Chapter 76. In the nonemergency situation, the midwife can manually remove the placenta in consultation with the physician. Placenta accreta should be in the back of the midwife's mind when the placenta does not spontaneously deliver within a reasonable period of time or when a plane of cleavage is not evident upon attempted manual removal.

Third Stage Hemorrhage

Third stage hemorrhage is due to partial separation of the placenta. The most common reason for partial separation is mismanagement of the third stage, usually involving uterine massage prior to placental separation. Partial separation may occur naturally during the physiological separation of the placenta but this condition is usually quickly transient. Partial separation resulting from massage of the uterus before the placenta's separation from the uterine wall is not physiological and carries with it the almost guaranteed result of third stage hemorrhage.

Normally there is some blood loss during the third stage, insofar as a sudden trickle or small gush of blood is a sign of placental separation. However, when there is a steady flow of blood and you have located the placenta within the uterus and determined that it has not fully separated, you need to institute measures for managing third stage hemorrhage immediately. These measures are as follows:

1. Have the nursing staff (in-hospital), a nurse or your assistant (birth center), or your assistant or a family member (home) give your consulting physician a *STAT* call. Also call an ambulance if you are in an out-of-hospital setting. Your consulting physician most likely will meet you at the hospital.
2. Thoroughly massage the uterus. Although this should never be done prior to placental separation in a normal situation, it is the first action to take when faced with a partially separated placenta and third stage hemorrhage. This is because a thorough massage at this time may complete placental separation. This action, with a well-contracted uterus, is combined with controlled cord traction so as separation is completed delivery of the placenta occurs immediately.
3. While doing Step 2, have the nursing staff or your assistant take the following steps:
   a. Make sure that the IV is patent or start one with a 16-gauge needle and Ringer's lactate solution if the woman does not have an IV.
   b. If the woman already has a patent IV, change the solution to Ringer's lactate for infusion.
   c. Draw a type and crossmatch if one has not already been drawn.
   d. Watch for signs and symptoms of shock and start monitoring the woman's blood pressure and pulse; lower the woman's head to flat on the bed if indicated.
4. If the placenta has not yet delivered, manually remove it (see Chapter 76). Catheterize the woman first unless you are sure that her bladder is empty.
5. If the placenta has not yet delivered and you do not know how to remove it manually, bleeding is steady and continuing, and the physician (in-hospital) or ambulance (out-of-hospital) has not yet arrived, then the addition of oxytocin to the IV infusion is in order. The purpose of oxytocin is to contract the uterus in an effort to cause completion of placental separation. Usually this action is delayed unless absolutely necessary. Oxytocin causes the cervix to close, thereby making manual removal of the placenta difficult as well as increasing the incidence of placental retention after its separation. However, an oxytocin preparation that causes intermittent contractions (Pitocin, Oxytocin, Syntocinon) is preferred over a preparation that causes a sustained contraction (Methergine). The former is less likely to cause the cervix to clamp down.

The incidence of third stage hemorrhage is rare *if* third stage is *not* mismanaged. Nevertheless, it can happen, even with the best third stage management. An infectious process with a high temperature during pregnancy increases placental adherence, as does any intrauterine infection, disease processes of the fetal membranes, or previous cesarean section. History of a previous third stage hemorrhage should make you anticipatory, alert, and wary. Third stage hemorrhage will occur when there is a partial placenta accreta.

Placenta Accreta

Placenta accreta is an abnormal partial or total adherence of the placenta to the uterine wall. In placenta accreta the placenta adheres directly to the myometrium with either defective decidua or no decidua in between. When the chorionic villi extend further than contact with the myometrium and actually penetrate the uterine wall, the condition is called *placenta increta*. *Placenta percreta* occurs when the chorionic villi invade through the entire uterine wall to the serosa layer. These conditions are rare complications, although there is an increased incidence of placenta accreta when the woman has placenta previa, previous cesarean section, or an unexplained elevated MSAFP [4].

A partial placenta accreta is first seen as an acute third stage hemorrhage resulting from a par-

tially separated placenta. Clinical diagnosis is made when the placenta's adherence is discovered during attempted manual removal. Definitive diagnosis of placenta accreta is made by microscopic examination. A complete placenta accreta has no signs and symptoms since there is no partial separation and, therefore, no hemorrhage. It is discovered during attempted manual removal of the retained placenta.

Placenta accreta is an obstetric disaster. Any suspicion that a retained placenta is due to placenta accreta requires that the midwife immediately place an emergency call for the consulting physician. If the woman is in an out-of-hospital setting, she should be transferred to the hospital in an ambulance immediately. While waiting, the midwife does all she or he can do to maintain the woman and prepare her for immediate surgery. Under no circumstances should any further attempt be made to remove the placenta, as this will only cause greater hemorrhage and possible rupture or inversion of the uterus. The physician probably will manage the care of the woman by performing an emergency hysterectomy.

Uterine Inversion

Uterine inversion is the situation in which the uterus literally turns inside out so that the inside of the fundus either (1) protrudes through the cervical os (incomplete), (2) descends to immediately within the vaginal introitus (complete), or (3) extrudes beyond the vulva (prolapsed). In the first two positions, the fundus, on vaginal examination, feels like a soft tumor filling the cervical or vaginal orifice. Abdominally, a funnel-like depression may be felt instead of the fundus (see Figure 32-1).

Basically there are three conditions that combine to create a situation favorable to uterine inversion. These are (1) uterine atony, or uncontracted uterus, (2) a patulous, dilated cervix, and (3) fundal pressure or traction caused by pulling on the umbilical cord or placenta.

Although it is possible for uterine inversion to occur spontaneously, it is more likely to be the result of mismanagement of the third stage of labor. In considering the three conditions just mentioned, it becomes obvious that it is the third condition over which the midwife has the most control. Uterine inversion can take place as a result of fundal pressure caused by a sudden increase in intra-abdominal pressure, such as with coughing. However, it is more apt to occur from any or a combination of the following, each of which is an act of mismanagement:

1. Applying fundal pressure with a hand on an uncontracted uterus, such as might be done in facilitating expulsion of the placenta if the uterus were wrongly being used as a piston
2. Having the mother push to help expel the placenta without first checking to see that the uterus is contracted
3. Exerting cord traction prior to placental separation
4. Pulling on the placenta during manual removal prior to total placental separation

In approximately three-quarters of the cases of uterine inversion, the placenta is completely or partially attached to the uterine fundus. Spontaneous uterine inversion fortunately is an extremely rare obstetric accident.

The major result of uterine inversion is shock. Excessive bleeding and severe uterine pain may or may not be present. Diagnosis is made by observation of the uterine lining outside the vulva or on the basis of findings from vaginal and abdominal examination. Uterine inversion should be suspected and a diagnostic vaginal examination performed if the woman goes into shock after giving birth without obvious reason.

In the event of uterine inversion, the consulting physician should be notified immediately. If the woman is in an out-of-hospital setting, she should be transferred to the hospital in an ambulance immediately. While waiting for the ambulance, the midwife should start an IV and apply normal saline packs to the inverted uterus. The woman should be maintained and treated for shock until the physician arrives at the hospital. The physician probably will manage the care of the woman by treating for shock and by repositioning the uterus. Repositioning the uterus can be done manually if inversion is diagnosed and the manipulation is performed immediately after the inversion occurs. However, if there has been a time interval between inversion and diagnosis, which can happen in insidious cases during the postpartal period, then operative procedures will be required in order to reposition the uterus.

Repositioning of the uterus is done with the placenta still attached. Blood loss is usually related to the length of time the uterus is inverted but will be less if the placenta is removed *after* the uterus is replaced [5]. Manual repositioning is accomplished by placing one entire hand in the vagina with the

fingertips around the circumference of the junction where the uterus has turned on itself and the inverted fundus in the palm of the hand (see Figure 32-1). Pressure is then applied with the palm of the hand on the fundus and the fingertips on the uterine walls. The fingertips walk up the uterine walls as the fundus is repositioned. Care must be taken not to puncture or rupture the soft uterine wall. At the same time the entire uterus is lifted high out of the pelvis, above the level of the umbilicus, and held there for several minutes. This puts tension on the uterine ligaments, which keeps the uterus reinverted. This procedure is usually quite painful, and deep anesthesia or an intravenous uterine relaxant (e.g., magnesium sulfate, halogenated anesthetic agents, terbutaline) is desirable [6]. All of these drugs have hypotensive side effects and should be used with great caution in the event of excessive blood loss and a falling blood pressure. The midwife should know this technique and use it, with or without drug-induced uterine relaxation, in the event arrival of the physician is going to be delayed. Most midwives will never see this complication.

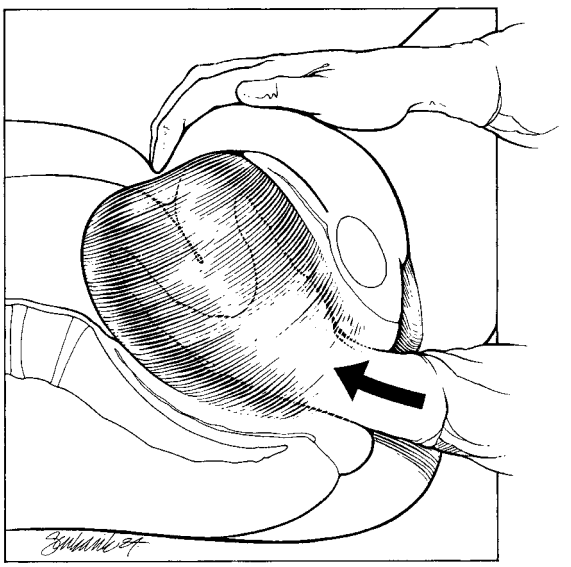

FIGURE 32-1 Repositioning the inverted uterus. Note that the abdominal hand feels a funnel-like depression instead of the fundus.

Source: From Gabbe, S. G., Niebyl, J., and Simpson, J. L. *Obstetrics: Normal and Problem Pregnancies*, 2nd ed. New York: Churchill Livingstone, 1991, p. 601. Reproduced by permission.

References

1. Dombrowski, M. P., Bottoms, S. F., Saleh, A. A., et al. Third stage of labor: Analysis of duration and clinical practice. *Am. J. Obstet. Gynecol.* 172(4, pt. 1):1279–1284 (April) 1995.
2. Wingeier, R., and Griggs, R. Management of retained placenta using intraumbilical oxytocin injection. *J. Nurse-Midwifery* 36(4):240–244 (July/August) 1991.
3. Brucker, M. C., Management of the third stage of labor: an evidence-based approach. *J. Midwifery Womens Health* 46(6):381–392 (November/December) 2001.
4. Kupferminc, M. J., Tamura, R. K., Wigten, T. R., et al. Placenta accreta is associated with elevated maternal serum alpha-fetoprotein. *Obstet. Gynecol.* 82(2):266–269 (August) 1993.
5. Shah-Hosseini, R., and Evrard, J. R. Puerperal uterine inversion. *Obstet. Gynecol.* 73(4):567–570 (April) 1989.
6. Postpartum hemorrhage. *ACOG Educational Bulletin,* No. 243 (January) 1998.

CHAPTER

33

The Normal Fourth Stage of Labor

Immediately following the birth of the placenta, a number of maternal changes occur as the physical and emotional stresses of labor and birth resolve into postpartum recovery and bonding. At the same time, the midwife has a series of evaluations and tasks to complete related to the intrapartum period. Although intrapartum is complete, the term *fourth stage of labor* identifies this first postpartum hour as one requiring close observation and assessment. The midwife has responsibility during this hour for the following:

1. Evaluation of uterine contractility and bleeding
2. Inspection and evaluation of the cervix, vagina, and perineum
3. Inspection and evaluation of the placenta, membranes, and umbilical cord
4. Assessment and repair of any lacerations or an episiotomy
5. Evaluation of vital signs and other physiological changes that indicate recovery

Throughout this period another activity of paramount importance is taking place: family relationships are being formed (Figure 33-1). Newborns are alert, able to see and hear those close by, and responsive to the touch of their mother's body against their own. Facilitation of this taking-in phase and ensuring the mother's ability to participate are vital steps in the process of bonding. Bonding is an ongoing process. Thus, urgent medical intervention for either the mother or baby takes precedence.

Just as the midwife must be aware of all assessments of the mother during this time, such as her vital signs, she also has responsibility for knowing about the baby's vital signs and physiologic indications of well-being. Evaluation of the baby is discussed in the chapters on the neonate.

Database for the Fourth Stage of Labor

The components of the database for the fourth stage of labor include information needed for the evaluation and management of the care of the mother during the first hour postpartum, and knowledge of the taking in phase of the newborn and the maternal child bonding process.

The Uterus

After delivery of the placenta, the uterus can be found in the middle of the abdomen approximately two-thirds to three-fourths of the way up between the symphysis pubis and the umbilicus (see Figure

FIGURE 33-1 New family relationships.

42-1). If the uterus is found centrally above the umbilicus, it suggests the presence of blood and clots in the uterus, which need to be expressed and expelled. A uterus above the umbilicus and displaced, most commonly to the right, is more likely to represent a full bladder. A full bladder displaces the uterus, preventing contraction and allowing increased bleeding to occur. If the mother is unable to void spontaneously at this time, the bladder should be emptied by catheter to prevent excessive bleeding.

The normally contracted uterus should be firm to the touch. If the upper uterine segment is hard but bleeding persists, assessment of the lower segment is essential. A soft, boggy, hypotonic uterus is not well contracted; uterine atony is the major cause of immediate postpartum hemorrhage. Effective uterine hemostasis is effected by the contraction of the intertwining muscle fibers of the myometrium. These fibers serve as ligatures for the open blood vessels at the placental site. In general, thrombi form in the distal blood vessels of the decidua, rather than in myometrial vessels. This mechanism—by which ligation occurs in the myometrium and thrombosis in the decidua—is important because it prevents the release of thrombi into the systemic circulation.

The Cervix, Vagina, and Perineum

The cervix, vagina, and perineum are inspected for lacerations, bruising, and early hematoma formation. Since inspection of the cervix may be painful for the mother, it is performed only when indicated, as discussed in the management plan later in this chapter. Immediately after the birth, the cervix is patulous, floppy, and thick. An anterior lip during labor, or any portion of the cervix trapped by the descent of the fetal head for a prolonged period, is reflected by increased edema and bruising in that area. Vaginal tone, as well as the appearance of the vaginal tissue itself, is affected by the stretching that has occurred during the second stage of labor. Edema or bruising at the introitus or throughout the perineal area should be noted.

The Placenta, Membranes, and Umbilical Cord

Inspection of the placental unit requires that the midwife be able to identify the different placental types and cord insertions. This information, along with the procedure for placental inspection, is discussed in Chapter 74. The midwife must be aware of whether the placenta and membranes are complete, and whether any abnormalities, such as a true knot or two-vessel cord, are present.

Repair of Episiotomy and Lacerations

Repair of episiotomies and lacerations entails knowledge of perineal anatomy, types of stitches, hemostasis, surgical asepsis, and wound healing. The relevant material is found in Chapter 79. The midwife should also be aware of suture and needle types, standard instruments, and equipment available in the setting.

Physiological Status

Many of the physiological changes that occur during labor and birth return to prelabor levels and stabilize during the first hour postpartum. Other physiological manifestations seen during this period result from or are the aftermath of the stresses of labor. Knowledge of normal findings is essential to accurate evaluation of the mother.

Vital Signs Blood pressure, pulse, and respiration should stabilize at prelabor levels during the first postpartum hour. Monitoring blood pressure and pulse regularly during this interval is one means of detecting shock from excessive blood loss. The mother's temperature continues to be slightly elevated but normally remains below 100.4°F (38.0°C).

Shaking It is not uncommon for a woman to experience a shaking tremor during the fourth stage of labor; such shaking is considered normal in the absence of fever >100.4°F (38.0°C) or other signs of infection. This response may result from release of tension and energy expenditure during birth; the physiologic response to the decrease in intra-abdominal volume and hematologic shift also play a role.

Gastrointestinal System Nausea and vomiting, if present during labor, should be resolved. Thirst is common, and many mothers report hunger shortly thereafter.

Renal System A hypotonic bladder with significant urinary retention and enlargement is not uncommon. Pressure and compression on the bladder and urethra during labor and birth are the cause. Keeping the woman's bladder empty during labor can reduce trauma. After birth, it is important for the bladder to stay empty to prevent uterine dis-

placement and atony. A poorly contracted uterus increases both bleeding and the severity of pain.

Management Plan for the Fourth Stage of Labor

Evaluation and Management of the Uterus

The midwife's first action following delivery of the placenta is to evaluate uterine consistency and to massage it as needed to bring it into a state of firm contraction. At the same time, the degree of cervical/uterine descent into the vagina can be assessed. Most of the time a healthy uterus can contract on its own. If the midwife determines that the uterus is relaxed, or atonic, the cause should be assessed and management to fully contract the uterus be initiated promptly. Failure to attend to the problem of atony can lead to an immediate postpartum hemorrhage (see Chapter 34). The following are factors to consider:

1. Uterine consistency; the uterus should be well contracted, feeling firm and hard to the touch.
2. Potential for uterine relaxation, including the following:
   a. history of uterine atony in a prior pregnancy
   b. maternal status as a grand multipara
   c. overdistension of the uterus, as with multiple gestation, polyhydramnios, or macrosomia
   d. induction or augmentation of labor
   e. precipitous labor
   f. prolonged labor
3. Completeness of placenta and membranes on inspection—i.e., evidence of possible retained placental fragments or membranes
4. Status of the urinary bladder
5. Availability of a second person to monitor uterine consistency and lochial flow, and assist with uterine massage
6. Ability of the mother-baby pair to initiate early breastfeeding (see Figure 33-2)

If the mother intends to breastfeed, placing the baby at breast may stimulate uterine contractions and promote maintenance of firm tone. If this is not possible, the use of oxytocics can be considered. Factors considered in using oxytocic drugs in the immediate postpartum period should include the woman's need for this therapy, and the action and effect of the different drugs available. The action, effect, dosage, and route of the different oxytocic drugs, and their use in control of immediate postpartum hemorrhage are discussed in Chapter 34.

FIGURE 33-2 Breastfeeding within the first hour of life.

Inspection and Evaluation of the Cervix, Vagina, and Perineum

Having assured that the uterus is well contracted and that any bleeding is from another source, the midwife inspects the perineum, lower vagina, and periurethral areas for bruising, hematoma formation, lacerations, or torn and bleeding blood vessels. If an episiotomy has been cut, it is evaluated for depth and for any extensions.

Next, consideration is given to inspection of the vaginal vault and cervix for lacerations or injury. In most normal spontaneous vaginal births, there will be no indication for this evaluation, and it need not be performed. Indications for such an examination include the following:

1. A steady flow or trickle of bright red vaginal bleeding, from above any observed lacerations, after uterine contraction is confirmed
2. Rapid or precipitous labor
3. Manipulation of the cervix during labor—e.g., to reduce an anterior lip
4. Maternal pushing prior to full cervical dilation
5. Operative vaginal delivery with forceps or vacuum
6. Traumatic delivery—e.g., shoulder dystocia

The presence of any of these factors indicates the need for cervical inspection and ascertainment of the need for repair. Some clinicians advocate routine inspection of the cervix, using the rationale that this eliminates cervical laceration as a cause of later hemorrhage. However, cervical inspection is not required in the presence of normal labor and birth without persistent bleeding. The midwife needs to master the thorough, rapid performance of this skill

for those occasions when it is necessary, since it is frequently uncomfortable or even painful for the mother. The technique of cervical inspection is discussed in Chapter 75.

Finally, the midwife should evaluate the perianal area for hemorrhoid formation and for any small skin tears. If an episiotomy has been cut or lacerations have occurred, assessment of extension into the rectal area is included in this inspection.

Inspection and Evaluation of the Placenta, Membranes, and Umbilical Cord

Even though the midwife may have performed a quick, cursory inspection of the placenta, membranes, and cord as they delivered, it is essential to completely examine them prior to repairing lacerations or an episiotomy. First, if the midwife finds evidence of retained placental fragments or membranes, the uterus must be explored; retained fragments can cause hemorrhage later as well as immediately after the birth. Second, delaying exploration until after any repair work is done will put tension on the suture line and may cause it to break down. Examination of the placenta, membrane, and cord is detailed in Chapter 74. Exploration of the uterus is described in Chapter 77.

Repair of Lacerations or Episiotomy

This step follows the evaluation of the placenta, as mentioned above. The uterus is checked for consistency once more prior to this step. The condition of the entire vaginal area should be considered before suturing begins. A plan should develop in the midwife's mind that facilitates hemostasis and the reestablishment of normal anatomy as the repair progresses; small, well-approximated first degree lacerations that are not bleeding may not require repair. Basic stitches used in the repair of lacerations, manipulation of the needle holder and suture, and step-by-step repair of a midline episiotomy, mediolateral episiotomy, and lacerations are detailed in Chapter 79.

Completing the Immediate Postpartum Evaluation

After all inspection, evaluation, and repair is complete, the midwife assesses the uterine fundus again. This provides an opportunity to assess tone, evaluate the effect of uterine massage on lochial flow, and express any accumulated clots. Next, a final vaginal examination is performed, to ensure that any gauze packing has been removed, evaluate the consistency of the lower uterine segment as needed, and check the status of any repairs. Finally, the midwife cleans the perineal area, vulva, inner thighs, buttocks, and perianal area, using the same principles observed when washing the area before delivery. Dried blood and secretions in this area can be sticky and irritating; this procedure will make the woman more comfortable. Clean absorbent bed pads and fresh linen are provided, and a perineal pad or ice pack may be placed against the perineum. Ice is used to decrease edema of the vulva, and to cool or comfort tissues bruised by the delivery process. Particularly if the woman has sustained significant lacerations, or smaller tears in particularly sensitive areas such as around the clitoris, ice may offer relief. Chemical ice packs, or crushed ice in a glove or small plastic bag, can be used; in either case, an insulating layer, such as a washcloth or pad should be between the ice and the woman's skin.

If women deliver or have vaginal repairs in lithotomy position, both legs are lifted down from the stirrups at the same time to reduce back strain, potential nerve compression, and physical discomfort, which may occur if one leg is down and the other is still up in a stirrup. The preferred technique is to bring her legs together and support her legs as she lowers them simultaneously to a resting position.

After completion of all tasks related to the mother's well-being, the midwife removes any sharps from her sterile field and straightens her work area, minimizing risk of an injury or exposure to blood and body fluids for others.

Monitoring Physiological Well-Being

Throughout the first hour after birth, the mother's vital signs, uterus, lochia, perineum, and bladder are regularly monitored and evaluated until all are stabilized in the normal range.

Vital Signs Monitoring the mother's blood pressure, pulse, and respirations begins immediately following the delivery of the placenta and continues every 15 minutes until the vital signs are stable at prelabor levels, or until a determination is made that a problem requiring more intensive monitoring exists.

In addition, the temperature is taken at least once during this period. New mothers are often thirsty, and all healthy mothers should be encouraged to drink liberally, particularly non-caffeine beverages such as water or juice. As soon as food is available, she can eat if she is hungry. However,

what she eats may be limited by what food is available or can be prepared at the site of birth.

Maternal shakiness or tremor not associated with infection can be relieved with warm blankets, reassurance, and the use of the same progressive relaxation and controlled breathing techniques she learned to use for labor relief.

Uterine Consistency and Lochia Uterine tone and amount of lochial flow are assessed simultaneously by regular massage of the uterine fundus. A well-contracted uterus will not demonstrate increased bleeding when massaged. In contrast, if the uterus has a tendency to relax and become boggy, the lochial flow will be moderate or large. This is assessed most easily by directly observing for an increase in lochia or expressed clots while massaging the fundus. Persistent heavy lochia when the fundus is well contracted will require further assessment.

Support to the lower uterus during massage prevents stretching the cardinal ligaments. To perform uterine massage correctly, grasp the lower uterus abdominally just above the symphysis pubis and hold it in place with one hand while massaging with the other. Effective uterine massage involves more than the anterior slope of the fundus. The entire fundus—anterior, lateral, and posterior—must be reached. This procedure is done quickly with a firm, gentle touch. As you begin, warn the mother that the procedure may be painful and explain why this is necessary. Such thorough massage can be avoided if the uterus is never allowed to become soft. Breastfeeding is an effective method of improving uterine tone, but few infants stay at the breast for a substantial portion of the first hour of life. Maintaining frequent light massage is also effective; if the nurse or birth assistant is unable to remain at the bedside throughout this time, the mother herself can be shown how to maintain constant, gentle contact and periodic light massage. She should learn this technique now in any event, since performing uterine massage periodically will continue to promote uterine contractions. Involving the mother encourages her to participate in managing her own care and be more knowledgeable about her body; it may lessen bleeding, and thus prevent the need for more thorough massage. Finally, if a woman has demonstrated risks for postpartum hemorrhage, oxytocic agents can be continued through this hour.

The mother should also be taught how to gently massage her uterus and check her lochia and encouraged to do so regularly for the first day or so after birth. Breastfeeding mothers can be reminded that nursing will be associated with afterbirth pains for a few days, directly related to the contraction of a uterus stimulated by pitocin release as the baby suckles.

Perineum Ongoing evaluation of edema, bruising, and possible hematoma formation is performed at each check of the lochial flow. This includes observation of the perianal area for hemorrhoids. In addition to application of ice packs, astringents such as witch hazel or Tucks Pads, or anesthetic/analgesic sprays or creams can be used to decrease local discomfort.

Bladder The bladder is assessed again near the end of this time and must be emptied if it is filling and has displaced the uterus. Hypotonicity of the bladder may cause loss of the urge to urinate. Women should always be encouraged to void spontaneously before catheterization is considered, since catheterization, besides being uncomfortable, carries an increased risk of infection. Whenever possible, the woman should be escorted to the bathroom and supported as needed; this is certainly the most comfortable and effective method of promoting urination. Unresolved epidural or spinal anesthesia, the lingering effects of late labor analgesia, or excessive blood loss may prevent this, in which case offering a bedpan is appropriate. Allowing adequate time for the mother to relax and urination to begin is important. Many midwives describe the benefits of using water to promote voiding, for example, by running water in the sink or tub, pouring warm water over the perineal area, or even putting the new mother into a warm shower. Relaxation measures that were helpful in labor may also help the mother at this time.

Initiation of Family Relationships with the Newborn

At the same time that the process of birth is being completed, a new process is beginning, equally as essential to the future of the family. This initial time—in which mother is most open to her infant and the newborn in his or her period of initial reactivity is equally open to new experience—is most valuable for the process of bonding. Klaus and Kennell, among other researchers, have promoted the importance of a sensitive period following birth

[1]. The idea of a sensitive period can be seen at work in the early behaviors of parents who reach out toward their infants, stroke or gently explore the newborn's body, change vocal tone and rhythm to a soothing pattern, position the child *en face*, etc. Cultural and individual variation persists in this as in so many human behaviors. The midwife needs to be aware that women will demonstrate a diversity of behaviors and be open to their range.

Uninterrupted contact between mother and infant during the hour after birth is well demonstrated to promote this attachment process. Righard and Alade studied healthy newborns and observed that, if left undressed on the mother's abdomen at birth, infants would soon begin to creep toward the nipple and latch on [2]. Widström and colleagues, who also studied neonates and their early suckling behaviors, found that mothers whose infants were in skin to skin contact and attempted to nurse in the first hour spent more time with their infants and increased the amount of talking to the infant during breastfeeding [3]. The time from birth to effective suckling is approximately an hour, suggesting that at least an hour of uninterrupted contact is important [2, 4] (see Figure 33-3).

Involving the father or other close family members in this period can promote the family's enjoyment (see Figure 33-4). However, limiting extended visits by well-meaning family and friends during this immediate period can also be a factor in maintaining mother-infant contact. The midwife can be an important part of maintaining the balance between the important work of family bonding and family celebration.

FIGURE 33-3 Initial breastfeeding during the fourth stage.

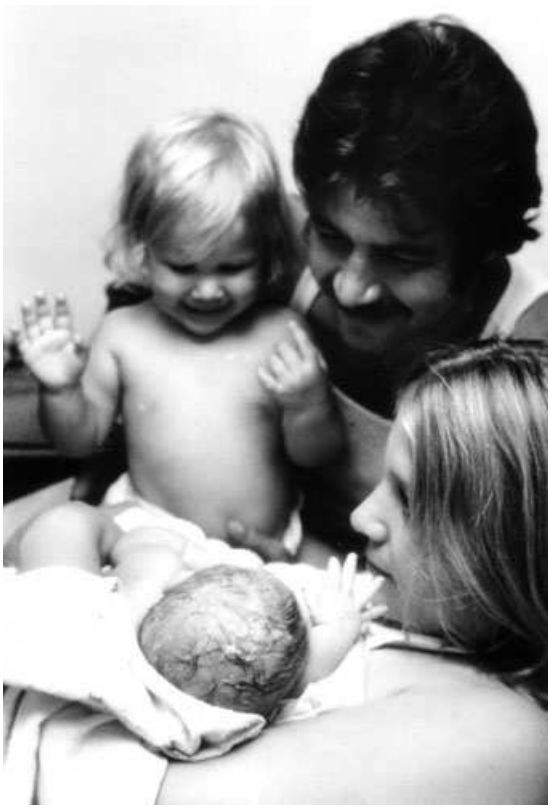

FIGURE 33-4 Family bonding.
Source: Photograph by Artemis/Harriette Hartigan.

For the hospital-based midwife, promotion of this prolonged contact may also involve reeducating hospital staff to provide newborn care at the mother's bedside and delay procedures such as footprinting until after the baby has breastfed. Often, the midwife will need to encourage mothers who are timid about initiating breastfeeding or tired from a long labor to maintain contact. She will also need to attend to her own behavior, working around the baby as she performs her evaluation and completes her tasks from the birth. When medical necessity requires interrupting this period—for example, to resuscitate an infant or deal with postpartum hemorrhage—attention is paid to reuniting the mother-infant couple as soon as possible.

The process of family attachment and relationship formation is an ongoing one. This hour alone is not enough to complete human bonding, nor is its absence fatal to the development of healthy families. It is, however, a particularly beneficial period; thus it is imperative for the midwife to value and promote this process.

References

1. Klaus, M. H., and Kennell, J. H. *Parent-Infant Bonding*. St. Louis, MO: Mosby, 1982.
2. Righard, L., and Alade, M. O. Effect of delivery room routines on success of first breastfeed. *Lancet* 336:1105, 1990.
3. Widström A-M., Wahlberg, V., Matthiesen, A. S., et al. Short-term effects of early suckling and touch of the nipple on maternal behavior. *Early Hum. Dev*. 21:153, 1990.
4. Widström A-M., Ransjo-Arvidson, A. B., Christensson, K., et al. Gastric suction in healthy newborn infants: effects on circulation and developing feeding behaviour. *Acta Paediatr. Scand*. 76(4):566, 1987.

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CHAPTER

34

Management of Immediate Postpartum Hemorrhage

Postpartum hemorrhage can be categorized as early (from delivery to 24 hours postpartum) or late (24 hours to 6 weeks postpartum). Early postpartum hemorrhage has greater blood loss and morbidity and is more common [1]. This chapter addresses postpartum hemorrhage that occurs immediately after delivery of the placenta.

Hemorrhage, by definition, is an abnormal loss of blood. The average blood loss during an uncomplicated obstetrician-conducted vaginal delivery is slightly more than 500 mL; the average blood loss during a cesarean section is approximately 1000 mL [2]. The average blood loss for a midwife-conducted vaginal delivery is observed to be less but has not been studied and verified. The probable reason for the difference is the fact that midwives do not routinely cut episiotomies and have mastered the art of delivery over an intact perineum. The average blood loss with an uncomplicated obstetrician-conducted vaginal delivery most likely reflects the blood loss from a much higher incidence of episiotomy and laceration.

The long-held and widely accepted definition of postpartum hemorrhage in obstetrics is a loss of 500 milliliters of blood or more. Note that the amount of blood loss specified in this definition of *hemorrhage* is the same as the average blood loss in vaginal delivery by an obstetrician; this is attributable to the fact that the clinical estimation of blood loss is underestimated by 30 to 50 percent [3, 4]. "Thus, the 'classic' definition of postpartum hemorrhage rests on a systematic tendency to underestimate measured blood loss" [5].

One does not, however, wait until there has been a loss of 500 milliliters of blood (actual or estimated) before deciding that the woman may in fact be hemorrhaging and taking appropriate action. Early action in the presence of excessive bleeding may prevent actual hemorrhage and certainly the life-threatening sequelae of hemorrhage that are first manifested by the signs and symptoms of shock.

Causes of Immediate Postpartum Hemorrhage

Immediate postpartum hemorrhage is hemorrhaging that takes place immediately after completion of the delivery of the placenta, which marks the end of the third stage of labor. In 80 to 90 percent of cases of immediate postpartum hemorrhage, the cause is uterine atony resulting from any number of predisposing factors (see below) or from incomplete delivery of the placenta—that is, retained placental fragments or cotyledons. The latter is also a cause of delayed postpartum hemorrhage. The other causes of immediate postpartum hemorrhage that a midwife might encounter include (1) cervical lacerations, (2) extensive lacerations of the vagina and perineum, and, (3) very rarely, laceration of the lower uterine segment or uterine rupture.

There are a number of other situations in which immediate postpartum hemorrhage may be encountered. However, these are, or relate to, abnormal situations in which the woman would already be under the management of a physician (e.g., placenta pre-

via, abruptio placentae, cesarean section, deep and prolonged inhalation anesthesia, operative procedures such as version and extraction, prolonged retention of a dead fetus following intrauterine death).

Predisposing Factors

Uterine atony and the possibility of immediate postpartum hemorrhage in essentially normal women usually can be anticipated prior to delivery. The following conditions should alert the midwife to the potential of immediate postpartum hemorrhage due to uterine atony:

1. Overdistended uterus (multiple gestation, polyhydramnios, a large baby)
2. Oxytocin induction or augmentation
3. Rapid or precipitous labor and delivery
4. Prolonged first and second stage of labor
5. Grand multiparity
6. History of uterine atony/postpartum hemorrhage with previous childbearing
7. Use of uterine-relaxing agents such as magnesium sulfate and terbutaline

Preparatory Measures

Anticipation of immediate postpartum hemorrhage as a result of uterine atony allows the midwife to take preparatory measures to most quickly and effectively prevent or control the amount of blood loss as much as possible. These preparatory measures include the following:

1. Make a deliberate decision regarding the locale of birth. If she has a combination of two or more predisposing factors, the woman should be in the hospital.
2. Alert your consulting physician to the possibility so he or she is prepared for a *STAT* call if needed.
3. Alert the nursing staff to the possibility and request that they draw up and have ready to give your order for oxytocic drugs for use immediately after delivery of the placenta.
4. Make sure that an intravenous infusion is started with a 16-gauge needle and that this venous route is patent at the time of delivery. Use 5% dextrose in lactated Ringer's solution.
5. Draw a type and crossmatch preparatory for obtaining blood if needed.
6. Make sure the woman's bladder is empty at the time of delivery.

Action, Effect, Dosage, and Route of Oxytocic Drugs

Action and Effect

Uterotonins, or oxytocics, cause the uterus to contract. Oxytocin is an endogenous uterotonin from the posterior lobe of the pituitary gland. Exogenous uterotonins include synthetic forms of oxytocin, ergots, and prostaglandins [6].

The synthetic forms of oxytocin (Pitocin, Oxytocin, Syntocinon) stimulate intermittent contractions. They have little to no effect on blood pressure *if* given intramuscularly or added to IV fluids. These are the drugs of choice in most situations. When added to an IV infusion, which will last over time, they supplement oxytocic drugs already being given to effect a sustained contraction; or they may be used by themselves when bleeding is not excessive but the uterus is tending to relax.

The semisynthetic ergot preparation methylergonovine maleate (Methergine) acts directly on the smooth muscle of the uterus and stimulates a sustained, tetanic contraction. Methergine potentiates a hypertensive condition and may cause blood pressure increases in normotensive women because of its peripheral vasoconstrictive effect. Methergine is contraindicated in women with hypertension, preeclampsia, or eclampsia.

The 15-methyl prostaglandin F_2 alpha (15-methyl $PGF_{2\alpha}$) (Hemabate [carboprost tromethamine]; Prostin/15M) stimulates smooth muscle, thus causing myometrial contractions similar to term labor contractions. It also stimulates the smooth muscle of other body systems, causing side effects of diarrhea, nausea, and vomiting; transient temperature elevation; elevated blood pressure; and transient bronchoconstriction. It is contraindicated for women who have acute pelvic inflammatory disease or active cardiac, pulmonary, renal, or hepatic disease. It should not be given to women with asthma. However, it sometimes controls uterine bleeding when other oxytocics have not.

The midwife thus has to decide which uterotonin to use based on the amount of bleeding, the status of the woman's blood pressure, and history of any contraindications. If a woman is having a little heavy bleeding and she is hypertensive, then a synthetic oxytocin most likely will suffice. If a

woman is bleeding excessively as a result of uterine atony (which indicates a need for a drug that will stimulate a sustained contraction) and her blood pressure has been and is normal, then Methergine is the drug of choice. If a woman is bleeding excessively as a result of uterine atony but there is concern for a possible hypertensive effect, Methergine or 15-methyl prostaglandin $F_{2\alpha}$ (Hemabate [carboprost tromethamine]; Prostin/15M) would be the midwife's drug of choice, regardless of the woman's blood pressure, *if* the intermittent contractions produced by synthetic oxytocin are not sufficient for control of the degree of uterine atony and bleeding present.

Dosage and Route

The standard single dose for each of the oxytocic drugs discussed is as follows:

- Pitocin, intramuscular injection, 10 USP units or international units (IU)/mL
- Oxytocin, intramuscular injection, 10 USP units or IU/mL
- Syntocinon, intramuscular injection, 10 USP units or IU/mL
- Methergine, intramuscular injection, 0.2 mg/mL; tablets, 0.2 mg/tablet
- Prostin/15M, intramuscular injection, 0.25 mg/mL
- Hemabate, intramuscular injection, 250 mcg/mL

Pitocin, Oxytocin, and Syntocinon may be given intramuscularly or added to intravenous fluids for a prolonged effect by intravenous infusion. *At no time should these drugs be given IV push.* This practice is fraught with cardiovascular danger [7] and is actually counterproductive to the lifesaving results desired in controlling immediate postpartum hemorrhage, the circumstance for which oxytocin is most often ordered.

The administration of Pitocin, Oxytocin, or Syntocinon 10 IU intramuscularly or 10–40 units diluted in 1000 mL of intravenous fluid has no demonstrable cardiovascular effect. However, intravenous injection (IV push) of even as small an amount as 0.5 unit elicits a pattern of hypotension and tachycardia. The extent of the hypotension and tachycardia and length of time before recovery to preinjection levels are directly proportional to the dosage given. The larger the amount given, the greater the reduction in blood pressure for a longer period of time. There can be nearly a 40 to 50 percent reduction in blood pressure with a dosage of 10 units [7]. This is sufficient to put a woman into shock, if she is not already, or to endanger the life of the mother if she is already in shock. Such an action is counterproductive to the desired results.

Methergine is intended for intramuscular use. Methergine can also be given intravenously, but this practice is *warned against* as it may cause sudden hypertension and a cerebrovascular accident. *At no time should Methergine be given prior to birth of the baby* because a sustained contraction at that time could have the effect of killing the baby (by sustained uteroplacental insufficiency) and rupturing the uterus, thereby endangering the life of the mother. A single 0.2-mg intramuscular dose of Methergine is the effective amount. This may be repeated in 2 to 4 hours if needed. A larger dose does not increase the effectiveness of the drug in the event of hemorrhage but would unnecessarily increase the risk of undesirable side effects. Methergine tablets are used as needed during the postpartum period, as discussed in Chapters 42 and 44.

The idea of giving a combination of Methergine and Pitocin, Oxytocin, or Syntocinon intravenously, on the assumption that their opposite actions will counteract each other, is erroneous. Instead, the woman responds sequentially, first reacting to the synthetic oxytocin by developing hypotension and then reacting to the semisynthetic ergot preparation by developing hypertension.

Prostin 15/M and Hemabate are intended for intramuscular use only. While usually given in the deltoid muscle, prostaglandins may also be given directly into the myometrium through either a transabdominal or a transvaginal route.

The use of uterotonins is invaluable in controlling postpartum uterine bleeding. The desired action can be obtained rapidly by way of the intramuscular route for the semisynthetic ergot preparation or by way of the intramuscular or diluted intravenous infusion routes for the synthetic oxytocin drugs, and without the cardiovascular dangers involved in direct intravenous administration of any of these drugs.

Management Steps

Bleeding should be minimal if the woman's uterus is well contracted after delivery of the placenta. If, instead, there is a steady flow (as opposed to a trickle) or gush of blood from the vagina the midwife should take the following steps to manage this emergency:

1. Check the consistency of the uterus. This step is first, since 80 to 90 percent of immediate postpartum hemorrhage is due to uterine atony.
2. If the uterus is atonic, massage it in order to stimulate contraction so that the bleeding vessels at the placental site will be ligated.
3. If the uterus fails to contract well *immediately* with massage:
   a. Do bimanual compression (see Chapter 78). In addition to stimulating contraction of the uterus, which ligates blood vessels at the placental site, bimanual compression places continuous pressure on the uterine veins and on the lower uterine segment, which may be another site of bleeding.
   b. Simultaneously order the administration of oxytocic drugs (if they have not already been given) or additional oxytocic drugs.
   c. Make sure the IV is patent, or have the nurse start one with a 16-gauge needle and 5% dextrose in lactated Ringer's solution to which is added 10 units of Pitocin per 500 mL of solution. If the woman does have a patent IV, have the nurse add Pitocin to the existing IV solution in the proportion just stated.
4. If the woman's bleeding still is not under control:
   a. Have the nursing staff give your consulting physician a *STAT* call.
   b. Continue bimanual compression.
   c. Have a type and crossmatch drawn, if not already drawn, and sent to the blood bank.
   d. Have the nursing staff monitor the woman's blood pressure and pulse for signs of shock.
5. Examine the placenta, or have it examined, to ascertain if any placental fragments or cotyledons were retained and to determine if a uterine exploration needs to be done.
6. If placental fragments or cotyledons are missing, do a uterine exploration (see Chapter 77). The uterus needs to be completely empty in order to contract effectively.
7. If the uterus is empty and well contracted but bleeding continues, examine the woman for cervical, vaginal, and perineal lacerations since these may be the cause of the hemorrhage (see Chapter 75). Tie off the bleeders that are the source of hemorrhage and repair any lacerations (see Chapter 79).
8. If the woman is developing shock (lowered blood pressure; elevated pulse rate; rapid, shallow respirations; cold, clammy skin), place her in Trendelenburg shock position, cover her with warm blankets, administer oxygen, and order the blood to the floor.
9. In extreme and very rare cases when hemorrhage is rampant, the woman's life is in imminent danger, and the physician has not yet arrived, aortic compression can be carried out in relatively thin women. This involves abdominally compressing the aorta against the spine.

In the vast majority of situations in which a midwife is managing the care of the woman and an immediate postpartum hemorrhage occurs, it is readily controlled with a combination of bimanual compression and oxytocic drugs. Usually management steps are taken so rapidly (because of anticipatory alertness and early detection) that excessive blood loss is avoided. Occasionally the midwife will need to perform an intrauterine exploration (Chapter 77). In an extremely rare situation (never seen by most midwives), the first seven steps listed here will not be sufficient. In such an event the midwife maintains the woman as outlined in the additional last two steps until the physician arrives.

References

1. Postpartum hemorrhage. *ACOG Educational Bulletin* No. 243 (January) 1998.
2. Pritchard, J. A., Baldwin, R. M. J., Dickey, J. C., and Wiggins, K. M. Blood volume changes in pregnancy and the puerperium. II. Red blood cell loss and changes in apparent blood volume during and following vaginal delivery, cesarean section, and cesarean section plus total hysterectomy. *Am. J. Obstet. Gynecol.* 84:1271–1282, 1962.
3. Combs, C. A., Murphy, E. L., and Laros, R. K., Jr. Factors associated with postpartum hemorrhage with vaginal birth. *Obstet. Gynecol.* 77(1):69–76 (January) 1991.
4. Akins, S. Postpartum hemorrhage: a 90s approach to an age-old problem. *J. Nurse-Midwifery* 39(2 suppl.):123S–134S (March/April) 1994.
5. Diagnosis and management of postpartum hemorrhage. *ACOG Technical Bulletin* No. 143 (July) 1990.
6. Brucker, M. C. Management of the third stage of labor: an evidence-based approach. *J. Midwifery Womens Health.* 46(6):381–392 (November/December) 2001.
7. Hendricks, C. H., and Brenner, W. E. Cardiovascular effects of oxytocic drugs used postpartum. *Am. J. Obstet. Gynecol.* 108:751, 1970.

CHAPTER

35

Birth in the Home and in the Birth Center

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Introduction

Birth is profoundly affected by the environment in which it takes place. Ideally, every laboring woman and the team that supports and facilitates her efforts to birth work together in an environment that is the most comfortable and safe for the birthing mother. For many women, families, and providers, that safe, comfortable place to birth is in the home or birth center.

The midwife who works in the home or birth center has an opportunity to develop the hands-on, low-tech skills that are a hallmark of midwifery. Expertise in and fascination with normal life processes make midwives keenly aware of how much they depend on the mother's natural abilities to birth. Midwives finely tune perception and interaction skills that amplify the mother's abilities. The women in these birth settings are active in creating a network of support that enables them to optimize their health, and to birth safely, effectively, and with great satisfaction. These women are true partners with their midwives as together they create the process of care. As described by Varney in an earlier edition of this book:

> If one were to place the control and responsibility assumed by the woman on a continuum, the continuum would stretch from the hospital delivery room at one end to home birth at the other. There are two important breaks in this continuum where power is transferred to the woman. The first break is when birth moves out of the hospital. The second break is when it moves from a freestanding out-of-hospital childbirth center to the home. In each instance the woman moves further away from external regulations and policies that are imposed on her childbirth experience. [1]

A wealth of data exists describing safe healthy outcomes in home and birth center births. In the United States and abroad, data have been obtained from small individual practices, larger networks of practices, analysis of birth certificates, and large-scale government sponsored epidemiological studies [2–28]. These studies have shown that planned home and birth center births for healthy women experiencing normal pregnancy are at least as safe as, and in some cases safer than, birth in the hospital. These studies also have documented that rates of obstetrical interventions are lower for women who begin their labors out of the hospital.

Perinatal mortality rates for these study populations range from 1.3 to 4.3/1000. In-labor transfer rates for women planning to birth at home or in a birth center were 2.3 to 23 percent. Cesarean birth rates for women transferred after starting labor at home or in a birth center were between 1.4 to 8.3 percent. For home or birth center born babies, only 0.5 percent of 5-minute Apgar scores were less than 7. Women who gave birth in a freestanding birth center or home had a lower incidence of meconium staining, fetal distress, shoulder dystocia, birth injury, neonatal respiratory distress, and postpartum hemorrhage [22, 29, 30]. In the United States in 1999, 35,977 births (0.9 percent) were

out-of-hospital, with 23,516 (0.6 percent) home births and 9642 (0.2 percent) in freestanding birth centers [31].

Hospitals often advertise their labor and delivery suite as a birth center or an alternative birthing center (ABC). These labels can be very confusing, as they have been used to refer to both in-hospital and out-of-hospital centers. The birth centers under discussion in this chapter are either freestanding or physically separate from the hospital labor and delivery area. In most cases, they are also administratively separate from a hospital. They are autonomous, formulating policies and procedures for operating both the facility and the program for the childbearing families they serve.

There will always be women who prefer to give birth outside of the institutional walls of a hospital—either in the home or the birth center. Many CNMs/CMs and SNMs/SMs do not have opportunities to work in these settings. This chapter describes how the midwife works with the mother who chooses home or birth center as her preferred birth site.

History*

Before 1900, giving birth in a hospital was the rare exception. Fewer than 5 percent of all women gave birth in the hospital and then only because they were desperately sick. Birth happened at home, controlled by women and attended by female midwives.

All this changed in a brief span of time. By 1940 nearly half of all births took place in hospitals and by 1970 the changeover was complete, with over 99 percent of births occurring within hospitals. Birth now happened in the hospital, controlled by men and largely attended by male physicians.

Some of the same factors influencing the status of midwives during the late nineteenth and early twentieth centuries (see Chapter 1) were also responsible for the move of birth from home to hospital. These factors include the evolution of the "male midwife" (physician) in the late eighteenth century; the inclusion of obstetrics in medical practice with the concurrent development of lying-in wards for the urban poor for teaching purposes during the late nineteenth and early twentieth centuries; Semmelweis's conquest of puerperal fever by hand washing, which made hospitals more safe; the concerted effort to abolish midwifery in the early twentieth century; the evolution and refinement of early obstetric technology such as forceps (eighteenth century), anesthesia (ether, 1847; chloroform, 1853; spinal anesthesia, 1885–1946), analgesia (1902), and infant incubators (late nineteenth century).

The physician promise of pain-free birth required that women be in the hospital in order to be near emergency equipment if needed in the event of anesthetic or analgesic complications. Women not only wanted pain-free birth but also demonstrated for it forming such organizations as the National Twilight Sleep Association. But the move into the hospitals brought with it the days of female dependency behaviors during pregnancy, labor, and birth; fear of pain and ignorance; centralized nurseries; and separation of baby from the mother and the mother from the family. The rural and urban poor who could not afford medical insurance or were not able to pay cash were attended by "granny" or immigrant midwives. "Colored" women were refused admission to hospitals. Both groups were denied access to the "comfortable, pain-free" childbirth promoted by the hospitals during this period of transition of birth into the hospital [32].

Another factor influencing the move into hospitals was the development of third party payment for health care. The Emergency Maternity and Infant Care program was instituted in 1943 to pay maternity and infant care costs for the families of servicemen. This specified hospital delivery. A 1948 U.S. Supreme Court decision increased the provision of health insurance by employers in negotiated contracts; by 1950, 50 percent of people in the United States had hospital insurance. This increased to 78 percent by 1970 after the advent of Medicaid and Medicare in 1965 [33].

The early nurse-midwifery services were home birth services (Frontier Nursing Service, founded in 1925; Lobenstine Midwifery Clinic, 1931; Tuskeegee School of Nurse-Midwifery, 1941; Catholic Maternity Institute, 1944). Nurse-midwives did not move into the hospitals until the mid-1950s when they made a deliberate and successful effort to gain access to the public hospitals because these hospitals were where the majority of women they had been caring for were now giving birth [34]. The move into hospitals was also part of moving into educational institutions for the place-

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ment of nurse-midwifery educational programs (Columbia University, 1955; Johns Hopkins University, 1956; Yale University, 1956; the move of the Maternity Center Association School of Nurse-Midwifery into Downstate Medical Center, State University of New York, 1958).

The early expression of consumer desire to reclaim responsibility for birth and promote the normalcy of childbearing, and their dissatisfaction with hospital childbearing practices and routines began in the 1940s. The mid-1940s saw the development of rooming-in in an effort to facilitate early mother-father-infant-family relationships and end the practice of separating mother and baby from each other and from the family. Grantly Dick-Read wrote *Childbirth Without Fear* in 1944 [35]. Herbert Thoms wrote *Understanding Natural Childbirth* in 1950 [36]. Maternity Center Association developed preparation for parenthood and childbirth classes and teaching materials such as *The Birth Atlas* during the 1940s and 1950s. Marjorie Karmel wrote *Thank You, Dr. Lamaze* in 1959 [37], and with her book the use of psychoprophylaxis and a variety of childbirth theories and methods got under way.

The late 1950s and the 1960s and early 1970s also saw consumers and professionals joining together to form national organizations to promote their beliefs in natural, prepared childbirth. Examples include the International Childbirth Education Association (ICEA), the American Society for Psychoprophylaxis in Obstetrics (ASPO), La Leche League International, the National Association of Parents and Professionals for Safe Alternatives in Childbirth (NAPSAC), Childbirth Providers of African Descent, and many smaller organizations. Some organizations were specifically supportive of home birth, such as Home Oriented Maternity Experience (HOME), the Association of Childbirth at Home International (ACHI), and the American College of Home Obstetrics.

The organizational alliances of consumers and professionals began to focus not only on promoting change within hospitals but also on the acceptance of out-of-hospital birth and the services midwives could provide. Consumers recognized that childbirth had not always been in hospitals and wanted a return to the norm of birth as a family event. They perceived this norm as naturally occurring in their homes or in freestanding birth centers with the hospital available in the event of variations of normal or complications requiring the technology and medical care located there.

The first established freestanding out-of-hospital childbirth center was La Casita at Catholic Maternity Institute in Sante Fe, New Mexico. It was started in the mid-1940s by graduates of the Maternity Center Association School of Nurse-Midwifery who were medical mission sisters. It closed in the mid-1960s. During the 1940s and 1950s, maternity shelters or community birthing centers were started in at least two counties in Georgia with nurse-midwives in attendance [33]. There were also a number of so-called maternity hospitals or homes in the 1940s and 1950s that were often associated with residential care for unwed mothers. Most of these closed between the late 1950s and the mid-1960s.

In 1972, Su Clinica Familiar, a migrant health clinic in southern Texas, expanded its services to include births in their clinic setting and became the first out-of-hospital childbirth center in more recent history [38]. The Maternity Center Association in New York City opened its precedent-setting Childbearing Center (CbC) in 1975 [39]. The CbC was designed to be a model that could lend itself to regulation, be financially viable, set standards, and be widely replicated with the intent of changing the maternity care delivery system (see Figure 35-1). Birth centers started to multiply. In 1981, the Cooperative Birth Center Network—a program of the Maternity Center Association of New York, which was funded by the John A. Hartford Foundation—began collecting data on birth centers and establishing a network for the collection and dissemination of information regarding birth centers. Recognizing the need for representation, further development, and help in implementing the birth center concept, and standards in the face of a proliferating number of childbirth centers, the Cooperative Birth Center Network underwent a metamorphosis in 1983 to become a nonprofit membership organization called the National Association of Childbearing Centers (NACC). One early function of this organization was to develop standards and criteria for care and safety in childbirth centers. This led to the formation by NACC of the Commission for the Accreditation of Birth Centers in 1985. Birth centers seeking accreditation undergo a rigorous internal and external review for compliance with established standards for excellence.

The American College of Nurse-Midwives (ACNM) has taken a professional leadership role in promoting the safety of out-of-hospital birth settings. The ACNM first published *Guidelines for Establishing a Home Birth Service* [40] and

FIGURE 35-1 The Childbearing Center of the Maternity Center Association. (top) The family room; (bottom) a multipurpose room used for group discussion and as a playroom for children accompanying their parents.
Source: Courtesy of the Maternity Center Association, New York. Photographs by Paco North.

Guidelines for Establishing an Alternative Birth Center (out-of-hospital) in 1979 [41]. The ACNM based its action on the experience, statistics, and demonstrated safety of nurse-midwives in home birth and birth center settings since 1925. In 1980, revised in 1997 and 1999, the ACNM came out with a position statement on practice settings that states the following:

> Every family has a right to experience a safe and satisfying childbirth, attended by providers who respect cultural variations, human dignity, and the rights of consumers to freedom of choice and self-determination. This includes respect for the client preferences regarding birth site. The education and preparation of CNMs/CMs qualify them to practice in a variety of settings including hospital, home and birth center. [42]

The Office of Migrant Health in the Bureau of Community Health Services of the U.S. Public Health Service contracted with the American College of Nurse-Midwives in 1980 to provide guidelines and consultant help in establishing childbirth centers associated with their clinics.

The National Association of Childbearing Centers conducted a prospective descriptive study between 1985 and 1987 that examined the care provided in birth centers. Known as the National Birth Center Study (NBCS), it examined the experience of 17,856 women who received care in 84 birth centers "to determine if birth centers are safe; and to describe the women who use birth centers, the care provided to those women, and the results of that care" [17, 43, 44]. Safety of care provided in birth centers was affirmed and the descriptive data collected during the study are invaluable.

In 1995, the *Journal of Nurse-Midwifery* published a special issue on home birth [45] and in 1997 the ACNM published *The ACNM Handbook: Home Birth Practice* written by the ACNM Home Birth Committee [46]. Recent studies published in 1995 and 1998 have again confirmed the safety of home birth with CNMs in attendance [4, 15]. This was first documented in 1958 by the Metropolitan Life Insurance Company in their analysis of 10,000 births in the Frontier Nursing Service [47].

There are still women in some segments of society—e.g., migrant workers, rural or urban poor or working poor—who do not receive prenatal care and give birth at home, not by choice but because they do not have access to all the resources and facilities of the health care system. For the vocal individual consumer, consumer groups, and the aforementioned national organizations, however, birth at home or in a birth center is a matter of choice and educated, participatory decision-making. These are knowledgeable consumers who promote a health care system that starts in the home and are disenchanted with what hospitals have to offer in *routine* maternity care and services. Resolving the resulting issues of power, control, responsibility, economics, and safety of both in-hospital and out-of-hospital birth settings have challenged consumers and health care providers alike.

Characteristics of Birth Center and Home Birth

The home and birth center environments have distinctive features that support healthy women experiencing normal birth. According to the World Health Organization:

> A low-risk pregnant woman should give birth in a place where she feels safe . . . that place may be at home, at a small maternity clinic, or birth center in town, or perhaps at the maternity unit of a larger hospital. It must be a place where all the attention and care are focused on her needs and safety, as close to home and her own culture as possible. [48]

The attributes of these settings broaden labor and birth management choices for nonpharmacologic childbirth. The following are characteristics of the home and birth center settings:

1. Centrality of the birthing woman is clearly recognized as essential.
2. Consumers in these settings are healthy women who are
   a. experiencing normal pregnancy
   b. actively working to promote their own health
   c. taking a partnership role in decision-making
3. Environments are optimal for normal birth.
4. Midwife and birthing family have increased authority.
5. Safety is preserved by adherence to essential principles.
6. Complex technologies are deliberately kept at a distance.

7. Practices are often owned by midwives.
8. Independence in midwifery practice is fostered.
9. Bureaucracy is minimized.
10. Preferences for varying levels of family participation are accommodated.

Care Process Characteristics

The centrality of the birthing woman is easy to recognize in the small and intimate environments provided by the home or birth center. Distracting events are minimized, allowing mother and practitioner alike to focus on the mother's all-important task of giving birth. Anticipating birth in a low-tech environment, these women and the midwives who work with them make a commitment to health promotion. They acknowledge that it is the pregnant woman herself who potentiates an excellent outcome, by engaging in the activities that will enhance her health.

A number of factors make these environments optimal for normal birth. First, the mother's natural efforts are respected, and all who work with her are dedicated to the concept that birth is normal. Within these environments, it is expected that the mother has the ability to birth her baby. She can do so with physical, social, and psychological support and without the use of complex technology. She surrounds herself with only the people she chooses, meeting her needs for privacy or companionship. Her team may be as small as four (the woman and her birth partner, the midwife, and the birth assistant) or as large as the home or birth center can accommodate. Able to focus only on the mother, the team offers their skills, presence, and support. They work to enhance the mother's comfort, helping her to use her energy efficiently. They provide an environment of safety and instill confidence, communicating their belief that she is doing fine and has the capacity to get the job done.

The environment itself communicates this expectation of normalcy. It is familiar, without elements foreign to the mother. There is no physical evidence of machinery designed to do the job for her. She is not attached to equipment. She is free to move around and to be in any position she chooses. She can easily alter her environment or make changes within it. She can go outdoors for walks that can invigorate her, occupy her attention, and promote labor progress. She can get in and out of a shower or tub to promote relaxation. Her privacy is protected. She can make sounds without fear of being overheard by strangers close by. She has her own clothes to wear or not wear as she sees fit. Familiar food and drink that she and her family have provided are available to nourish her. At home or in the birth center, women are less likely to encounter pathogenic bacteria and invasive procedures in their birth environment, reducing the risk of exposure. In the home, especially, maternal immunities to familiar bacteria protect the baby via the placenta, lessening the likelihood of infection for the pair [24].

In home and birth center practice, emphasis is placed on labor as a dynamic entity where progress may be rapid sometimes and slow at others. These ebbs and flows are viewed as essentially normal. An important task for the midwife is to attentively observe the mother's available energy and to work with her to maximize its efficient use. Encouraging food and fluid intake to maintain adequate fuel prevents exhaustion. When the woman is tired and contractions are flagging, quieting the environment is a simple task, minimizing interruptions to promote rest. When rest and nourishment have helped the mother to recoup her strength, she can change her activity to increase the effectiveness of the contractions. In the hospital environment, there is pressure from a variety of sources to alter these normal ebbs and flows of progress. These pressures may be physical—for example, the need to make space available to accommodate other laboring women. There may be active management policies and protocols mandating progress. Away from the hospital, attention can be focused on addressing the woman's needs, enabling her to progress or rest, expecting and accommodating plateaus of progress.

All births are owned by the mother and by those she has chosen to share in her maternity experience. At home and in the birth center, this ownership is easier for the woman and her providers to recognize. As a result, the mother feels increased authority to exert control over the birth's environment, management, and outcome. In this personalized milieu, the woman is able to communicate her birth plans directly with the policymakers prior to labor. She feels assured that her preferences will be honored and looks forward to her birth, confident that the providers have a management philosophy congruent with her own. She feels that the only surprises she will encounter are the ones labor brings, and that she has a right not to be distracted from her work while she is in labor.

The midwife practicing in these settings also feels her authority bolstered, as illustrated in the following excerpt:

> I was in a setting where no one could impose external parameters and policies; where I could use my clinical judgment and conclude that all was normal. There was no one around to tell me otherwise, to try to fill me with negativism and doubt, or to tell me I was wrong. [1]

This authority can be liberating and it can be daunting.

Safety Characteristics

In order to preserve safety at home and in the birth center, it is necessary to adhere to the following essential principles [1, 4–8, 11–13, 16, 18–20, 25–28, 49]:

1. *The woman must be committed to actively engage in health promotion*. Without good health, it is unsafe to plan birth at home or in a birth center. A healthy pregnancy is not a gift. Women must work to build excellent health, a strong uterus, an exquisitely functioning placenta, and a vigorous baby.
2. *The place of birth must be planned before the onset of labor*. Adequate planning for the place of birth includes determination that the mother's health and the pregnancy are within normal limits when labor begins and that preparations for appropriate support are in place.
3. *The attendant must be skilled, able to screen appropriately, provide vigilant care, and manage emergency complications should they occur*. In addition to assisting with health promotion antepartally, a skilled home or birth center midwife is vigilant in observation, communication, data collection, and care. This vigilance identifies reassuring signs of normalcy, as well as deviations from the norm that may preclude a home or birth center option. If problems occur or persist at any time in the maternity cycle, the midwife acts to correct the problem or if necessary, works to stabilize the mother's condition and transfer the mother to hospital-based care.
4. *There is a system in place for access to medical consultation, hospitalization, and emergency transport*. Clinical practice guidelines outline indications for consultation and a mechanism for transport. The midwife has established relationships with hospital-based practitioners to ensure a smooth transition into the hospital should a transfer be indicated.

Complex technologies are intentionally kept at a distance at home and birth center births. Minimizing technology may prevent some complications. The cascade of interventions that are often utilized in the hospital setting is well known [50]. Simply putting the mother to bed may have the effect of slowing down labor progress or increasing the possibility of posterior fetal position [51]. Hampering mobility with an intravenous (IV) infusion or discouraging an upright position by attaching a fetal monitor may reduce the mother's comfort and cause her to become anxious. Maternal anxiety increases the level of adrenaline that may interfere with the action of endogenous oxytocin [48]. Adding an oxytocin pump may increase maternal discomfort from augmented or induced contractions, and pharmacologic pain relief may be needed to enable the mother to cope. These more complex technologies are not benign. Some of them cause problems that can be remedied only with still more technologies. A need for complex technologic intervention is an indicator for transfer to the hospital.

Administrative Characteristics

Home and birth center services are owned mostly by the midwives who practice there. The midwives render care within a structure that they create and maintain themselves, fostering independent midwifery practice and leadership skills. These practices tend to be small, minimizing bureaucracy and simplifying communication and policy. Administrative time and paperwork are reduced and the organization is more client-friendly. Care can thus be more responsive to the needs of the mother, her family, and the midwife.

Characteristics Differing in Home and Birth Center Settings

Although both home and birth center practices share philosophical and administrative characteristics utilizing the same equipment and personnel, there are still differences between the two. The primary difference is that a birth center is still the professional's territory to which the woman comes, while a home birth takes place in the woman's territory to which the midwife goes [1]. The balance of power in each setting is different.

A woman who decides to remain in her own home to birth has increased authority. The midwife and the birth assistant are the guests, and the woman is the host. The mother is in her own territory at home where familiarity and privacy are increased, reducing the stresses that may accompany labor and birth. Because the midwife is the one who

travels to the mother, labor, birth, and postpartum are not disturbed by a trip that could slow or stop early labor, cause intense discomfort in active labor, or increase the risk of giving birth en route. When families have their babies at home, there is little interruption in family routines for adults as well as for children, and there is uninterrupted bonding. When the mother and the newborn baby are stable and settled postpartum, the rest period that occurs after the initial period of neonatal alertness is not interrupted by the return trip. Instead, the midwife and the birth assistant tuck the mother and baby into bed and quietly leave the home.

The birth center concept is a replicable model that has become a well-recognized birth option for families. The National Association of Childbearing Centers provides this description of a birth center:

> A homelike facility, existing within a health care system with a program of care designed in the wellness model of pregnancy and birth. Birth centers are guided by principles of prevention, sensitivity, safety, appropriate medical intervention, and cost effectiveness. Birth centers provide family-centered care for healthy women before, during, and after normal pregnancy, labor, and birth. [52]

Because our society has become accustomed to conducting birth in an institution, birth centers provide a compromise for families who wish to avoid the hospital but feel that the home birth choice is "too radical." Some families choose the birth center alternative to gain more privacy than they could achieve in their own busy household. Families who live outside a home birth midwife's geographic service area may choose a birth center birth to get the out-of-hospital birth services they desire. Families choosing birth center births often express concern regarding the "birth mess." The fact that at the birth center the family is relieved of clean up responsibilities may influence the family's decision.

Since birth centers are a birth option more accepted by the general population, families may feel that if an unexpected poor outcome occurred at the birth center, other family members and friends would be somewhat less accusatory than they would be if the birth had occurred at home. Accreditation is another factor that enhances family and practitioner confidence in the birth center choice. The Commission for the Accreditation of Birth Centers (CAB) of the National Association of Childbearing Centers (NACCs) provides a mechanism for external review giving guidance to professionals planning birth centers and practicing in them [53]. There is no comparable agency for home birth.

Birth Center and Home Birth Practice Models

Models of Birth Center Practices

There are two models of freestanding, out-of-hospital childbirth centers: the closed model and the open or community model. The closed model is a birth center that is used by a single practice of midwives and/or physicians. Most often the center is owned by the practice that provides services there. Only women who seek care from that practice may give birth at the center and privileges are not extended to any other providers in the community. Such a birth center is usually a facility not only for maternity services and birth, but also interconceptional care, well-woman gynecological care, and primary care of women [1].

The open model is a community facility owned by a separate corporation. It is available to all women whose health care providers have practice privileges at the birth center. Such a childbirth center may serve as a community resource, providing a media center, childbirth education classes, and other birth-related services. It is primarily a facility for intrapartum and postpartum care (see Figure 35-2). Women receive their prenatal, postpartal, gynecologic, and primary care in the offices of their health care providers and give birth at the birth center. There may or may not be an "in-house" practice that provides prenatal, postpartal, gynecologic, and primary care at the birth center [1].

Models of Home Birth Practices

Home birth practices are usually midwife owned and may be either solo or group practices. Home birth solo practice can be very rewarding but also quite challenging. The relationship between the solo midwife and the mother gives each great satisfaction. However, the intensely personalized relationship makes each reluctant to get assistance, if needed, from another midwife. It is not unusual for families' homes to be far from one another, making it difficult for the midwife to manage more than one labor at a time. The small number of CNMs/CMs in home birth practice makes cross coverage difficult to find. Group home birth practices allow the midwife more collegial support, and help decrease

FIGURE 35-2 Birth room in the Family Childbirth Center, New Haven, Connecticut.

the occurrence of practitioner burnout. When mothers meet more than one midwife from the outset, they are often amenable to having any of the group attend their births. However, relinquishing the unique one-to-one relationship created within the solo practice may decrease satisfaction for both midwife and mother.

For midwives who may not be interested in owning their own practice, a collaborative practice model works well. Usually owned by a physician or corporation, either a solo midwife or a group of midwives is hired to provide home birth services for interested families. This model encourages independent practice for the midwife, while the owner of the practice provides for administration. Financial arrangements may vary. The midwife may have a set salary or there may be other incentives such as profit sharing, bonuses, or payment according to the number of office visits and births attended.

Models of Combination Practices

Many birth center and home birth practices offer a combination of services: home/hospital, home/birth center, birth center/hospital, and home/birth center/hospital. Offering more than one birth option may increase the number of families interested in a midwifery service. This practice model provides the woman continuity of care as she begins her prenatal care with a service that allows her to easily change her planned birth site. In a combination practice, the midwife also has an opportunity to explore birthplace options with women who never would have considered a home or birth center birth. The midwife is not the only source providing information to help women consider all of their choices. For example, other families in the practice's reception area often share their experiences while waiting for their appointments. The mother, armed with information, develops the self-assurance needed to take an active role in selecting her child's birthplace.

Access to Hospital-Based Care

Access to medical consultation is crucial in all midwifery practice models. When women plan to birth at home or in a birth center, not only do they need access to consultation but they also need access to hospitalization should the need arise. Some out-of-hospital CNMs/CMs maintain hospital privileges enabling them to transfer and provide care for the mother who needs interventions that are more safely implemented within the hospital. Other out-of-hospital midwives elect to maintain consultation relationships and transfer care to hospital-based CNMs/CMs, family physicians, or obstetricians.

Plans for consultation and transport may be structured in a variety of ways. The most straightforward way is to have a formal written agreement with hospital-based practitioners or directly with a hospital. The midwife may consult with a solo practitioner, a group practice, several practices, or the house staff employed by the hospital. Each option has benefits and drawbacks.

The main benefit of working with a single solo practitioner is consistency in clinical policy. Management is usually predictable. The main difficulty is that if the consultant is away or unavailable, there may be no other provision for coverage. In addition, the solo consultant may feel overwhelmed if called upon to manage several complicated referrals in quick succession. At the other extreme, having an agreement with a hospital for staff to cover consultation needs provides 24-hour coverage. However, the disadvantage is that the practitioner who receives the mother in an emergency may be completely unfamiliar with home or birth center birth, and have a management philosophy extremely different from the referring midwife's practice. Because this limits the ability to know what to expect, anticipatory guidance in various clinical situations becomes extremely difficult. Having a small number of familiar, reliable consultants who cross-cover for one another works well. Sometimes, several midwifery practices may hire a physician to provide consultation services. The midwives benefit by sharing the cost. However, by covering more than one midwifery service, the physician may become overextended.

While some home and birth center CNMs/CMs maintain hospital privileges, others, for a variety of reasons, elect not to have them or are unable to get them. Out-of-hospital midwives may feel that their first commitment is to serve women who are planning to birth out of the hospital. They feel that if they also tried to serve women planning hospital births, there would not be enough space in their practices to meet the needs of their out-of-hospital census. Others feel that they would not be able to keep up with the bureaucratic and political administrative tasks associated with hospital privileges at the various hospitals that may be close to their clients' homes. In most of the above cases, continuity of care can be accomplished by accompanying the women requiring transfer into the hospital. Making a consultation agreement with hospital-based CNM/CM practices affords a means of access to the hospital, fostering the collegial relationship among midwives. Mothers appreciate this arrangement because even if they transfer to the hospital, they may still have their birth attended by a midwife.

When developing a consultant relationship, the midwife writes the clinical practice guidelines on which the practice is based and identifies those situations for which consultation would be needed. Negotiations for the desired services may then take place. Some consultants may be hesitant to put an agreement in writing due to concerns about professional liability insurance or their position in the community. If it is not possible to make a written agreement, it is reasonable to have an oral agreement. This works only if the midwife has a relationship with the consultant or hospital that is built upon mutual trust, open communication, and respect. This relationship is critical for the midwife and the mother in order to guarantee access to the hospital if more complex technologies are indicated. A difficult and potentially dangerous situation could be encountered if the consultant or hospital denied the midwife access to services for the mother when they were needed [46].

While working with consultants, management dilemmas may occur that have political implications. Once in-hospital CNM/CM or MD consultants become comfortable working with out-of-hospital midwifery management decisions, fewer visits may be required for mothers planning out-of-hospital births. Mothers may still want to meet with the consultant and should be encouraged to do so if they desire. When the mothers' desires conflict with accepted medical community standards, it may be difficult to convince a consultant to implement a plan that may be safe but unpopular in the medical community. The resulting situation can become very uncomfortable. The out-of-hospital midwife now has a dilemma with the medical community on one side and the mother's desires on the other. The out-of-hospital midwife and the consultants are caught in the middle. This has potential to jeopardize the relationship with the consultants and thereby access to the hospital for the entire home or birth center practice. Compromise will be necessary on all sides when working through issues. Because access to the hospital is essential for safety, the consultant arrangement must be nurtured.

Midwife/Client Relationship

In every setting, the relationship between the midwife and the woman is vital. In the home and birth center, it is particularly important to specify the

roles each participant assumes as they share responsibility and work together in a partnership based on mutual trust [54]. Goals and criteria for normal are clearly delineated. Together, along with the mother's support system, all share responsibility for both the process of care and the outcome. Working in this way requires clear and ongoing communication throughout the maternity cycle.

Women who choose to birth in their homes and birth centers are often seeking control over management of their maternity care from preconception through early parenting. They look for a birth attendant who will use a labor management philosophy matching their own. They choose an attendant very intentionally, searching for a good fit and seeking a collaborative nonhierarchic relationship. They want to find a midwife who will share power. Midwives who choose home and birth center practice need a clear sense of their own strengths and limitations. They must be comfortable with sharing power and occupying a role that is not central. This challenges midwives to sharpen communication skills, to be open to discovering how to expand flexibility, and to know how to set and explain evidence-based limits and boundaries. Home and birth center midwives must be able to determine where philosophical gaps lie and strategize to resolve these. They must be comfortable in situations where management does not revolve around the midwife but revolves around the woman.

While home and birth center midwives welcome and expect the woman's active participation in decision-making and management, these midwives must also feel comfortable taking a leadership role in the midwife-client partnership. Using scientific knowledge, clinical skills, past experience, and sensitive communication, the midwife guides the mother through the preparation process that will enable her to reach her goal of birthing in her preferred site. It is critical to convey the importance of the health promotion model, of a commitment to natural birth, and of the necessity to prepare both physically and psychologically. The midwife must also be assertive as she describes the limits of her practice in the home or birth center environments.

Antepartally, the midwife builds the mother's confidence and cultivates her self-reliance. By giving reassurance regarding the normalcy of pregnancy's changes, and communicating faith in the mother's ability to birth, the midwife assists the mother to amplify her strengths and helps her to compensate for any limitations. The midwife gives positive feedback as the mother takes on the necessary preparatory responsibilities of creating her framework of maternity resources, such as a partner for labor support and a social network for her care postpartum. The midwife strengthens the mother's confidence further by ensuring access to the medical system's safety net should it be needed.

During the intrapartum period, the midwife's role is to be the guardian of the birth environment. The mother depends on the midwife to provide a reassuring presence, physical and psychological labor support, and attention to comfort and progress using simple interventions when necessary. She depends on the midwife's ability to assess for continued normalcy. Should any complication occur, the midwife has the skills needed to manage, stabilize, and in many cases resolve the situation, consulting as indicated. If complications cannot be resolved in the home or birth center settings, the midwife effects a transfer to the hospital.

Health status is a dynamic entity throughout life. This is especially true for mother and baby during pregnancy. It is important to assist the mother to recognize and understand the significance of this fluidity. Changes in health may require changes in care. The mother, midwife, and medical system recognize that the mother's changing health status may mandate movement back and forth among providers within the health care system, sometimes requiring a change in the planned site of services. This may be difficult for both midwife and mother. The mother may be very emotionally attached to birthing at home or in the birth center, and grieves leaving her dreams behind. The midwife without hospital privileges may be reluctant to make the referral because in doing so she may lose or limit her opportunity to work with the mother. Neither reason, however, should prevent or delay a necessary transfer from taking place.

The mother plays the central role in her childbearing experience. The midwife is an advocate and a coordinator. The mother knows she can depend on the midwife and vice versa. Together they maintain the safety of the maternity cycle.

Initial Visit

At the initial prenatal visit, the midwife introduces the family to the services and philosophy of the practice. The midwife takes the opportunity to explain that when birth occurs in the home or birth center, both midwife and mother need to have a strong commitment to health promotion, to keeping birth normal, and to nonpharmacologic child-

birth. The midwife, the mother, and her family discuss their needs, and how the mother envisions getting her needs met. The visit also provides an opportunity for both mother and midwife to assess their abilities to work together. It is important that adequate time be allotted to cover these tasks. The components of an initial visit include the following:

1. Selection of birth site and analysis of mother's choice
2. Introduction to an informed consent process
3. Review of midwife responsibilities
4. Review of family responsibilities
5. Outline of safety criteria and outcome statistics
6. Discussion about possibility of transfer of care
7. Complete history and physical exam
8. Calculation of accurate due date

Selection of Birth Site

At the initial visit, the midwife and the mother consider advantages and disadvantages of all available birth options. The midwife and the mother work together to begin consideration of the best birth option for the mother and her family, delineating what can and cannot be done in each setting. When discussing birth site options, both positive and negative aspects of each site should be explored. In our society, the hospital has been assumed to be the safest birthplace. According to research, for healthy women experiencing normal pregnancy, this is not an evidence-based conclusion [2–8, 10–20, 23–27, 30, 32–33, 37, 39, 47, 55–59]. Table 35-1 compares the three birth sites and factors that women may consider when selecting a birth site. Influences on choice of birthplace may include the philosophy

TABLE 35-1 Influences on Birth Site Selection

	Hospital	Birth Center	Home Birth
1. Normalcy of the pregnancy		x	x
2. Prepregnancy medical history	x	x	x
3. Physical and laboratory findings	x	x	x
4. Decreased chance of infection		x	x
5. Extended time for prenatal visits		x	x
6. Education is core component	sometimes	x	x
7. Low-tech, high touch environment	sometimes	x	x
8. Minimal interruption in activities of daily living			x
9. Support for unmedicated birth maximized		x	x
10. Culturally sensitive environment	sometimes	x	x
11. Qualifications of provider	x	x	x
12. Relationship with provider	x	x	x
13. Previous hospital experience	x	x	x
14. Preferences of family members	x	x	x
15. No separation from baby	sometimes	x	x
16. Children can be included	sometimes	x	x
17. No limitation on persons attending birth	sometimes	x	x
18. Feeling that home environment is unsatisfactory	x	x	
19. Family not responsible for cleanup	x	x	
20. Society's expected birth site	x		
21. Considered safer by general population	x	x	
22. Medication for pain relief available	x	sometimes	
23. Complex technology on site	x		
24. Birth treated as a medical event	x		
25. Manages complicated pregnancy	x		
26. Transport necessary for high-tech interventions		x	x
27. Small intimate environment		x	x
28. Familiar environment	sometimes	x	x
29. Minimal bureaucracy		x	x
30. Cost effective	sometimes	x	x
31. Insurance company limitations	x	x	x
32. Birth takes place outside the hospital		x	x
33. Out-of-hospital alternative for families geographically too far for home birth		x	
34. No trip to or from birth place			x

Source: From BirthCare & Women's Health, Ltd., Alexandria, VA, 2001. Reprinted by permission.

of the mother and the caregivers, preferences regarding technology, mother's health state, feelings about previous birth experiences, societal and family considerations, and financial concerns. Less than 2 percent of women in the United States choose to have their babies at home or in a birth center [31]. Therefore, an understanding of the mother's motivation for her birth choice will enable the midwife and mother to work better together. The attitudes of the mother's support partner should also be included in this discussion.

Some women seek home and birth center services because they lack financial resources. Although the usual profile of the home or birth center mother is an educated middle class person [3, 60, 61], many women who do not fit this picture desire to educate themselves and work to keep themselves and their babies well. The economically disadvantaged mother may benefit from the personalized, nonbureaucratic, respectful, one-on-one care that she may not often encounter elsewhere in the health care system. As long as the mother can accomplish the needed preparation for the birth and the pregnancy remains normal, she is a good candidate for out-of-hospital birth. Although a home or birth center birth may be cheaper if everything is normal, it may be more expensive than a hospital birth if complications occur. To that end, women should be discouraged from seeking services purely for financial reasons.

Informed Consent

The midwife and the mother should review and sign an informed consent document detailing essential considerations regarding home or birth center birth. This document should enumerate the following points [46, 62]:

1. Advantages and disadvantages of the decision to give birth out-of-hospital attended by a midwife
2. Qualifications of the midwife
3. Mother's consent to examination and treatment
4. Responsibilities of mother and midwife
5. Possible complications associated with childbirth
6. Definition of common terms that will be used during the maternity cycle
7. Emergency equipment the midwife brings to the home or has at the birth center
8. Agreement to hospital transfer if indicated according to the midwife's professional judgment

The consent form should not be approached as a substitute for a trusting, nurturing relationship among the midwife, the mother, and her family. In fact:

> The woman's signature means only that she has heard the information, understands it, and agrees to the care offered. Therefore, a good form should prompt good discussion, which is also documented in the record. . . . The challenge is how to inform without creating a climate of doubt about birth, and how to address fear and uncertainty without undermining the birth process. [63]

There should be ongoing communication and exploration of concerns throughout the maternity cycle. In this way, self-care is fostered, good decision-making takes place, and the mother and her family are empowered.

Midwife Responsibilities

A list of the midwife's responsibilities is outlined to clarify the mother's expectations regarding the midwife's role. The midwife explains the concept of working in a midwife/client partnership, each with their own set of responsibilities. Throughout the maternity cycle, the midwife provides education, guidance, and health care, with particular emphasis on signs of normalcy and/or signs of deviation from normal. The role of the primary support partner is discussed, and the midwife makes 24-hour midwifery on-call services available to the mother. Finally, the midwife describes the referral and transport services available and resources to cover remuneration to both midwife and consultant in case of transfer. These are important factors to discuss.

Client Responsibilities

When a woman plans to birth in the home or the birth center, it is easier for her to see the connections between her actions and outcomes. She understands that she has responsibilities and that her actions can make a difference. At the initial visit, enumerating these responsibilities gives the mother an overview of the tasks that she will need to undertake to promote optimal health and to maximize the likelihood of having a normal pregnancy with labor and birth occurring in the birth site that she has chosen.

Basic health promotion includes good nutrition, adequate rest and exercise, stress reduction, keeping scheduled appointments, and avoiding

drugs, alcohol, and cigarettes. Responsibilities also include ensuring the participation of a support partner who will take primary responsibility to be available during pregnancy, labor and birth, and the postpartum period. When small children are to be present at the birth, an adult other than the primary support partner must provide their care.

Other responsibilities introduced during the initial visit will be addressed again later in the pregnancy, including breastfeeding preparation, gathering birth supplies, attending childbirth education classes, touring the hospital, and arranging services of a pediatric health care provider. Mothers may also be required to meet with the consultant service during the pregnancy. Finally, financial arrangements must be clear for both self-pay and insured clients. A written payment plan should be prepared, including insurance information and a schedule for payments. Financial concerns should be discussed openly by all responsible parties.

Safety Criteria and Transfer

The issue of transfer of care should a complication arise needs to be approached at the initial visit. Problems that may occur during the maternity cycle and their frequency of occurrence should be reviewed with women and their families. The importance of self-care and early intervention to promote health should be reemphasized. The midwife reviews the mother's health needs in order to ensure the choice of an appropriate birth site, making the mother aware that some health conditions are best addressed in the hospital (see Table 35-2). It is important to note that problems can occur that can be remedied through self-care, that need the midwife to resolve, or that need a physician to treat. Some problems may require referral or discharge out of the service. The midwife has ultimate responsibility for establishing the link to the hospital system, even though some women arrange or lay the groundwork for consultation/hospital services. Although urgent emergencies are rare in the home or in the birth center [15, 17], mothers need to explore their feelings regarding the worst possible birth outcome for them. This is a very sensitive issue that they may not be ready to discuss at the initial visit, but an introduction needs to be made and follow-up done during subsequent prenatal visits.

TABLE 35-2 Indications for a Change in Birth Site from Home or Birth Center to Hospital

1. Severe chronic hypertension and/or preeclampsia requiring management with medication
2. Current mental illness that the midwife deems would have a harmful effect on the perinatal course
3. Thromboembolic event requiring heparin
4. Current substance abuse including alcohol, cigarettes, and other drugs
5. Insulin-dependent diabetes
6. Clinically significant blood antibodies during current pregnancy
7. Two or more cesarean sections
8. No documented prenatal care
9. Medical indication for induction of labor
10. Placenta previa at term
11. Active preterm labor that cannot be stopped
12. Postdates greater than 42 weeks' gestation
13. Nonreassuring fetal surveillance results
14. Active herpes lesions of cervix, vagina, introitus, labia, or anus during labor
15. Multiple gestation diagnosed before or during labor
16. Persistent noncephalic presentation during labor
17. Febrile condition in labor with or without spontaneous rupture of membranes that does not resolve with hydration
18. Evidence of chorioamnionitis
19. Evidence of fetal intolerance of labor
20. Thick meconium stained amniotic fluid
21. Irresponsible attitude or action of parents
22. Unsafe home or location for birth

Note: The above list is not all-inclusive, and the midwife's clinical judgment may determine that additional conditions indicate a hospital birth. It must also be noted that there are recognized religious communities such as the Amish or Plain people who claim religious exemptions, choosing to give birth in the home or birth center setting even though they have conditions such as breech presentation or multiple gestation. The midwives caring for these women are responsible for acquiring the clinical skills necessary to manage these conditions, for obtaining informed consent from the mother, and for having a consultation agreement in place.

Source: From BirthCare & Women's Health, Ltd., Alexandria, VA, 2001. Reprinted by permission.

Complete History and Physical

During the initial visit, the midwife should be alert to historical and physical predictors of normalcy and predictors of deviation from normal. It is important for the mother and her partner to provide accurate family, medical, menstrual, and conception histories. Records from other health care providers should be requested if needed. With the information obtained through the history and physical, the woman and the midwife can identify factors that have potential to develop into problems. Instituting prevention strategies early increases the likelihood that the mother will birth in her chosen birth site.

Calculation of an Accurate Due Date

Particular attention must be paid to calculation of an accurate due date because there is a five-week window of safety for planned home or birth center birth. A pregnancy is full term from 37 weeks' gestation until 42 weeks' gestation after which it is considered postdates. Births occurring at less than 37 weeks' or more than 42 weeks' gestation, are more safely accomplished in the hospital, but occasionally the window of safety can be expanded a few days with careful fetal surveillance and appropriate consultation. When labor occurs before 37 weeks, lung maturity is a concern [50, 64, 65]. The mother whose preterm labor cannot be stopped is referred to the hospital, where appropriate staff and technology can give long-term support to the baby if needed. Likewise, labors occurring after 42 completed weeks of pregnancy are often transferred. As pregnancy is prolonged, there is an increased incidence of aging placenta, meconium passage, intrauterine fetal demise, and fetal distress during labor, which have been implicated as causes of morbidity and mortality [15].

Return Visits

By spending time with the mother during pregnancy, the midwife has occasion to obtain information that will help or hinder the mother's navigation through the maternity cycle. At every return visit, through an interim history, physical exam, and laboratory and adjunctive studies, mother and midwife identify reassuring signs of normalcy or identify problems that require follow-up. In the role of educator, the home and birth center midwife reminds the mother of symptoms that could indicate deviation from norm. The mother is thus enabled to continue to take a principal role in early identification of problems, allowing for early intervention. Women who plan to birth at home or in the birth center have less leeway to slip into the realm of abnormal. In order to remain out-of-hospital to birth, it is especially vital to intervene early, before problems occur that are not correctable. Women know that if they encounter specific complications (see Table 35-2) they will lose their opportunity to have the birth they had planned. This is a powerful motivator for women to engage in health promotion.

The Family's Preparation for Birth and Postpartum

Planning for birth involves readying the participants and requires considerable time, thought, and energy. More preparation on the part of the family is required when birth occurs out-of-hospital. The list of responsibilities include the following:

1. Continuing commitment to a jointly created plan of care
2. Keeping the midwife informed of any life changes
3. Doing specified reading
4. Attending childbirth education classes
5. Writing a birth plan
6. Confronting and resolving fears
7. Preparing antepartally for breastfeeding
8. Preparing invited participants for their responsibilities
9. Preparing siblings for their participation
10. Paying fees for care and/or conveying insurance information
11. Collecting and organizing specified supplies for home birth
12. Obtaining and packing supplies for transport to the birth center
13. Arranging birth assistant availability
14. Having a clean house
15. Arranging for pet safety and care at the time of labor and birth
16. Obtaining infant car seat and ensuring proper installation
17. Making an accurate, detailed map to the home
18. Visiting obstetric consultant, if needed

19. Making emergency plans and posting them by each telephone and in chart
20. Having a vehicle available with a full tank of gasoline
21. Knowing how to get to the hospital
22. Arranging pediatric care

As the due date nears, childbirth classes help the mother and her primary support partner focus on the upcoming birth. Classes that are most useful emphasize the mother's inner strengths and are presented by an instructor who is knowledgeable about home and/or birth center births, teaching with confidence that unmedicated birth is possible. Women will rely on techniques learned in class to enhance comfort and relaxation, to relieve pain, and to augment labor. Childbirth classes located in hospitals are often an orientation to the hospital system and prepare the mother for labor and birth in that setting.

Writing a birth plan gives women and their partners an opportunity to discuss what is important to them for their birth. These plans detail preferences about the environment, social interaction, and comfort measures, rather than options for medical pain relief and technologic interventions. Women and their partners identify who will be present at the birth, specific duties they may have, planned events with family and friends, the role of siblings, and religious or spiritual observances. Birth plans also describe coping measures learned from previous births, desired positions for labor and birth, and preferences for privacy and company at various points in labor. Plans for music, photography, audio and/or video recording may be outlined. To promote realistic thinking about possible transfers, families should be encouraged to write a hospital birth plan in addition to a home or birth center birth plan. This plan should focus on preferences regarding interventions and contact with the baby. Families must realize that when a transfer to the hospital is indicated, medical interventions are needed and should be expected.

Most home and birth center practices require that women breastfeed unless there are extenuating circumstances. Breastfeeding is an essential safety factor for women giving birth out-of-hospital. When the mother is home without professional assistance, breastfeeding helps to keep the uterus contracted, and, therefore, helps to control bleeding postpartum. La Leche League and other breastfeeding support groups are invaluable to breastfeeding preparation prenatally and support postpartum.

Participants who will be present for the birth require preparation. If children are to be present, they need to be prepared for birth events, including sights and sounds. They also need an adult whose primary responsibility is child care. This adult needs preparation for the labor and birth and for his or her role. Children must be cared for to allow the mother and her partner to focus their complete attention on managing labor. Also, if transport occurs, someone must be available for the children until the mother and/or her partner return from the hospital.

People attending the birth should be selected carefully. Some participants may have fears about out-of-hospital births. Addressing their fears before the birth may change attitudes, and their attendance at the birth can be a transformative experience. It should be made clear that people invited to attend the birth may be asked to leave if the mother seems to be distracted by their presence.

For birth center births, bags should be packed by 36 weeks' gestation and supplies ready for transport to the center. (See Table 35-3 for a list of supplies for birth center births.) Supplies needed for home birth, in addition to an up-to-date copy of the mother's chart, should also be organized by 36 weeks and in or close to the room in which the mother intends to birth. (See Table 35-4 for a list of supplies for home birth.) Siblings can take an active role in preparing supplies. Last minute details to be accomplished when labor starts can be posted on a "to do" list.

A home visit by the midwife or the birth assistant around 36 weeks' gestation confirms that the family is ready for the home or birth center birth. The family prepares a detailed map that can be tested for accuracy when this home visit is made. An emergency plan and important telephone numbers should be posted by each telephone in the home and in the mother's chart. The family should make a "practice run" to the backup hospital to ensure that they know the fastest route, the traffic patterns, where to park, and where to enter the building should a transfer become necessary. A cardinal rule is to be sure that the car that will be used for emergency transportation has adequate fuel to get to the hospital. Having hospital admission forms completed and in the chart before labor begins decreases stress if a transfer to the hospital becomes necessary. For home birth, a relatively clean house and pet control are obvious responsibilities of the family. Most pets can be present at births without causing any difficulties.

TABLE 35-3 Family Supplies for Birth Center Birth

Items Packed for Easy Transport to Birth Center by 36 Weeks

1. Nutritious, easy to prepare meals and snacks for you and your birth team
2. At least 3 quarts of juice, teas, and broths
3. Honey
4. Clothes to wear during labor
5. Extra pillows
6. Music (CDs or cassettes)
7. Bathing suit and towels for partner
8. Entertainment for older kids (books, games, videos, etc.)
9. Nutritious postpartum meal for the new parents
10. Clothes for the mother to wear home
11. Hydrogen peroxide and ammonia for spot removal and laundry
12. For the baby:
    a. Clean thermometer
    b. Six receiving blankets
    c. Vaseline
    d. Five disposable newborn size diapers
    e. Baby clothes suitable for the weather
    f. Car seat in place, adjusted to fit newborn

Source: From BirthCare & Women's Health, Ltd., Alexandria, VA, 2001.

TABLE 35-4 Family Supplies for Home Birth

Items to Be Assembled and Organized by 36 Weeks

Most midwives request that the family provide some supplies. These can be purchased through a company that customizes the birth kit to the specifications of the midwife or the family may obtain the items individually. Items for the family to obtain include the following:

1. Mattress cover (e.g., plastic drop cloth, shower curtain liner)
2. Extra pillows covered with plastic
3. Food and fluids for labor
4. Flexible straws
5. Clean towels
6. Antiseptic solution (e.g., betadine, zephiran)
7. Wash cloths or 4 × 4 gauze pads
8. Flashlight with batteries and extra batteries
9. Mirror
10. Bowl (2 quart size)
11. Bulb syringe
12. Heating pad
13. Baby hats
14. Baby receiving blankets/soft towels
15. Thermometer
16. Measuring tape
17. Peri pads and belt/panties
18. Squeeze bottle
19. Disposable waterproof underpads
20. Baby clothes and diapers
21. Alcohol and cotton balls
22. Large plastic garbage bags
23. Ziploc freezer bags
24. Hydrogen peroxide for removal of blood stains

Source: Adapted from American College of Nurse-Midwives. *ACNM Handbook: Home Birth Practice*. Washington, DC: ACNM, 2001 and from Varney, H. *Varney's Midwifery*, 3rd ed. Sudbury, MA: Jones and Bartlett, 1997.

The Experience of Birth at Home or in the Birth Center

When labor begins, the family contacts the midwife, the birth assistant, and the other people who are invited to attend the birth. Preparations by both family and midwife should be complete by 36 weeks' gestation so that all supplies and arrangements are in place when the midwife is notified that the mother may be in labor. During the initial labor call, the midwife gathers data about how the mother is experiencing her labor, her needs, and her support systems. Taking into account the mother's perceptions and prenatal history, the midwife, the mother, and her support network review choices and make appropriate management plans. Plans may include further telephone contact or a decision for the midwife to meet the mother for additional assessment.

If the mother is comfortable at home, has the support she needs, and there are no concerns that require immediate follow-up, continued telephone contact with her midwife may be all that is necessary. The mother may want to continue her activities of daily living while emphasizing hydration, nutrition, and increased rest. There should be a variety of food choices for the laboring mother and food should be available for the entire birth team. Friends and family may come to help with final preparation and management of other household activities, freeing the mother and her primary support partner to focus on the labor.

A woman planning a home birth may "double make" her bed to protect the mattress. The bed can be made with a full set of linen and then completely covered with plastic such as a plastic mattress cover, a drop cloth, or a shower curtain. A clean old sheet is placed on top of the plastic so that the bed may be used as desired for labor or birth. When the birth is completed, it is a simple matter to remove the top sheet and the plastic. Clean linen is then readily available for the mother's comfort postpartum.

The midwife may do the first physical assessment of labor in the mother's home, the birth center, or the midwife's office regardless of where the birth is planned. The midwife may also choose to delegate this assessment to birth center nursing staff or to home birth assistants. The initial assessment should include a review of the prenatal record, a physical to assess presentation, vital signs of the mother and baby, uterine contractions, and maternal response to labor. A pelvic exam may be part of the initial physical assessment to confirm labor progress, verify the presenting part, or provide information that the mother requests. This exam may be delayed until labor becomes more active.

As labor intensifies and the woman is working harder, the midwife augments the birth partner's support measures, gives reassurance, guides the mother to conserve her energy, and assesses maternal and fetal well-being as per clinical practice guidelines. The mother is free to move around and be in any position she chooses. The midwife may suggest positions that promote comfort, encourage progress, and maintain fetal well-being. In the birth center or home, mothers very frequently birth out of bed.

During the second stage, it is not unusual for the mother to continue to change positions moving from the bed to other locations within the home or birth center. The midwife must be alert, flexible, and able to anticipate the mother's movements. Sterile instruments should be placed on a portable sterile surface allowing the midwife to move, following the mother's lead. Good communication among the midwife, the mother, and her birth team helps everyone work together effectively. When the mother describes where and how she feels the baby's descent, the midwife can give feedback confirming or correcting her perceptions. If the mother is reluctant to change position, the midwife may need to use persuasive communication to suggest positions that will help effect the birth.

As the baby emerges, the mother and/or her partner often reach down to bring the baby out of the birth canal onto the mother's abdomen or chest. The baby remains skin to skin with the mother, the midwife observes the baby for signs of successful transition from intrauterine to extrauterine life, and breastfeeding is encouraged immediately. The focus of the family is directed toward welcoming the new baby (Figure 35-3). Siblings are often present at the birth or they can be invited in when the mother wishes.

The midwife is attentive to the progress of the third stage. Birth of the placenta is usually unhurried. If the mother needs or chooses to, she may squat or sit on the toilet to facilitate the completion of third stage. The family has the option of keeping their placenta to bury under a plant or tree or the midwife may dispose of it through a medical waste management company.

FIGURE 35-3 (top) Family welcoming new baby at home birth. (bottom) Sibling contemplates the new changes in her family.
Source: Photo credit, Kari Horton.

Birth is simple. In the home and birth center settings, where interruptions are limited to those necessary to ensure safety, birth can more easily unfold. Welcoming the new baby can take place as the family has planned. An out-of-hospital birth can have long-lasting, positive effects on parental and sibling bonding and attachment, confidence for parenting, and memories of the birth as a peak emotional experience for the family.

The Early Postpartum Period and Follow-up

The postpartum period is a special time for the mother, her family, and friends to welcome and bond with the new baby. The midwife in the home and birth center setting is a participant in this time of welcome. The tasks that the midwife must accomplish are both similar to and different from tasks in the hospital environment. During this postpartum period, it is not unusual for the midwife to spend at least two to four hours actively working at jobs typically accomplished in the hospital by nursing, secretarial, housekeeping, and dietary staff [66].

The mother and her baby are more likely to remain stable after breastfeeding is established. Once vital signs are stable and within normal limits, the midwife can leave the family in private, facilitating a period of family bonding. During this time, the midwife can accomplish the usual postpartum responsibility of documenting the birth. The midwife, along with the birth assistant, also ensures nourishment of the mother, helps with breastfeeding, assists the mother to shower and void, washes the instruments, and puts the birth site in order. Quite often, family and friends who have attended the birth as guests become helpers during this postpartum family time.

The midwife does a complete newborn physical examination, often using a heating pad for a warm surface. The exam provides an opportunity for teaching, usually taking place on the mother's bed in the presence of excited children greeting the new sibling (Figure 35-4). Family members often participate in weighing, measuring, and dressing the new baby in the midst of friends taking photographs and a great deal of socializing and celebration [66].

The very positive side of this time is the intimacy, emotion, and social closeness involved in spending this time with a family. For many midwives, the tenderness, bonding, and beauty of these postpartum hours fuel their love for midwifery and out-of-hospital birth on a fundamental level [66].

After the midwife departs the home or the family leaves the birth center, it is recommended that the baby stay close to the mother and not receive a bath for the first 24 to 48 hours to aid the baby's ability to stabilize temperature. The mother and baby are assessed in the first 24 to 48 hours (see Chapter 42) at either a home or office visit. A phone assessment may also be made. The developing family relationships, adequacy of help in the home, infant caretaking abilities, and follow-up appointments with the baby's health care provider are also assessed at this visit [1]. The family may be seen in the midwife's office at 2 weeks and 6 weeks postpartum to evaluate postpartum recovery (see Chapter 42). Follow-up thereafter is in accord with the woman's needs for gynecologic and primary health care.

FIGURE 35-4 Cutting the umbilical cord: sibling participation.

Maintaining Safety

Maintaining safety is the primary priority in all settings where midwifery is practiced. Mechanisms for handling problems must be clearly outlined by providers and institutions wherever birth takes place. In the home and birth center environments, careful planning for these requirements is also essential.

Prevention is the first line of defense for safety maintenance. Safety is most effectively maintained when you work to enhance health and strategize to reduce risk. Most women who choose home and birth center birth understand that in order to achieve their goal of birthing in their preferred site, they have to work to build an optimum maternity experience by bolstering excellent health and promoting a pregnancy free from complications. Appropriate birth site planning also reduces the incidence of problems during labor and birth (see Table 35-2). However, birth is not 100 percent predictable. Even when you and the mother have worked together to select the birth site to match her needs, challenges and problems may occur during labor and birth [2, 4, 15, 19, 21, 25, 43].

The second line of defense is early recognition of problems and appropriate early interventions to resolve them. Research demonstrates that the screening process will yield a limited and predictable pool of potential complications that can be anticipated [3, 10, 11, 19, 25, 67, 68]. Early problem recognition makes it possible to effectively intervene utilizing the small number of provider personnel and the simple technologies typically present at a home or birth center birth. When the midwife determines that more personnel and complex technologies are needed, previously arranged plans are implemented for transport.

Equipment, Personnel, and Clinical Judgment

The equipment that you need intrapartally to assist with normal birth as well as to intervene for problems or complications is remarkably simple. You may want to make changes in the suggested list of equipment and its organization as you actually use it for births (see Table 35-5).

Most home and birth center practices utilize two intrapartum providers: the primary midwife and a birth assistant [46]. This ensures that adequate staff is available to meet the laboring family's needs for support and safety maintenance without compromising privacy. The physical needs of the woman require physical strength to meet them. Labor is often long, and in order to meet the woman's needs, the midwife may need rest to keep her mind fresh, her attention focused, and her body strong. Providing both a midwife and a birth assistant reduces distracting staff changes while providing adequate help.

A birth assistant is a person with supportive and technical labor, birth, and postpartum skills. These skills include evaluation of the mother's physical and emotional needs and status during labor, and the ability to monitor maternal, fetal, and newborn vital signs. The birth assistant should also be able to provide assistance with breastfeeding and postpartum care. A positive attitude toward out-of-hospital birth is essential. Some birth assistants are registered nurses or emergency medical technicians, but it is not necessary for the birth assistant to be a medical professional. Childbirth educators, La Leche League leaders, and doulas have many of the above skills and make good birth assistants. The additional technical skills can be readily obtained.

Each time the midwife and the birth assistant set up for a birth, they organize and check the equipment. A review of the mother's chart and her birth plan will focus attention on her individual needs. The midwife and birth assistant may desire to ready equipment and review the skills needed to address potential problems. Drills may be scheduled to ensure that the midwife and assistant will be able to work together smoothly.

For complications such as shoulder dystocia, postpartum hemorrhage, and neonatal resuscitation, there is value in having help. The birth assistant should also be able to perform emergency measures as needed, including suprapubic pressure, fundal massage, and assistance with the administration of medication. CPR certification and familiarity with neonatal advanced life support are essential.

Problems may develop that are a challenge to manage with the limited equipment and personnel available in the home or birth center setting. In a hospital practice, the infrastructure of the hospital's technology and personnel provides layers of additional support. Away from the hospital, clinical judgment takes into account the known delay between some decisions and the implementation of necessary interventions. Management of problems depends on written clinical practice guidelines, characteristics of the mother and her support system, the network of medical support, and the midwife's ability to perform clinically [46]. Other factors that influence decision-making may include the following:

1. Level of experience of CNM/CM
2. Distance from the hospital
3. Quality of the consultant relationship
4. Road conditions
5. Mother's previous birth experiences and commitment to out-of-hospital birth
6. Quality of communication between the CNM/CM and the parents

TABLE 35-5 Midwife Equipment for Birth at Home or in the Birth Center

Essentials

1. Up-to-date copy of chart available
2. Forms for intrapartum, postpartum, and newborn charting
3. Birth certificate forms
4. Blood pressure cuff, stethoscope
5. Fetoscope/Doppler
6. Gloves (sterile; nonsterile)
7. Lubricant (sterile; nonsterile)
8. Sterile instruments
   a. scissors (2 pairs)
   b. large clamps (Kelly or Rochester-Ochsner)
   c. needle holder
   d. ring forceps
   e. amnihook
   f. cord clamp or cord tape
9. Sterile 4 × 4 gauze pads
10. Baby blankets
11. Heating pad for baby blankets
12. Bulb syringe
13. Baby scale
14. Measuring tape
15. Vitamin K
16. Erythromycin ophthalmic ointment
17. Sharps box and mechanism for hazardous waste disposal
18. Light source (e.g., flashlight, gooseneck lamp)
19. DeLee suction trap or suction machine
20. Baby ambu-bag
21. Laryngoscope with infant blade
22. Endotracheal tubes, size 3.5 mm and 4 mm
23. Oral airways (infant, adult)
24. Small oxygen tank, oxygen tubing, mask (neonatal and adult)
25. Injectable oxytocin (Pitocin) and methylergonovine maleate (Methergine)
26. Oral methergine
27. Urinary catheters
28. Suture with needles
29. Local anesthetic, syringes, and needles
30. Urine dipsticks
31. Nitrazine paper
32. Intravenous fluids: lactated Ringer's/5% dextrose in Ringer's lactate/5% dextrose in water/normal saline
33. Angiocaths, long intravenous tubing, tape, antiseptic ointment, gauze pads
34. Blood-collecting equipment: tourniquet, tubes, vacutainer, and needles
35. Newborn screening collection forms and lancets

Extras to Consider

1. Otoscope/ophthalmoscope
2. Hot water bottle or heating pad
3. Flexible straws
4. Electrolyte replacement drink (e.g., Pedialyte, Gatorade)
5. Massage roller
6. Instruments
   a. tissue forceps
   b. Allis clamps
   c. hemostats
7. Combs for acupressure points
8. Antibiotics for intravenous use
9. Crock-pot for hot perineal compresses
10. Adult ambu-bag
11. Cotton baby hats
12. Culturettes
13. Camera
14. Apron or gown and protective eyewear
15. Change of clothes
16. Toilet articles
17. Mirror
18. Speculum
19. Dextrostix

Source: Adapted from American College of Nurse-Midwives. *ACNM Handbook: Home Birth Practice*. Washington, DC: ACNM, 2001 and from Varney, H. *Varney's Midwifery*, 3rd ed. Sudbury, MA: Jones and Bartlett, 1997.

It is important to remember that for home and birth center births, it is rare for transfers to the hospital to be of an urgent or emergency nature. Research shows that 97.5 to 99 percent of women in labor planning a home or birth center birth actually give birth in their chosen setting or are transferred in a nonemergency fashion [3, 4, 17]. Appropriate birth site selection, familiarity with the research, and sound clinical knowledge enable the midwife to plan appropriately for prevention, correction, or stabilization of problems and, if necessary, for transport of the mother and/or the baby to the hospital.

Home and birth center midwives need to remember that in an urgent emergency, the midwife has ultimate responsibility for decision-making. If time permits, the birthing woman and her family may provide input. Consultation with a colleague or a physician may be possible only by telephone, but time constraints and birth setting may mandate decision-making and clinical action by the midwife alone, usually with the help of a birth assistant.

Many times the midwife will be tempted to be led by the heart instead of the head. The midwife may also be pressured by families who wish that their midwife would attend them in labor in spite of

complications. Wish management does not work. Learning to say "no" is not only important, it is crucial. Midwives must be brutally honest with themselves in describing their own skills, their own comfort level, and their own experience.

Some clinical situations have become a focus of attention and curiosity causing concern or controversy among researchers, maternity care providers, and consumers alike regarding appropriate management of home or birth center birth. The following sections include a discussion of selected clinical situations along with some management strategies that are utilized when planning a home or birth center birth. Management of these situations may be divided into three categories for home and birth center management: (1) preventive, (2) nonurgent, and (3) emergency.

Preventive Management

Antepartal prevention is the key for dealing with iron deficiency anemia, gestational diabetes, and pregnancy-induced hypertension. These conditions, if not properly managed, can preclude a birth center or home birth. If a tendency toward low hematocrit, increased glucose levels, or pregnancy-induced hypertension is identified during pregnancy, greater attention to self-care, including diet, exercise, rest, and stress reduction can help prevent the problem or restore normalcy. Mothers who are motivated and successful in keeping their lab values and other signs and symptoms within normal limits, may continue their out-of-hospital birth plans if no underlying disease is present. To ensure good communication and to cultivate the mother's readiness to transfer, a consultation visit may be indicated. If lab work, vital signs, or symptoms cannot be maintained within the range of normal, antepartal referral to a physician should be arranged. If health status remains outside the range of normal, the technologies and staff for monitoring the needs of mother and baby are too complex for intrapartal management in the home or birth center.

Management of Nonurgent Clinical Situations

Multiple studies have identified prolonged labor in nulliparas as the most common reason for transfer into the hospital [2–4, 10, 14, 19, 25, 67–69]. Patience and attention to supporting the mother's efficient use of energy during labor are the most important interventions that the midwife can effect. Adequate hydration and nutritional sources of energy are essential. The environmental variety found within the birth center and home can help the mother pass the time and maintain progress. When slow progress is a concern, it must be clearly understood that oxytocin cannot be administered to augment or induce labor in home or birth center. Exogenous oxytocin may cause hyperstimulation of the uterus that significantly reduces the placental blood flow, causing hypoxia in the baby who then needs increased technology to be rescued from the labor. If labor stimulation cannot be accomplished by more natural means such as walking, nutritional support, castor oil, making love, or nipple stimulation, then a hospital transfer is indicated.

Sometimes when labor has been long, the mother may lose her ability to cope with labor pain and may find that strategies for nonpharmacologic pain relief are no longer effective. At home or in the birth center, medication for pain is avoided or minimized because of the medicine's potential for reducing effectiveness of contractions and potential depression of the baby's respiratory centers. In cases when narcotic analgesics such as nalbuphine (Nubain) are used, naloxone hydrochloride (Narcan) for the baby must be available. If the mother's need for pain relief cannot be met by nonpharmacologic means or with limited amounts of mild analgesia, a transfer is indicated. A nonurgent transfer may take place in the family car as long as vital signs are observed indicating good health in both mother and baby. Mothers transferred for prolonged labor with their first baby can usually complete subsequent births out-of-hospital.

In cases of prolonged rupture of the membranes at home or in the birth center, concern about infection is much reduced, but not eliminated. Pathogenic bacteria are not in abundance, and the intravaginal instrumentation that often occurs in the hospital setting is not done. Nevertheless, limiting pelvic exams and monitoring for signs of infection remain of critical importance. A time limit before transfer to the hospital, if necessary, will depend on the midwife's preferences, the mother's preferences, and negotiations with the medical system, including obstetric, pediatric, and neonatal protocols.

Clients with positive Group B Streptococcus (+GBS) status may birth safely at home or the birth center. When intravenous antibiotic prophylaxis is indicated, it may be administered in the home or birth center. Positive GBS mothers and their partners should discuss neonatal follow-up plans with the baby's pediatric care provider during the prena-

tal period. Families may be taught to monitor and record the baby's vital signs on a newborn monitoring form such as the one shown in Figure 35-5. This will enable them to convey information about the baby's health to their pediatric care provider within 12 to 48 hours after birth.

Because vaginal birth after cesarean (VBAC) labors tend to be long, the home or birth center may be the ideal birthplace for the VBAC mother, especially if she feels that the initial cesarean was unnecessary. The VBAC mother needs support to empower herself to labor and to protect herself from disappointment again. It may be liberating for her not to go back to the hospital [70]. Feelings of profound hurt may not be totally resolved until after the current pregnancy is completed and the mother births her baby vaginally or via repeat cesarean. Documentation of a low transverse uterine incision

Newborn Monitoring Form

Baby's name _____ **Date and time of birth** _____
Birth weight _____
Notable factors _____

Use this form to record your baby's vital signs and appearance every 3 to 4 hours. Temperature may be taken under the baby's arm. Count heart rate (HR) and respiratory rate (RR) for a full minute. Note the baby's activity, feeding, and excretory patterns—e.g., sleeping, alertness, crying, diaper changes, and any other observations—in the comments column.

Time	Temperature	Heart Rate (HR)	Respiratory Rate (RR)	Color	Comments

Note: Normal range for heart rate is 120 to 160 beats per minute. It may be lower when baby is sleeping. A heart rate over 160 when baby is at rest is not normal. The respiratory rate should be within 30 to 60 breaths per minute. A rate over 60 when baby is at rest is also not normal. The baby's axillary temperature should be between 97.7 and 98.6°F. Notify your midwife or baby's health care provider if your baby's heart rate, respiratory rate, or temperature are not normal or if you notice irritability, inactivity, poor feeding, vomiting and abdominal distention, jaundice, episodes of blue or gray color, or increasing respiratory effort.

FIGURE 35-5 Newborn monitoring form.

Source: From BirthCare & Women's Health, Ltd., Alexandria, VA, 2001. Reprinted by permission.

must be obtained. The mother should have a history of only one previous cesarean, as there is a slightly higher incidence of uterine rupture with two or more previous incisions. If the mother has had a previous vaginal birth, her chances of having a successful VBAC are greatly increased [71–75]. Informed consent specific to VBAC should be obtained from the outset with careful review of the practice's successful VBAC rate, repeat cesarean rate, possible complications, arrangement for transport to the hospital, and discussion of realistic expectations. Obtain a clear jointly agreed upon management plan with the obstetrical consultant.

If meconium appears at any time after rupture of the membranes, consistency of the meconium should be evaluated. Notification of the consultant depends on the consultation agreement and the type of meconium present. Meconium stained amniotic fluid combined with a fetal assessment that evidences fetal well-being does not always indicate need to transfer the mother to the hospital. However, a discussion with the mother and her support partner regarding your assessment, possible consequences of meconium aspiration, and treatment options both in and out of the hospital should always be initiated and documented. The decision to transport or not should occur with the midwife's guidance and with consideration of the family's preferences. If the decision is made to remain out-of-hospital for the birth, a DeLee suction trap and other resuscitation equipment should be readied. Amniotic fluid with thick meconium indicates that the mother should be transferred to the hospital before the birth, if there is adequate time.

Management of Emergency Clinical Situations

Some variations and abnormalities in fetal heart rates and patterns may require emergency transport to the hospital. If at any point during the labor the midwife feels a need to monitor the baby more closely than intermittent use of the fetoscope or Doppler allows, then the mother should be moved to the hospital rather than a fetal monitor moved to the mother. Abnormal fetal heart rate patterns that do not resolve with increased hydration, a change in maternal position, and a brief period of oxygen by mask indicate that the baby is at increased risk. A transfer to the hospital is indicated to allow access to the needed personnel and technology to manage the problem.

Women with breech presentation diagnosed antepartally should have an informed consent discussion about getting the baby to turn and/or planned hospitalization for vaginal breech birth, or cesarean for breech. If by the onset of labor the breech presentation persists, the plan for hospitalization should continue. Rarely, a client in labor at home or in the birth center may present with a previously undetected breech. If this occurs, it is important for the home and birth center midwife to implement care for breech birth, and if time allows to call 911 for extra personnel and equipment, to call the consultant, and to transport to the hospital if possible.

Home birth is for normal birth. Part of planning for safe home birth is considering the "what ifs": what if a birth is complicated and the mother needs to go to the hospital? Safe home birth depends on skilled assistance and technology being available 24 hours a day for complications and emergencies.

The question of most concern that the general population asks regarding home and birth center birth is "What if the baby doesn't breathe?" The reality is that in the healthy population experiencing normal pregnancy, unmedicated labor, and uncomplicated birth at home and in the birth center, birth requiring resuscitation is very rare [29, 30]. However, dealing with such fears is essential. Neonatal Advanced Life Support (NALS) certification or an equivalent is a critical skill for both midwife and birth assistant who attend home and birth center births. Having two trained people present for all births is advisable. When a need for resuscitation occurs in these settings, help is remote and you are truly on your own. The resuscitation equipment and skills provided by home and birth center midwives are usually successful in stimulating the baby's respiratory effort, and the baby is likely to recover immediately. If this does not occur, your goal is to stabilize the baby, oxygenating adequately until transport to a neonatal intensive care unit is completed.

Another common concern regarding home or birth center birth is "What if the mother bleeds too much?" The reality is that postpartum hemorrhage requiring transport is *extremely* rare. The incidence reported is 0.2 to 1 percent [4, 15, 17]. In research that examines out-of-hospital birth with a comparison low-risk group birthing in the hospital, there is a greater incidence of postpartum hemorrhage in the hospital group [30]. In out-of-hospital settings, intravenous volume expanders with added oxytocin (Pitocin) can be started, or methylergonovine maleate (Methergine) can be administered intramuscularly or orally. Oxytocin administration in the home or birth center is limited to placental manage-

ment and postpartum hemorrhage. Management of postpartum hemorrhage as outlined in Chapter 34 can take place safely and successfully in the home or birth center, with the exception of the administration of blood or blood products that are not available in these settings. However, a hematocrit of less than 30 percent or a hemoglobin of less than 10 g/dL may predispose a woman to anemia symptomatology, and antepartal transfer to hospital-based care may be considered. If an immediate or delayed postpartum blood loss causes symptoms of hypovolemia making ambulation difficult, reducing self-care abilities, delaying the onset of milk production, or reducing the mother's ability to compensate, she may need professional assistance beyond the capabilities of family and friends and may require hospitalization for evaluation and treatment if indicated. It is important to remember that mothers birthing at home or in a birth center will not have continuous professional postpartum support beyond 3 to 12 hours postpartum.

Coping with Unexpected Outcomes

If transfer to the hospital due to complications becomes necessary, women who had planned a home or birth center birth must cope with two concerns: worrying about their health and/or their baby's health, and experiencing the feelings of the loss of their planned home or birth center birth. Anticipatory guidance prenatally can reduce the family's distress if transport becomes a reality. Reminding families late in pregnancy of the possibility that transfer could be necessary, reviewing practice statistics, and describing actual transport experiences may be helpful. Discussion may include a review of the decision-making process, consultation, the trip to the hospital, and admission. Women need help to understand that if they are going to the hospital, they are going to obtain the technical interventions they had hoped to avoid but now need.

During the process of informed consent at the first visit, and again around 36 weeks, women should be made aware of the possibility that their baby could be injured or die during the birth process regardless of their chosen birth setting [46, 63]. Although most people hesitate to focus on this frightening issue, women need to ask themselves what they would do and how they would cope. They also need to explore how they would respond to family or friends who may not have been supportive of their decision to give birth outside the hospital. The excerpt in Figure 35-6 offers a moving perspective that can help with preparation of the family.

Final Thoughts

Part of birth is death. Conception is the beginning of life and every life must end sometime. It may be at the time of implantation of the egg in the uterine nest, or it may be a true knot in the cord that tightens in pregnancy, or it may be a car accident that takes this new life. Part of pregnancy is the excitement of new life and the fear of its loss. This is normal human reality and is in part why pregnancy deepens and matures a woman and a man spiritually and emotionally.

The last "what if" to consider is what if your baby is injured or dies as a result of an accident of nature? How would you feel? How would your family treat you? You will need to live with your decision and face family and the public in a culture where the norm is to go to the hospital for childbirth. Please explore these questions in your self and discuss them with your partner and your midwives.

The safety of home birth is well documented (see Marjory Tew's *A Safer Childbirth*), but childbirth by its nature is a threshold passage for the baby. Some babies are born with defects and injuries despite all the technology, tests, and skills of the attendants. Despite the fact that hospitalization of birth has failed to eliminate fetal or neonatal death, there is a cultural expectation that doctors and hospitals can guarantee a "perfect baby" every time.

We believe that by being prepared for all scenarios you will have a deeper more empowering birth experience and will feel that you made the best choices possible given the best information available at the time. The facts are not all in yet. We as a culture are still all learning about the wonders of pregnancy and birth.

FIGURE 35-6 Final thoughts.

Source: From Kate Bowland, CNM, and Roxanne Potter, CNM, Santa Cruz, California. Reprinted by permission.

How to Accomplish an Effective Hospital Transfer

When problems occur intrapartally and a transfer to medical management is necessary, it is often a time of stress for providers and families alike. Credibility will be increased on arrival at the hospital if a professional image is maintained. Sometimes this is hard to preserve when working quickly with little time to chart. In times such as these, it is worthwhile to have a previous arrangement already in place with a referral system, and a transfer form to quickly summarize the clinical picture.

Ideally, the problem necessitating transfer is identified as it is emerging. Decision-making, clinical skills, and good communication among midwife, woman, family, and consulting practice take the midwife's full concentration and attention. Unfortunately, transfers often occur when labor has been long, and mother and midwife are tired. The mother and her family may be disappointed, and sometimes may blame the midwife for letting them down. Under such circumstances, it may be difficult to find the time and mental ability to document completely and accurately, but it is even more critical in these circumstances to do so.

The transfer summary (Figure 35-7) is a straightforward, simple form that elicits pertinent data and relieves much of the worry that some important documentation is being omitted. It can be easily utilized by the midwife or the birth assistant. Communication by phone with the clinicians who will receive the mother is also important. It is good to have no-carbon-required (NCR) forms or to make a copy of the chart before you get to the hospital. The midwife transferring the mother to the hospital must retain the original copy of all the records.

When consultation, collaboration, or referral including transfer is needed, a concise, complete, and easy-to-read chart is an ambassador for the mother and the referring midwifery service. This is

TRANSFER SUMMARY

Date	Time	Event
		Reason for transfer
		Review with client and family YES/NO
		Name of consultant
		Consultation and plan
		Transport called (if applicable) YES/NO
		Mode of Transport
		Arrival of transport vehicle (if applicable)
		Mom: T _____ P _____ R _____ BP _____
		Baby: FHT _____ T _____ P _____ R _____
		Departure from home/birth center
		Arrival at hospital
		Signature of receiving provider
		Type of intervention
		Initiation of treatment
		Birth info: Vag C/S Apgars ____ / ____
		Outcome summary
		Release for hospital records sent
		Hospital records received

FIGURE 35-7 Transfer summary.

Source: From BirthCare & Women's Health, Ltd., Alexandria, VA, 2001. Reprinted by permission.

especially important in home and birth center practice, since the hospital staff who receives the woman may not be familiar with home or birth center birth. They may not be aware of the statistics that have shown just how safe this birth option really is and may believe that the woman's original plans were unwise. The chart can sway the attitudes of the clinicians who render care and may determine what care the woman receives. In addition, hospital providers actually see only the mothers for whom transfers are needed. Their experience has not been shaped by the reassurance and satisfaction of seeing the other 85 to 90 percent of labors and births that proceed safely and superbly at home or in the birth center [4, 30].

Business Issues

Although most birth centers and home birth services are small, regulatory and business issues still must be addressed when opening a practice. The same legal and professional documents that are necessary when starting a hospital practice are also necessary for a home or birth center practice. A reliable financial management system must also be in place. Combining the on-call lifestyle with practice management may cause the midwife to overlook either clinical or administrative issues. These are not easy tasks to accomplish, particularly when a night of sleep is missed. A midwife needs administrative help to run a service.

A self-employed independent midwife has more control over decision-making and administration. There is less vulnerability to losing the practice due to a change in priority on the part of a physician, an HMO, or a hospital administration. Knowing the cost of every item used, the midwife is able to determine the economic advantages and disadvantages of business strategies. By the same token, there is much more responsibility and financial risk. The midwife understands when to go "that extra mile" to keep the practice alive.

Financial management can make or break a practice, and administrative structure may need to be adjusted often. There may not be much of a budget to work with in the beginning, so it is important to make realistic predictions. If the overhead of the practice can be kept low, salaries may be adjusted higher. Even in established practices, it is not uncommon for home birth or birth center midwives to have lower salaries than their hospital-based colleagues.

Salaries for clinical staff should amount to approximately 50 percent of the income generated. However, when the practice first opens, overhead may use up all of the income from services, leaving little for the owner(s). In most practices, the person in charge of billing and collections is key to financial survival. Interpersonal skills and a commitment to the practice help keep the service afloat financially.

The major changes that have occurred in the health insurance industry in recent years affect all providers. Many home birth and birth center midwives are providers on managed care panels, and they are reimbursed by Medicaid and indemnity plans. Some insurance companies require accreditation through the Commission for Accreditation of Birth Centers in order for birth center based midwives to become participating providers. Negotiations with insurance companies require patience, persistence, and expertise. ACNM has developed materials to help midwives become skillful negotiators, thereby keeping services viable and available to women [46, 76–79]. Unfortunately, insurance may limit provider choice for women unless they have the resources to pay out of pocket. This can be especially sad for returning clients whose insurance has changed, precluding birth with their previous midwifery service.

Financial arrangements with consulting practices should be clear. The consultant may elect not to charge a consultation fee to the midwife for providing services but will charge the woman for services actually rendered. This works out well financially for the midwife, as long as the families pay the consultant. If women have past due balances with the consulting practice, it is wise for the midwife to pay the consultant adding the woman's unpaid balance to her bill from the referring midwife's office. By ensuring prompt payment of fees, the midwife fosters the relationship with the consultant.

A mechanism for statistical collection should be in place before a practice opens. Accurate statistics facilitate evaluation, quality management, validation of effective practice, peer review, and research. These practice statistics should be collected regularly and analyzed at least annually. Computer programs are available to assist in data collection and analysis. When arrayed clearly, statistics also serve as a public relations tool conveying important information to families about outcomes and transfers.

Although the home and birth center environments are less bureaucratic, they are not less political. Emotions run high about out-of-hospital-birth.

People in the medical community are often unfamiliar with and hesitant to show support for birth center and home birth, harboring misconceptions that are not based on fact. Their attitudes can be a significant barrier to practice. Sometimes when physicians serve as consultants for home and birth center practices, they may benefit from referrals not only from the midwife practice but also from client networks and sympathetic childbirth educators. However, this can have its costs in the medical community. As the consultant's practice grows, competition among physicians may also grow. Some physician colleagues may refuse to cross-cover for a midwife's consultant physician.

Midwives practicing in the home and birth center settings need to be astutely aware of who wields power, both in their local medical community and in their legislative and regulatory arenas. ACNM has legislative liaisons and lobbyists both nationally and at the chapter level to keep members aware of political and practice issues. In order to break down barriers, safeguard the profession, and protect the health care rights of women and their families, midwives have to be alert and proactive.

Special Home and Birth Center Resources

Working in the home and birth center environments, midwives have increased access to the important resources of time, place, and social interaction. In the hospital, the staff may become inured to and unconscious of interruptions:

> Studies found that a woman with a low risk delivery giving birth to her first child in a teaching hospital could be attended by as many as 16 people during 6 hours of labor and still be left alone for most of the time. Routine, though unfamiliar, procedures, the presence of strangers and being left alone during labor and/or delivery caused stress, and stress can interfere with the course of birth by prolonging it. . . . [48]

In birth centers and homes, midwives are able to provide more time and privacy to the birthing woman and her support partner. Observing unobtrusively and vigilantly for continued normalcy and for early signs and symptoms of problems, midwives' lifeguarding skills, in the vast majority of cases, remain only in their minds, tucked away in their bags, and behind the closed doors of cabinets. As long as birth remains normal, midwives limit their role to helping the woman be as comfortable as possible, validating the efforts the mother makes to bring forth her baby. In the out-of-hospital environment, midwives maximize opportunities to practice "the art of doing nothing well" [80].

All laboring women seek ways in which they can be most comfortable and most productive. In the home and birth center, women and their partners feel that they have more permission to be creative in finding ways to help themselves birth their babies. The primary support partner knows better than anyone what is needed to help the mother be herself and do her best.

The birthing family's job is to invent and claim their coping strategies [81]. The midwife's job is knowing when and how to augment the partner's supportive efforts and when to assist in their inventions. The home and birth center environment fosters continuity of care that takes on a new meaning within this paradigm. The midwife is more free to offer a continuous presence during labor, benefiting those mothers who desire increased support. This continuity enables the midwife to watch the way the mother and her partner work with labor and how labor energy is being used. Because home and birth center birth is dependent on the mother's natural abilities, continuity provides the midwife an opportunity to watch the dynamic process of labor as it ebbs and flows. This enables her to know when it is beneficial to wait and when to push labor along before the mother's energy cannot be replenished.

In the home and birth center, the midwife can make physical changes in the birth environment to promote the mother's coping ability. Energy to promote labor is affected by the connotative values and physical attributes of spaces. The control over and accessibility of the environment will have an effect on how labor energy is used. Home and birth center environments open up opportunities not often available in the hospital.

The woman conserves labor energy simply by knowing where things are and not having to ask for permission to enter a space or touch things inside the space. Helping a woman move to another room can alter labor, enabling the mother to leave behind nonproductive reactions and coping mechanisms. In the home and birth center, the character of each room gives variation to the quality of the energy. The bedroom has a restful feel to it, the living room or lounge is more social, and the kitchen is a place where people are busy and move around. As the social dynamic changes, activities that are acceptable also change. In a bedroom, the mother feels she has

permission to be naked, to cuddle with her partner in privacy, or even to have sex, which can increase effectiveness of contractions. In the lounge or living room, dancing to music at whatever volume she chooses seems natural. In going from room to room the lighting and temperatures change, and change more still when going outdoors. If the children are present, a variety of familiar spaces are available in which the children can keep busy while waiting. When children are content, their mother is better able to concentrate [82].

In the mother's own home, the environment is more complex. Her home is richly textured with reminders of life's experiences. She is usually less inhibited in her own home and is free to unself-consciously express and engage in religious or social activities [82]. Conversely, some women find these familiar reminders too distracting and need to leave them behind in order to labor. The birth center can be a haven providing a private, quiet out-of-hospital alternative to a busy household.

A complex familiar environment can both energize and relax the laboring woman. In early labor, familiar objects, scents, and activities of daily living keep the laboring woman's mind engaged and help to pass time. As labor proceeds and she needs to be more focused, it is easy for her to ignore these familiar stimuli. When unfamiliar stimuli are present, they are a distraction, taking up energy that she could better use for labor and birth. The midwife carefully selects interventions and utilizes them only when the mother needs them and without interrupting the flow of labor. Being aware of and encouraging changes in place, time, and social interaction are special tasks of the midwife in the home and birth center settings.

References

1. Varney, H. *Varney's Midwifery*, 3rd ed. Sudbury, MA: Jones and Bartlett, 1997. Chapter 31.
2. Ackerman-Liebrich, U., Voegeli, T., Gunter-Witt, K., et al. Home vs. hospital deliveries: follow-up of matched pairs for procedures and outcomes. *BMJ* 313:1313–1318, 1996.
3. Anderson, R., and Greener, D. A descriptive analysis of home births attended by CNMs in two nurse-midwifery services. *J. Nurse-Midwifery* 36:215–220, 1991.
4. Anderson, R. E., and Murphy, P. A. Outcomes of 11,788 planned home births attended by Certified Nurse-Midwives: a retrospective descriptive study. *J. Nurse-Midwifery* 40(6):483–492 (November/December) 1995.
5. Burnett, C. A., Jones, J. A., Rooks, J., Chen, C. H., Tyler, C. W., and Miller, A. Home delivery and neonatal mortality in North Carolina. *JAMA* 244:2741–2745, 1980.
6. Campbell, R., Davies, I. M., MacFarlane, A., and Beral, V. Home births in England and Wales, 1979: perinatal mortality according to intended place of delivery. *BMJ* 289:721–724, 1984.
7. Crotty, M., Ramsay, A. T., Smart, R., and Chan, A. Planned homebirths for Southern Australia 1976–1987: a descriptive study. *Med. J. Aust.* 153:664–671, 1990.
8. Davies, J., Reid, W., and Young, G., for the Home Birth Study Steering Group. Prospective regional study of planned home births. *BMJ* 313:1302–1306, 1996.
9. DeClercq, E. R., Paine, L. L., and Winter M. R. Home birth in the United States, 1989–1992: a longitudinal descriptive report of national birth certificate data. *J. Nurse-Midwifery* 40:474–482, 1995.
10. Durand, A. M. The safety of home birth: the Farm study. *Am. J. Public Health* 82:450–453, 1992.
11. Ford, C., Illiffe, S., and Franklin, O. Outcome of planned home births in an inner city practice. *BMJ* 303:1517–1519, 1991.
12. Hinds, M. W., Bergeisen, G. H., and Allen, D. T. Neonatal outcome in planned versus unplanned out of hospital births in Kentucky. *JAMA* 253:1578–1582, 1985.
13. Janssen, P. A., Holt, V. L., and Myers, S. J. Licensed midwife-attended, out of hospital births in Washington state: are they safe? *Birth* 21:141–148, 1994.
14. Mehl, L. E., Peterson, G. H., Whitt, M., and Hawes, W. E. Outcomes of elective home births: a series of 1146 cases. *J. Reprod. Med.* 19:281–290, 1977.
15. Murphy, P. A., and Fullerton, J. Outcomes of intended home births in nurse-midwifery practice: a prospective descriptive study. *Obstet. Gynecol.* 92(3):461–470 (September) 1998.
16. Northern Region Perinatal Mortality Survey Coordinating Group. Collaborative survey of perinatal loss in planned and unplanned home births. *BMJ* 313:1306–1309, 1996.
17. Rooks, J. P., Weatherby, N. L., Ernst, E. K., et al. Outcomes of care in birth centers: The National Birth Center Study. *N. Eng. J. Med.* 321:1804–1811, 1989.

18. Schramm, W. F., Barnes, D. E., and Bakewell, J. M. Neonatal mortality in Missouri home births, 1978–1984. *Am. J. Public Health* 77:930–935, 1987.

19. Shearer, J. M. L. Five year prospective survey of risk of booking for home birth in Essex. *BMJ* 291:1478–1480, 1985.

20. Shy, K. K., Frost, F., and Ullom, J. Out of hospital delivery in Washington State: 1975–1977. *Am. J. Obstet. Gynecol.* 137:547–552, 1980.

21. Springer, N. P., and Van Weel, C. Homebirth: safe in selected women, and with adequate infrastructure and support. *BMJ* 313:1276–1277, 1996.

22. Stotland, N. E., and Declerq, E. R. Safety of out-of-hospital birth in the United States—a review. *Clin. Problems Obstet. Gynecol.* 25:133–144, 2002.

23. Sullivan, D. A., and Beeman, R. Fours years experience with home birth by licensed midwives in Arizona. *Am. J. Public Health* 73:641–645, 1983.

24. Tew, M. *A Safer Childbirth: A Critical History of Maternity Care*, 2nd ed. London and New York: Chapman and Hall, 1995.

25. Van Alten, D., Eskes, M., and Treffers, P. E. Midwifery in the Netherlands. The Wormerveer study; selection, mode of delivery, perinatal mortality, and infant morbidity. *Br. J. Obstet. Gynaecol.* 96:656–662, 1989.

26. Weigers, T. A., Keirse, M. J. N. C., van der Zee, J., and Berghs, G. A. H. Outcome of planned home and planned hospital births in low risk pregnancies: prospective study in midwifery practices in the Netherlands. *BMJ* 313:1309–1313, 1996.

27. Woodcock, H. C., Read, A. W., Moore, D. J., Stanley, F. J., and Bower, C. Planned homebirths in Western Australia 1981–1987: a descriptive study. *Med. J. Aust.* 153:672–678, 1990.

28. Janssen, P. A., Lee, S. K., Ryan, E. M., et al. Outcomes of planned home births versus planned hospital births after regulation of midwifery in British Columbia. *Can. Med. Assoc. J.* 166(3):315–323, 2002.

29. Olsen, O. Meta-analysis of the safety of home birth. *Birth* 24(1):4–13 (March) 1997.

30. Rooks, J. P. *Safety of Out-of-Hospital Births in the United States: Midwifery and Childbirth in America*. Philadelphia, PA: Temple University Press, 1997.

31. National Center for Health Statistics. *Vital Statistics Report* 49:69, April 2001.

32. Burst, H. V. The influence of consumers on the birthing movement. *Top. Clin. Nurs.* 5(3):42–54 (October) 1983.

33. Dawley, K. L. *Leaving the Nest: Nurse-Midwifery in the United States 1940–1980*. Doctoral dissertation. Philadelphia, PA: University of Pennsylvania, 2001.

34. Burst, H. V. Alternative birth settings and providers. In McCloskey, J., and Grace, H. (Eds.) *Current Issues in Nursing*, 2nd ed. Boston, MA: Blackwell Scientific Publications, 1985.

35. Dick-Read, G. *Childbirth Without Fear*. New York: Harper, 1944.

36. Thoms, H., Roth, L. G., and Linton, D. *Understanding Natural Childbirth*. New York: McGraw-Hill, 1950.

37. Karmel, M. *Thank You, Dr. Lamaze*. Philadelphia, PA: Lippincott, 1959.

38. Murdaugh, A. Experiences of a new migrant health clinic. Bureau of Community Health Services, 1977.

39. Lubic, R. W. and Ernst, E. K. M. The childbearing center: an alternative to conventional care. *Nurs. Outlook* 26:754–760, 1978.

40. American College of Nurse-Midwives. *Guidelines for Establishing a Home Birth Service*. Washington, DC: ACNM, 1980.

41. American College of Nurse-Midwives. *Establishing an Alternative Birth Center (Out-of-Hospital)*. Washington, DC: ACNM, 1979.

42. American College of Nurse-Midwives, *Statement on Practice Settings*. Position statement. Washington, DC: ACNM, 1980; rev. in 1997 and 1999.

43. Rooks, J. P., Weatherby, N. L., and Ernst, E. K. M. The National Birth Center Study. Part 1: Methodology and prenatal care and referrals. *J. Nurse-Midwifery* 37(4):222–253 (July/August) 1992.

44. Rooks, J. P., Weatherby, N. L., and Ernst, E. K. M. The National Birth Center Study. Part 2: Intrapartum and immediate postpartum and neonatal care. *J. Nurse-Midwifery* 37(5):301–330 (September/October) 1992.

45. Journal of Nurse-Midwifery: Home study program on home birth. *J. Nurse-Midwifery* 40(6) 463–585, 1995.

46. American College of Nurse-Midwives. *ACNM Handbook: Home Birth Practice*. Washington, DC: ACNM, 2001.

47. Metropolitan Life Insurance Company. Summary of the ten thousand confinement records of the Frontier Nursing Service.

Frontier Nurs. Serv. Q. Bull. 33, 1958, Reprinted in *Bull. Am. Coll. Nurse-Midwives* 5:1–9, 1960.

48. World Health Organization Maternal and Newborn Health/Safe Motherhood Unit. *Care in Normal Birth: A Practical Guide*. Geneva: World Health Organization, 1996.

49. Tyson, H. Outcomes of 1001 midwife-attended home births in Toronto, 1983–1988. *Birth* 18:14–19, 1991.

50. Enkin, M., Keirse, M. J., Renfrew, M., and Neilson, J. *A Guide to Effective Care in Pregnancy and Childbirth*, 3rd ed. Oxford, England: Oxford University Press, 2000.

51. Scott, P., and Sutton, J. *Optimal Foetal Positioning*. London: Birth Concepts, 1996.

52. National Association of Childbearing Centers. *Membership Invitation*. Brochure, 1997.

53. *Manual for the Accreditation of Birth Centers*. Perkiomenville, PA: Commission for the Accreditation of Birth Centers, 2000.

54. Bailes, A., and Jackson, M. E. Shared responsibility in home birth practice: collaborating with clients. *J. Midwifery Womens Health* 45(6):537–543, 2000.

55. Campbell, R., and MacFarlane, A. Place of delivery: a review. *Br. J. Obstet. Gynaecol.* 93:675–683, 1986.

56. Campbell, R., and MacFarlane, A. *Where to Be Born? The Debate and the Evidence*, 2nd ed. Oxford, England: National Perinatal Epidemiology Unit, Radcliffe Infirmary, 1994.

57. Fullerton, J. T., and Severino R. In-hospital care for low-risk childbirth: comparison with results from the National Birth Center Study. *J. Nurse-Midwifery* 37(5):331–340, 1992.

58. Goer, H. *The Thinking Woman's Guide to a Better Birth*. New York: Berkeley Publishing Group, 1999.

59. Rooks, J. P., Weatherby, N. L., and Ernst, E. K. M. The National Birth Center Study. Part 3: Intrapartum and immediate postpartum and neonatal complications and transfers, postpartum and neonatal care, outcomes, and client satisfaction. *J. Nurse-Midwifery* 37(6):361–397 (November/December) 1992.

60. Albers, L. L., and Katz, V. L. Birth setting for low-risk pregnancies: an analysis of the current literature. *J. Nurse-Midwifery* 36(4):215–220, 1991.

61. Kleiverda, G., Steen, A. M., Ingerlise, A., Treffers, P. E., and Everaerd, W. Place of delivery in the Netherlands: actual location of confinement. *Eur. J. Obstet. Gynecol. Reprod. Biol.* 39:139–146, 1991.

62. Dancy, R. B., and Fullerton, J. T. Preparing couples for home birth. *J. Nurse-Midwifery* 40(6):522–528, 1995

63. Spindel, P. G., and Suarez, S. H. Informed consent and home birth. *J. Nurse-Midwifery* 40(6):541–554, 1995.

64. Klaus, M., and Fanaroff, A. A. *Care of the High-Risk Neonate*, 5th ed. Philadelphia, PA: W. B. Saunders, 2001.

65. Toepke, M. L., and Albers L. L. Neonatal considerations when birth occurs at home. *J. Nurse-Midwifery* 40(6):529–533, 1995.

66. Dotson, W. Personal communication, May 10, 2002.

67. Acheson, L. S., Harris, S. E., and Zyzanski, S. J. Patient selection and outcomes for out-of-hospital births in one family practice. *J. Fam. Pract.* 31:128–136, 1990.

68. Vedam, S., and Kolodji, Y. Guidelines for client selection in the home birth midwifery practice. *J. Nurse-Midwifery* 40(6):508–521, 1995.

69. Scupholme, A., McLeod, A. G., and Robertson, E. G. A birth center affiliated with the tertiary care center: comparison of outcome. *Obstet. Gynecol.* 67:598–603, 1986.

70. Cohen, N. W., and Estner J. L. *Silent Knife*. South Hadley, MA: Bergin and Garvey Publishers, 1983.

71. Caughey, A. B., Shipp T. D., Repke J. T., Zelop C. M., Cohen A., and Lieberman E. Rate of uterine rupture during a trial of labor in women with one or two previous cesarean deliveries. *Am. J. Obstet. Gynecol.* 181(4):872–876, 1999.

72. Rinehart, H. A VBAC primer. *Midwifery Today* 57:16–20 (Spring) 2001.

73. American College of Obstetricians and Gynecologists. Vaginal birth after previous cesarean delivery. *ACOG Practice Bulletin* No. 5 (July) 1999.

74. Lieberman, E. Risk factors for uterine rupture during a trial of labor after cesarean. *Clin. Obstet. Gynecol.* 44:609–621, 2001.

75. Flamm, B. Vaginal birth after cesarean (VBAC). *Best Pract. Res. Clin. Obstet. Gynaecol.* 15(1):81–92 (February) 2001.

76. American College of Nurse-Midwives. *ACNM Handbook: Getting Paid: Billing, Coding and Payment for Nurse-Midwifery Services*. Washington, DC: ACNM, 2001.

77. American College of Nurse-Midwives. *ACNM Handbook: Managed Care*. Washington, DC: ACNM, 2000.

78. American College of Nurse-Midwives. *ACNM Handbook: Marketing and Public Relations: A*

Complete Resource Guide. Washington, DC: ACNM, 2000.

79. American College of Nurse-Midwives. *ACNM Handbook: Minding Your Own Business: Business Plans for Midwifery Practice*. Washington, DC: ACNM, 2000.

80. Kennedy, H. P. The essence of nurse-midwifery care: the woman's story. *J. Nurse-Midwifery* (40):493–507, 1995.

81. Simkin, P. *The Birth Partner: Everything You Need to Know to Help a Woman Through Childbirth*. Boston, MA: Harvard Common Press, 2001.

82. Jackson, M. E., and Bailes, A. Home birth with certified nurse-midwife attendants in the United States: an overview. *J. Nurse-Midwifery* 40(6):493–506, 1995.

PART

VI

Newborn Care

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CHAPTER

36

Physiological Transition to Extrauterine Life

MARY KATHLEEN MCHUGH, CNM, MSN

The first few moments and hours of extrauterine life are among the most dynamic of the entire life cycle. At birth, the newborn moves from complete dependence to physiological independence. This complex process of change is known as the transitional period—a period that starts when the infant emerges from the mother and continues over a matter of weeks for certain organ systems. Some organs, such as the lungs, make rapid changes that are fully accomplished within days of birth. Other organ systems, like the hepatic system, take longer to convert to extrauterine functioning. Overall, the transition to extrauterine life should be viewed as an ongoing process that occurs during the entire first month of life. It is the midwife's responsibility to understand and facilitate this extrauterine adaptation. At times the midwife will need to provide extraordinary support to the newborn in order for the transition to extrauterine life to occur successfully.

The transition to extrauterine life is part of a continuum that started with conception and extended through the prenatal life of the fetus. The extrauterine transition can be profoundly influenced by prenatal factors as well as intrapartum events. At each birth, the midwife should be thinking about which antepartal or intrapartal factors could cause compromise in the first extrauterine hours. Events during conception and prenatal life that might cause compromise include congenital malformations, genetic disorders, the residual effect of environmental or workplace teratogens, substance use by the mother, prenatal infections (especially viral), chronic poor nutrition, prematurity or postmaturity, maternal chronic disease (cardiac, renal, hepatic, diabetes), and any condition causing blood loss. Labor and birth events that might influence extrauterine transition include prolonged labor, maternal starvation during labor, hypoxic uterine conditions, birth trauma, infection, passage of meconium, fetal blood loss, use of medications during labor, and conditions causing fetal dehydration such as prolonged rupture of membranes.

The midwife must make every effort to predict the potential for a difficult extrauterine transition. Accurate prediction of risk is essential if the midwife is to select the proper site for birth and alert proper personnel.

Immediate Extrauterine Transition

The newborn's most dramatic, quick extrauterine transitions occur in four areas: in the respiratory system, in the circulatory system, in the ability to thermoregulate, and in the ability to procure a source of glucose. Each area of change will be reviewed separately.

Respiratory Changes

The respiratory system is the system most challenged in the change from an intrauterine to an extrauterine environment—the newborn must begin respiration immediately on arrival in the atmosphere. The organ responsible for fetal oxygenation

prior to birth is the placenta. During gestation, there are numerous developments that provide the infrastructure for the onset of respiration. The fetus develops the musculature needed to breath and shows breathing movements throughout the second and third trimesters. The alveoli develop throughout gestation, as does the fetus's ability to produce surfactant, the phospholipid that reduces surface tension at the alveolar-air interface. The interstitial space between the alveoli markedly thins and allows maximum contact between capillaries and the alveoli for air exchange.

The term fetus experiences a decrease in lung fluid in the days before labor, and during labor. This is in response to an increase in stress hormones and to an increase in circulating plasma proteins causing oncotic pressure to increase with a flow of lung water into the pulmonary interstitial space for absorption into the lymphatic circulation. At birth, up to 35 percent of the fetal lung fluid is gone [1]. The term fetus is prepared on many levels to initiate successful respiration.

The phenomena that stimulate the neonate to take the first breath are only partially understood (see Figure 36-1). There are biochemical events such as the relative hypoxia of the end of labor and physical stimuli to which the neonate is subjected, such as cold, gravity, pain, light, and noise, which cause excitation of the respiratory center. The work of taking the first breath may be slightly assisted by the squeezing of the thorax that occurs in the last minutes of fetal life. The high pressure on the thorax as the fetus passes through the vagina is suddenly eliminated with birth. Fluid filling the mouth and trachea is partially released and air begins to fill the tracheal column. Neonates born by cesarean section, especially in the absence of labor, do not get the benefit of the diminution of lung water and the thoracic squeeze and therefore have more persistent wet lungs. This situation can lead to transient tachypnea of the newborn (TTN).

The newborn cannot sustain respiration unless both the brain's respiratory center and the respiratory muscles act to regulate respiration. The response of the newborn lungs to chemoreceptors (located in the aortic and carotid bodies) and mechanoreceptors of the lung becomes a driving force in the regulation of further breaths. The strength of respiratory muscles and the ability of the diaphragm to move directly affect the adequacy of each inspiration and expiration. The healthy newborn autoregulates many aspects of its respiratory efforts, achieving the proper balance of oxygen, carbon dioxide, and functional residual capacity.

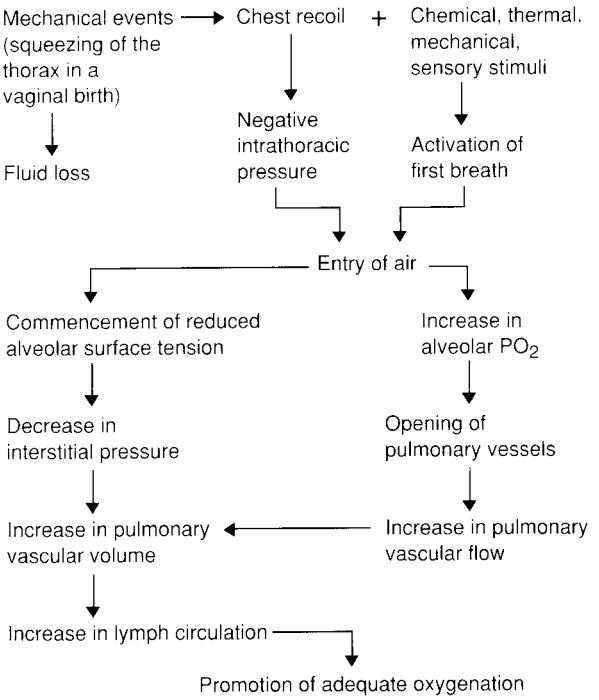

FIGURE 36-1 Initiation of respiration.

Source: Maternal-Newborn & Child Nursing: Family Centered Care by London/Ladewing/Ball/Bindler, © Reprinted by permission of Pearson Education, Inc. Upper Saddle River, NJ, 2002.

The first active breaths set in motion a seamless chain of events that (1) assists with the conversion from fetal to adult circulation, (2) empties the lungs of liquid, (3) establishes neonatal lung volume and the characteristics of pulmonary function in the newly born infant, and (4) decreases pulmonary artery pressure.

When the head is born, mucus drains from the nares and mouth. Many newborns gasp and even cry at this time. Therefore, suctioning the mouth and nares with a bulb syringe may not be necessary. Use of a suctioning device such as a bulb syringe or wall suction should be limited to situations in which the newborn's respiratory efforts are diminished or when meconium needs to be cleared from the airway. The first few breaths require a large amount of pressure because the air is flowing into a fluid-filled space. Newborns who are exhausted and compromised by the birth process will need the midwife's assistance in clearing the fluid and mucus from the upper airway.

Tactile stimulation such as gently rubbing the neonate's back, drying the wet infant, or flicking

the sole of the foot is sufficient to stimulate respiration in most newborns. Stimulation that is too vigorous, such as slapping or exposure to extreme cold, is no better than mild stimulation and merely delays the initiation of appropriate resuscitation.

With the first few breaths, room air starts to fill the large airways of the neonate's trachea and bronchi. Fluid within the lung is pushed to the lung periphery, where it is absorbed. All the alveoli expand with air over time. Maximum function of the alveoli occurs in the presence of adequate surfactant and adequate blood flow through the pulmonary microcirculation. The surfactant helps to stabilize the walls of the alveoli so that they do not collapse onto themselves at the end of a breath. This reduces the pressure needed for respiration, thereby decreasing the workload of breathing. Adequate oxygenation is a critical factor in maintenance of adequate air exchange. In the presence of hypoxia, the pulmonary vasculature vasoconstricts. Therefore, air that is in the alveoli cannot be transported into blood vessels for oxygenation of other areas of the body.

The respiratory pattern varies with onset of respiration. Respirations fluctuate and are not stable for a period of time. Breathing in a newborn may sound noisy and wet during this period of transition. There are, however, certain normal and abnormal responses to look for in the newborn. A respiratory rate consistently greater than 60 breaths per minute, with or without flaring, grunting, or retractions, is clearly abnormal at 2 hours of life. Other normal and abnormal responses are summarized in Table 36-1.

Circulatory Changes

The blood flow from the placenta stops with the clamping of the umbilical cord. This eliminates the placental supply of oxygen and causes a subsequent series of reactions. These reactions are complemented by the reactions occurring in the lungs in response to the first breath.

Fetal circulation is characterized as a low-pressure system. Because the lungs are a closed, fluid-filled organ, they need minimal blood flow. Most oxygenated fetal blood bypasses the lungs and instead flows through the opening between the right and left atria called the foramen ovale. This oxygenated blood then preferentially flows to the brain through the ductus arteriosus.

Clamping the umbilical cord shuts down the low-pressure system that was the fetal-placental unit (see Figure 36-2). The newborn circulatory system is now a freestanding, closed, high-pressure system. The immediate effect of the cord clamping is a rise in the systemic vascular resistance (SVR). Most importantly, this rise occurs at the same time as the newborn's first breaths. The oxygen from those breaths causes the pulmonary vasculature to relax and open. The lungs now become a low-pressure system.

The combination of pressure that is increasing in the systemic circulation but decreasing in the pulmonary circulation causes changes in the pressure of blood flow in the heart. The pressure from increased blood flow in the left side of the heart causes the foramen ovale to shut. The ductus arteriosus, which shunted oxygenated placental blood to the brain in fetal life, is now unnecessary. In 48 hours it constricts and functionally closes secondary to the falling levels of prostaglandin E2, previously provided by the placenta. The oxygenated blood now routinely passing by the ductus arteriosus also causes it to constrict. The results of the change in systemic and pulmonary resistance, and the closure of the shunts of the ductus arteriosus and the foramen ovale complete the radical changes in the anatomy and physiology of the heart. Deoxygenated blood enters the neonatal heart, becomes fully oxygenated in the lungs, and is pumped to all other body tissues.

Within a few moments, tremendous pressure changes have occurred in the newborn heart and circulation. Although these changes are not anatomically complete for weeks, the functional closure of the foramen ovale and the ductus arteriosus occurs soon after birth. It is of the utmost importance for the midwife to understand that the changes from fetal to newborn circulation are totally interrelated with adequate respiratory function and oxygenation.

TABLE 36-1 Normal and Abnormal Respiratory Responses

Normal	Abnormal
Average rate: 40 bpm	—
Range: 30–60 bpm	—
Diaphragmatic and abdominal breathing	Intercostal retractions, retractions of the xyphoid
Obligate nose breather	Flared nostrils
—	Grunting on expiration

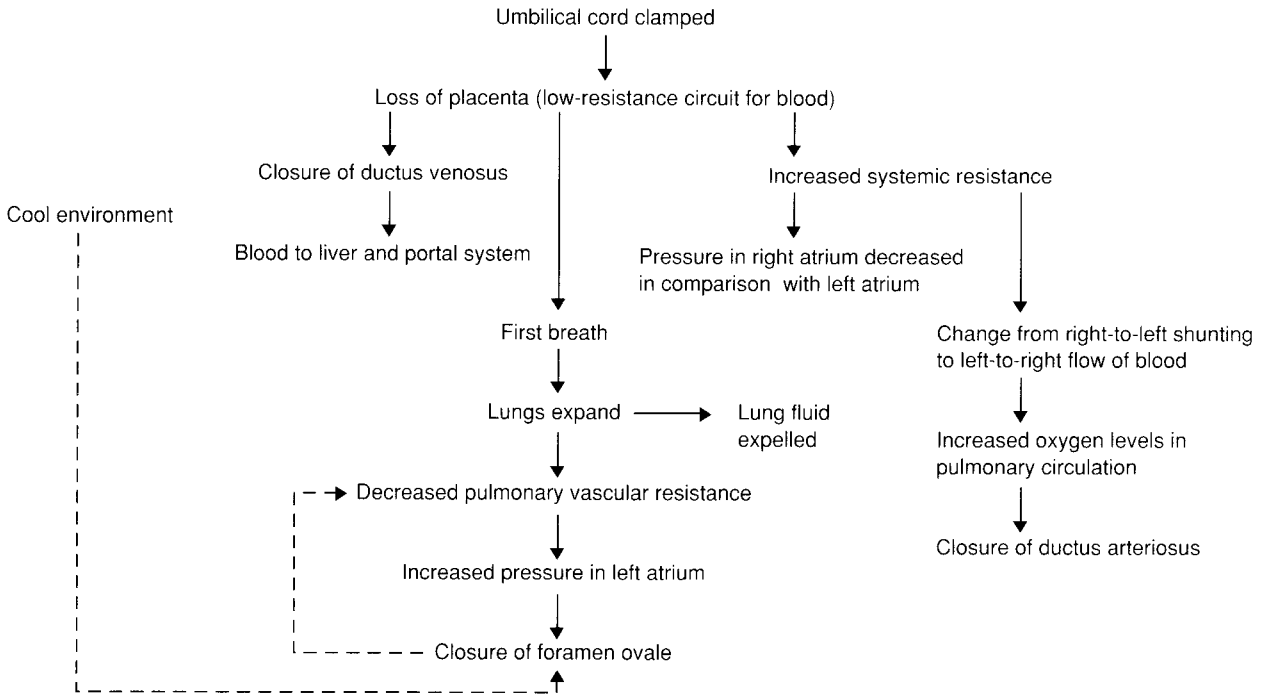

FIGURE 36-2 Changes from fetal to neonatal circulation.

Source: Reprinted from Kenner, C., Bruggemeyer, A., and Gunderson, L., *Comprehensive Neonatal Nursing: A Physiologic Perspective*, 233, © 1993 Elsevier Inc., with permission from Elsevier.

Thermoregulation

The newborn has the tendency to become rapidly stressed by changes in environmental temperature. Because the intrauterine temperature fluctuates little, the fetus has no need to regulate temperature. The fetal temperature is typically 0.6°C higher than the maternal temperature. At birth, factors that contribute to heat loss in the newborn include the large surface area of a newborn, varying levels of subcutaneous fat insulation, and degree of muscle flexion. Term babies of high birth weight with good muscle flexion have the best natural protection against heat loss. Yet even the healthy term newborn does not stabilize in its ability to control temperature adequately until after 2 days of life. The midwife has an obligation to organize the birth environment so that heat loss by the wet newborn is minimized.

Newborns can lose heat through four mechanisms: (1) convection, (2) conduction, (3) radiation, and (4) evaporation [2]. The birth site should be adequately prepared to minimize heat loss by the neonate. The following methods of heat conservation are commonly used:

Pre-warm any blankets, hats, or clothing prior to the birth.

Dry newborn immediately.

Replace wet blankets after drying newborn.

Pre-warm the newborn resuscitation area.

Set birth room temperature at 75°F.

Do not suction newborn on wet birthing bed sheets.

Postpone newborn bath until newborn temperature has been stable for 2 hours.

Place newborn care areas away from windows, outside walls, or doorways.

Keep newborn head covered and body well wrapped for 48 hours.

The neonate can create heat in three ways: shivering, voluntary muscle activity, and nonshivering thermogenesis. Shivering is inefficient and, in neonates, is seen only in the most severe cold stress. Muscular activity can generate heat but is of limited benefit, even in term infants with sufficient muscle strength to cry and remain in a flexed position.

Nonshivering thermogenesis refers to one of two pathways: an increased metabolic rate or the utilization of brown fat for heat production. Neonates can generate an impressive amount of heat through increasing their metabolic rate. In this reaction, norepinephrine triggers the splitting of fatty acids, which

are oxidized and released into the circulation. This causes a marked increase in oxygen utilization and can exhaust even a healthy, term neonate.

In the second pathway brown fat is mobilized to create heat. Brown fat deposits are located in and around the upper spine, the clavicles and the sternum, and the kidneys and major blood vessels. The amount of brown fat depends on gestational age and is decreased in growth-retarded newborns. Brown fat is a nonrenewable resource of the newborn. Creation of heat through utilization of brown fat stores starts at birth with a surge of catecholamines and withdrawal of the placental suppressors prostaglandin and adenosine [3]. The cold stimulus of leaving the mother's warm body triggers activity in the hypothalamus. Chemical messages are sent to the brown fat cells. Through the mediation of glucose and glycogen, the cells produce energy that converts multiple small intracellular fat vacuoles into heat energy. In a newborn experiencing hypoglycemia or thyroid dysfunction, the use of brown fat stores does not proceed efficiently.

The sequelae of heat loss in the neonate can cascade quickly into effects that include hypoglycemia, hypoxia, and acidosis (see Figure 36-3). These effects are consequences of the increased metabolic demands that result from the newborn's attempts to create a neutral thermal zone.

Clinical symptoms of hypothermia may be subtle and include tachypnea and an increased heart rate. Any newborn who has been stressed by hypothermia should be evaluated for hypoglycemia and hypoxia and closely observed. The re-warming process will take a number of hours. Attempts to rapidly re-warm a newborn may lead to apnea. If an infant has become hypothermic, head coverings should be removed during the re-warming process if the hypothermia occurs in an incubator or radiant warmer. Because the head is a large surface area, temporarily uncovering it during the re-warming maximizes heat gain from the warming source.

The newborn's temperature can be assessed at various sites with different types of thermometers. It is recommended that rectal and axillary temperatures remain in the range of 36.5–37.5°C (97.7–99.5°F) and abdominal skin temperature in the range of 36–36.5°C (96.8–97.7°F). Infrared tympanic thermometers (2 seconds in the ear) can be used to measure temperature but are probably the least reliable in infants [4]. Core (rectal) temperatures are usually slightly higher (0.4°C) than axillary temperatures [5] and can be up to 2° higher.

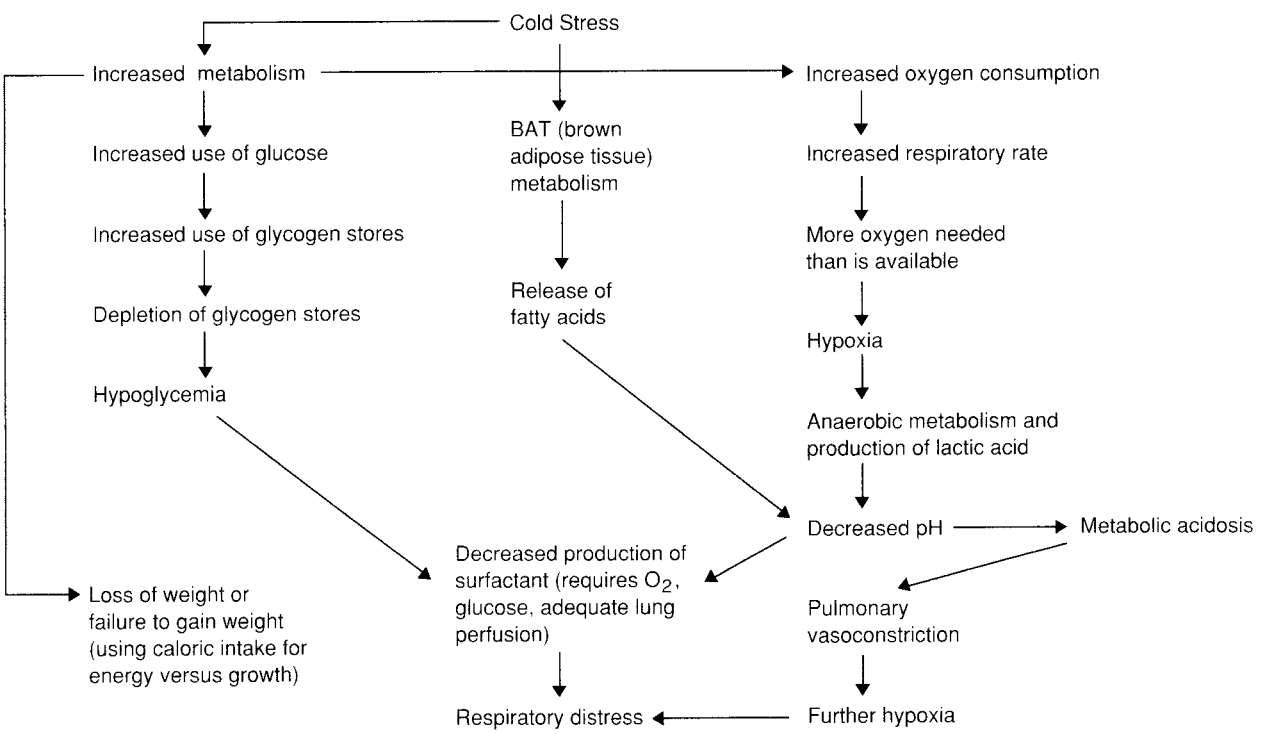

FIGURE 36-3 Sequelae of newborn heat loss.

Source: From Blackburn, S. *Maternal, Fetal, and Neonatal Physiology: A Clinical Perspective*. Philadelphia, PA: Saunders, 2003, p. 725. Reproduced by permission.

Axillary temperatures may be falsely elevated in a cold-stressed infant secondary to metabolism of brown fat. Noncontinuous temperature assessment is accurate only if the thermometer is in place for an adequate time (2 minutes for rectal, 3 minutes for axillary). If temperature is assessed with an abdominal skin sensor, the sensor must be in good contact with the skin and covered with a reflective shield. Skin temperatures should be slightly lower than core temperatures.

Glucose Regulation

Prior to birth the fetus is exposed to nearly constant blood glucose levels that are approximately 60 to 70 percent of maternal levels. In preparation for extrauterine life the healthy fetus stores glucose as glycogen, especially in the liver. Most glycogen storage occurs in the third trimester. Although any infant may develop symptomatic or nonsymptomatic hypoglycemia, newborns with intrauterine growth retardation, postterm infants, preterm infants, and infants experiencing fetal distress are at particular risk. In all of these infants there has been an alteration in the amount of glycogen stored.

The moment the cord is clamped, the newborn must find a way to maintain the balance of glucose that is essential for neonatal brain function. In every newborn, blood glucose falls for a short period of time (1 to 2 hours after birth). Studies of healthy term newborns discovered that the physiologic low occurred at 1 to 1.5 hours after birth and that levels stabilized at 3 to 4 hours. There is no strict definition of the cutoff number upon which intervention is necessary. If a neonate is symptomatic, general recommendations are to intervene with a plasma glucose level of 45 mg/dL and to intervene at 35 mg/dL for the asymptomatic infant [6, 7]. On average mean glucose levels from 4 to 72 hours are 60–70 mg/dL [8].

The healthy newborn's system learns to self-correct the physiologic fall in glucose. The correction of falling blood glucose can occur in three ways: (1) through utilization of breast milk/formula; (2) through utilization of the glycogen stores; or (3) through creation of glucose from other sources, especially lipids. These last two activities are called glycogenolysis and gluconeogenesis. The healthy newborn generates glucose in the amount of 4–8 mg/kg/min in response to a need. The need to self-correct blood glucose is a permanent part of extrauterine existence.

The healthy newborn should be encouraged to feed as soon as possible after birth. Many newborns are active feeders during the first period of reactivity. This is an ideal time to imprint the infant with a breastfeeding experience. Newborns who are exhausted and stressed from long labor may show minimal interest in feeding. Even if an infant feeds successfully, the amount of calories taken in will be minimal and may not be adequate for the glucose needs of a stressed newborn.

Newborns who cannot ingest adequate food will create glucose from glycogen. However, glycogenolysis can only occur if the baby has adequate stores of glycogen. An infant stressed through chronic intrauterine deprivation may have nearly depleted glycogen stores at birth. An infant exposed to major stress at birth through hypothermia, with resulting hypoxia, may use much of its glycogen stores within the first hour of birth. Although it is possible for the newborn to create glucose from fats or proteins, the process of gluconeogenesis is inefficient and can create many metabolic by-products. The midwife must make an accurate assessment of the neonate's at-risk status for hypoglycemia and institute proper surveillance.

The midwife can facilitate the adjustment of glucose level by an emphasis on early feeding of healthy newborns. At the same time, the midwife must evaluate each newborn realistically for the possibility of hypoglycemia. Symptoms of hypoglycemia can be vague and nonspecific and can include jitteriness, cyanosis, apnea, weak cry, lethargy, limpness, and refusal to feed. The midwife must keep in mind that hypoglycemia may be asymptomatic at first. A long-term sequela of uncorrected hypoglycemia can be widespread damage to brain cells sometimes evidenced by seizures.

Evaluation of hypoglycemia is done with a blood sample. Blood taken from the newborn heel contains capillary blood and blood glucose levels in such a sample can be falsely low if there has been venous stasis in the foot. The heel should be warmed prior to sampling to increase blood flow. Care should be taken to avoid puncturing the sensitive structures on the back of the heel (see Figure 36-4). There is some evidence that use of an automated blood collection device may cause less trauma and lead to more successful sample collection results than use of manual lancets [9]. Blood taken from a heel sample is frequently evaluated using a test strip that can be read at the bedside with or without a reflectance colorimeter; use of the colorimeter may increase accuracy. However, the test strip methods have many limitations that relate to operator technique and neonatal hematocrit.

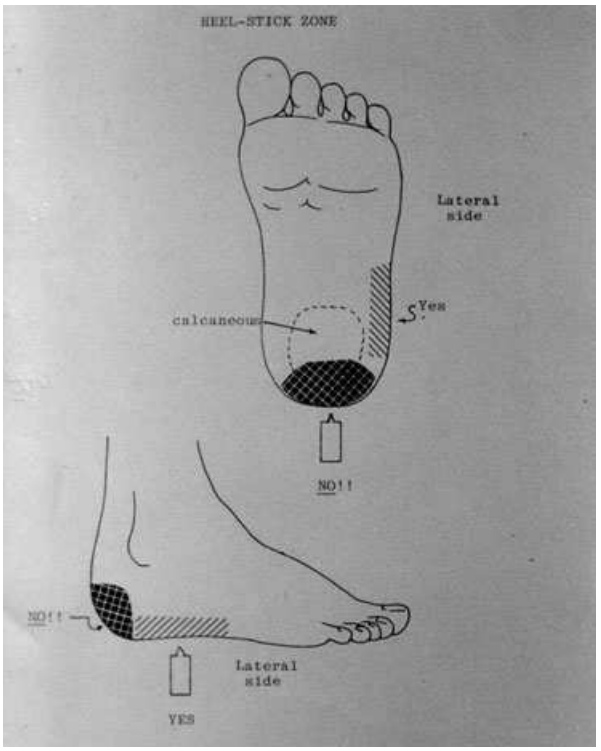

FIGURE 36-4 Anatomic landmarks for heel sticks.

Test strips that have been open for more than 1 month may also produce inaccurate results. Any borderline glucose level (40–45 mg/dL) requires that the midwife intervene and attempt to get the newborn to feed. A repeat test is performed in 30 minutes and if the borderline level continues a venous sample must be checked. Values lower than 45 mg/dL should be evaluated immediately with a venous sample drawn from scalp vein or the antecubital fossa. If the low value is confirmed, treatment is indicated.

Venous samples can be analyzed using the whole blood or the plasma (serum). Samples should be chilled during transport to the lab. Most labs report the plasma result, which will be close to 15 percent higher than a sample run on whole blood. The midwife should understand the testing method used by a particular lab.

Ongoing Extrauterine Transition

Changes in the Blood

The newborn's blood values vary in many ways from those of an adult or older child. The midwife must be aware of the range for normal and the implications of any unusual values for the care of the newborn (see Table 36-2).

TABLE 36-2 Cord Blood Values of a Full-Term Newborn

Component	Optimal Range
Hemoglobin concentration	14.0–20.0 g/dL
Red blood cell (RBC) count	4,200,000–5,800,000/mm^3
Hematocrit	43–63%
Mean cell diameter	8.0–8.3 μm
Mean corpuscular volume (MCV)	100–120 μm^3
Mean corpuscular hemoglobin (MCH)	32–40 pg
Mean corpuscular hemoglobin concentration (MCHC)	30–34%
Reticulocyte count	3–7%
Nucleated red blood cell count	200–600/mm^3
White blood cell count	10,000–30,000/mm^3
Granulocytes	40–80%
Lymphocytes	20–40%
Monocytes	3–10%
Platelet count	150,000–350,000/mm^3
Serum iron concentration	125–225 μg/dL
Total iron-binding capacity	150–350 μg/dL

Source: From Fanaroff, A., and Martin, R., *Neonatal and Perinatal Medicine: Diseases of the Fetus and Infant*, 7th ed. St. Louis, MO: Mosby, 2002, p. 1661. Reprinted by permission.

Newborns are born with a high hemoglobin/hematocrit value. Normal hemoglobin concentrations can range from 13.7 to 20.0 g/dL. If the hematocrit is obtained using a heel stick, it may be higher than normal because of venous stasis in the foot. Values higher than 65 percent need to be confirmed by a venous sample.

The hemoglobin that predominates in the fetal period, hemoglobin F, is gradually eliminated over the first month of life. Fetal hemoglobin has a high affinity for oxygen, a beneficial effect for the fetus. During the first few days of life, the hemoglobin value shifts slightly upward, as plasma volume decreases. As a result of these shifts in plasma volume, the hematocrit—normally in the range of 51 to 56 percent at birth—shifts upward from 3 to 6 percent. The hemoglobin then decreases slowly but steadily over the first 7 to 9 weeks after birth. The average hemoglobin value of a 2-month-old child will be 12.0 g/dL.

The initial hemoglobin values in a newborn are markedly influenced by the timing of clamping of

the cord and the newborn's position immediately after birth. This is an area of controversy in both the obstetric and pediatric communities. Delay in clamping the umbilical cord can increase the neonate's blood volume between 25 to 40 percent [10]. The custom of immediate cord clamping is related to modern obstetrical practices and is not practiced in many areas of the world. Proponents of early clamping have concerns about the potential of side effects from placental transfusion including respiratory distress, polycythemia, hyperviscosity syndrome, and hyperbilirubinemia. The midwife who lowers the neonate markedly below the introitus and actively strips the cord toward the newborn can cause an excessively large transfusion.

Proponents of delayed clamping believe that the increased blood volume is beneficial and supports the natural physiological course of transition to extrauterine life. Some of the benefits of a delay in clamping include the following:

1. A continuing bolus of oxygenated blood during the first tumultuous breaths
2. Volume expansion that promotes pulmonary capillary perfusion
3. A more rapid achievement of adequate oxygenation leading to closure of fetal structures like the ductus arteriosus [11]

If a midwife wants to support the physiologic transfusion that occurs over the first 1 to 3 minutes of life, the newborn is placed on the mother's abdomen with the cord intact. This position promotes modest amounts of blood flow to the newborn without the potential danger of a forced and large bolus of blood. By 3 minutes, most of the blood flow from the cord to the neonate is accomplished.

Although it is possible for blood flow to reverse from infant to placenta, this situation is unusual because the umbilical arteries (carrying blood from the fetus back to the placenta) spasm quickly in the ambient temperature of the birthing room. If reverse flow occurs, the newborn could become profoundly hypovolemic. Therefore, the midwife should make every effort to minimize extremes of position of the infant in relation to the vaginal introitus.

The newborn's red blood cells have a short life span of 80 days on average (in contrast to an adult RBC lifespan of 120 days). This rapid cell turnover creates more by-products of cell breakdown, including bilirubin, which must be metabolized. This excess bilirubin load contributes to the physiological jaundice seen in newborns. There is a correspondingly high reticulocyte count in newborns, reflecting the high formation of new red blood cells.

The average white blood cell levels in a newborn range from 10,000 to 30,000/mm^3. There can be a further elevation in a normal newborn during the first 24 hours of life. Prolonged periods of crying can also cause a shift upward. The white blood cell differential contains a preponderance of granulocytes.

Platelet counts in newborns are within the same range as adult values. However, platelet aggregation can vary in term newborns. There is an overall deficiency of many of the clotting factors that are dependent on vitamin K. Prothrombin time, thrombin time, and partial thromboplastin time are slightly prolonged. Because of this general deficiency in certain clotting factors, it is customary to give newborns supplementary vitamin K after birth (see Chapter 37, page 978).

Whenever a blood sample is being obtained from a newborn, the midwife should be aware that capillary samples from heel sticks might give erroneous results because of venous stasis in the extremities. Venous stasis will be exacerbated in any infant who is cold or who has experienced recent hypoxia. Before sampling, the midwife should try to maximize blood flow by warming the heel. Any suspicious values need to be confirmed with a venous sampling.

Changes in the Gastrointestinal System

The gastrointestinal system in a term newborn is relatively mature. Prior to birth, the term fetus practices sucking and swallowing. Mature gag and cough reflexes are intact at birth. Meconium, although sterile, contains debris from the amniotic fluid, which confirms that the fetus ingests amniotic fluid and that the fluid passes through the gastrointestinal passage.

The ability of the term newborn to ingest and digest exogenous food sources is limited in some ways. Much of the limitation has to do with the varying amount of digestive enzymes and hormones present in all portions of the gastrointestinal tract, from the mouth to the intestines. Newborns are less able to digest proteins and fats than adults. Carbohydrate absorption is relatively efficient but still less than adult abilities. The newborn is particularly efficient at the absorption of monosaccharides such as glucose, as long as the amount of glucose is not too large.

The cardiac sphincter—the juncture of the lower esophagus and the stomach—is incomplete,

which contributes to the widespread regurgitation of stomach contents in newborns and young infants. The capacity of the stomach itself is quite limited, less than 30 cc for a term newborn.

The newborn's intestines are relatively immature. The underlying musculature is thinner and less efficient than in the adult, leading to unpredictable peristaltic waves. The folds and villi of the intestinal wall are not fully developed. The epithelial cells lining the newborn's small intestine do not have the rapid cell turnover that promotes most effective absorption. The beginning of oral feedings stimulates the intestinal lining to mature by promotion of rapid cell turnover and production of microvillous enzymes such as amylase, trypsin, and pancreatic lipase [12]. The midwife's support for early newborn feeding will aid in this maturation of intestinal capabilities.

The immaturity of the intestinal epithelium affects the ability of the gut to protect itself from harmful substances. In humans, the entire gastrointestinal tract serves as part of the natural immune system, a system of defense for the host. Among the defenses present in the GI tract are the chemical barriers of increased acidity, the digestive enzymes that break down large molecules, and the secretory IgA that lines the small intestine.

During early infancy, the newborn faces the substantial task of "gut closure," the process by which the epithelial surfaces of the intestine become impermeable to antigens [13]. Prior to gut closure, the infant is vulnerable to bacterial/viral infection and also to allergenic stimulation through intestinal absorption of large molecules. All enteral feedings, even in very small amounts, lead to helpful surges in gastrointestinal trophic factors—mainly hormones that lead to a full maturation in functioning [14]. Breastfeeding in particular promotes gut closure because it provides a large amount of secretory IgA and stimulates intestinal enzyme proliferation. The midwife should strongly promote early and frequent feedings of the infant, whether by breast or bottle.

The colon in the newborn conserves water less efficiently than in the adult, therefore predisposing the newborn to water loss complications. This makes diarrheal illness potentially serious in a young infant.

Changes in the Immune System

The neonatal immune system is immature on a number of significant levels. This functional immaturity makes the neonate vulnerable to many infections and allergic responses. The mature immune system offers both natural and acquired immunity. Table 36-3 reviews some of the differences in newborn immune response.

TABLE 36-3 Alterations in Immune Response Mechanisms in the Neonate

Alteration	Result	Implication
Innate Immunity		
Structural alterations of polymorphonuclear neutrophils (PMNs) (e.g., more rigid, less deformable, poorer response to chemotactic stimulation)	Altered movement kinetics and orientation of PMNs	Delayed initial response to invasion by pathogenic organisms
Altered PMN chemotaxis and adherence	Slower movement to site of antigenic invasion	Less able to localize infection
	Poorer PMN aggregation	Increased risk of generalized sepsis
Reduced bactericidal activity in stressed neonates	Delayed initial response to infection	Increased risk of severe infection
Decreased fibronectin	Delayed initial response to infection	Less able to localize infection
		Increased risk of generalized sepsis
Decreased natural killer cell activity	Delayed initial response to infection	Less able to localize infection
		Increased risk of generalized sepsis
Poor hypothalamic response to pyrogens	Fever is not a reliable sign of sepsis	Signs of sepsis often subtle and nonspecific

TABLE 36-3 Alterations in Immune Response Mechanisms in the Neonate (*continued*)

Alteration	Result	Implication
Antibody-Mediated Immunity		
Decreased immunoglobulin G (IgG) in preterm infant	Due to lack of transfer from mother	Reduced defense against many bacteria Increased risk of bacterial sepsis, especially from gram-positive cocci
Decreased IgA and absent sigA; defective switch from IgM to other immunoglobulins	Reduced defense against gastrointestinal (GI) and respiratory infections; increased defense in breastfed infants	Increased risk of respiratory and GI infections
Decreased IgM with less specificity	Reduced defense against viral and gram-negative organisms	Increased risk of *Esherichia coli* sepsis and rubella, syphilis, toxoplasmosis, cytomegalovirus (CMV), and other viral infections
Altered of B-cell function due to reduced T-cell activity and cytokine production	Slower switch from IgM to IgA and IgG production	Increased risk of severe infection and generalized septicemia
Lack of previous exposure of B cells to many organisms, with lack of development of memory cells	Delayed specific responses to pathogenic organisms	Increased risk of severe or overwhelming infection
Cell-Mediated Immunity		
Decreased T-cell function (reduced cytokine production, cytotoxic activity)	Reduced defenses against viral and fungal infections	Increased risk and severity of infection from herpes, CMV, and other TORCH organisms
T-suppressor activity commences	Alteration in B-lymphocyte function	Increased risk and severity of bacterial infection
Reduced levels of IL-2, IL-5, IL-8, and IFN-γ	Altered cell-mediated responses, immunoglobulin production, and innate response	Less able to localize infection Increased risk of generalized sepsis
"Naïve" T cells	Delayed responses to specific pathogenic organisms	Increased risk of viral and fungal infections
Complement		
Decreased complement proteins C1, C3, C4, C7, and C9	Decreased opsonization	Decreased ability to localize infection
Deficient activity of alternative pathway	Decreased chemotaxis Decreased cell lysis	Decreased ability to opsonize and eliminate organisms with capsular polysaccharide such as Group B Streptococci (GBS) Increased risk and severity of bacterial sepsis

Source: From Blackburn, S. *Maternal, Fetal and Neonatal Physiology: A Clinical Perspective*. Philadelphia, PA: Saunders, 2003, p. 498. Reprinted by permission.

Natural Immunity Natural immunity consists of bodily structures that prevent or minimize infection. Some examples of natural immunity include (1) the barrier protection offered by the skin and mucous membranes; (2) the sievelike action of the respiratory passages; (3) the colonization of skin and gut by protective microbes; and (4) the chemical protection offered by the acidic environment of the stomach. The gut closure that leads to the mature intestinal lining, discussed above, also provides natural immunity.

Natural immunity is also provided at the cellular level by blood cells that are available at birth to help the newborn kill foreign microorganisms. Three cell types effect their action by the phagocytosis (engulfing and killing) of invaders: (1) polymorphonuclear neutrophils (PMN), (2) monocytes, and (3) macrophages. The process of phagocytosis is enhanced if the foreign cells are prepared by substances called complement components. Other cells called natural killer (NK) cells are part of the natural immunity system but kill without phagocytosis.

The polymorphonuclear neutrophil (PMN) will eventually become the primary phagocyte in the defense of the host. However, in the neonate, the PMN is compromised both in its ability to mobilize and move in the right direction and in its ability to adhere to inflammatory sites. These deficiencies do not reflect inadequate numbers of the PMN cells but rather inadequate chemotaxis and opsonization. Chemotaxis refers to the organized movement of a phagocytic cell—its actual travel around the body. Opsonization is the alteration, or "marking," of the cell surface of a foreign microbe or antigen. This marking promotes the destruction of foreign cells. This immaturity of chemotaxis and opsonization decreases the effectiveness of the phagocytic response and leads to one of the main weaknesses of the neonatal immune system: its inability to localize infection. This tendency to have systemic rather than local infection drives the midwife in vigilant assessment of any neonate where infection is likely or suspected.

Acquired Immunity The neonate is born with passive immunity to viruses and bacteria that the mother has encountered. The fetus acquires this immunity via the transplacental travel of immunoglobulins of the IgG variety. Other immunoglobulins, such as IgM and IgA, cannot cross the placenta. Finding them in cord blood is an indication that the fetus has actively responded to an infection while in utero. The neonate will not have a passive immunity to diseases or microbes unless the mother has responded to those infections during her life.

Gradually, the young infant will begin to produce adequate circulating antibodies of the IgG class. This takes time, and the full antibody response to a foreign antigen is not possible until well into early childhood. This accounts for the numbers of illnesses experienced by small children. The full antibody response corresponds with the diminution of the IgG acquired prenatally from the mother. One of the primary biological tasks during infancy and early childhood is the building of immunity.

Because of these deficiencies in both natural and acquired immunities, the neonate is very vulnerable to infection. Neonatal response to infection is sluggish and inadequate, leading to a predisposition to systemic rather than localized infections. The midwife caring for a mother during pregnancy, birth, and the postpartum course must be vigilant in identifying the risk for infection, minimizing exposure to microbes, and recognizing symptoms of infection in the neonate.

Changes in the Renal System

The term newborn has some structural and functional deficits in the renal system. Many of these deficits correct themselves over the first month of life and are only a problem for sick or stressed newborns. The limitations of the renal system become of particular consequence if the newborn needs intravenous fluids or medications, which increase the possibility of iatrogenic fluid overload.

The newborn kidney shows decreased renal blood flow and a decreased glomerular filtration rate. These can lead easily to fluid retention and water intoxication. Tubular function is immature, which can lead to large sodium losses and other electrolyte imbalances [15]. The newborn is unable to concentrate urine very well, which is reflected in a low specific gravity (as low as 1.004) and urine osmolality. All of these renal limitations are worse in the preterm infant.

The newborn excretes a small quantity of urine in the first 48 hours of life, often as little as 30 to 60 mL. There should not be protein or blood in newborn urine. Large amounts of cellular debris may indicate injury or irritation within the renal system. The midwife should remember that abdominal masses found on physical exam frequently are renal and may reflect tumors, enlargement, or deviations within the kidneys.

References

1. Blackburn, S. *Maternal, Fetal and Neonatal Physiology: A Clinical Perspective*. Philadelphia, PA: Saunders, 2003, p. 334.
2. Thomas, K. Thermoregulation in neonates. *Neonatal Network* 13(2):15–22 (March) 1994.
3. Blackburn, S. *Maternal, Fetal and Neonatal Physiology: A Clinical Perspective*. Philadelphia, PA: Saunders, 2003, p. 715.
4. Weiss, M. E., Poelter, D., and Gocka, I. Infrared tympanic thermometry for neonatal temperature assessment. *JOGNN* 23(9):798, 1993.
5. Weiss, M. E., and Richards, M. T. Accuracy of electronic axillary temperature assessment in term and preterm neonates. *Neonatal Network* 13(8):35 (December) 1994.
6. *Neonatal Decision Making*. St. Louis, MO: Mosby, 1993, p. 239.
7. Kalhan, S., and Peter-Wohl, S. Hypoglycemia: What is it for the neonate? *Am. J. Perintatol.* 17:1, 2000.
8. Pildes, R., and Lilien, L. Carbohydrate disorders. In Fanaroff, A. A., and Martin, R. J. *Neonatal and Perinatal Medicine: Diseases of the Fetus and Infant*, 5th ed. St. Louis, MO: Mosby, 1992, p. 1154.
9. Kellan, B., Sacks, L. M., Wailer, J. L., et al. Tenderfoot Preemie vs. a manual lancet: a clinical evaluation. *Neonatal Network* 20(7):31, 2001.
10. Gilmore, M., and Nelson, N. Peripartum considerations. In Hoekelman, R. A., et al. *Primary Pediatric Care*. St. Louis, MO: Mosby, 2001, p. 537.
11. Mercer, J. S., and Skovgaard, R. L. Neonatal transitional physiology: a new paradigm. *J. Perinat. Neonat. Nurs.* 15:4, 56–75, 2002.
12. Bersett, C. L. Neonatal small intestinal motility: motor responses to feeding in term and preterm infants. *Pediatrics* 71:41, 1990.
13. Yoder, M. C., and Polin, R. Developmental immunology. In Fanaroff, A. A., and Martin, R. J. *Neonatal and Perinatal Medicine: Diseases of the Fetus and Infant*, 5th ed. St. Louis, MO: Mosby, 1992, p. 587.
14. Blackburn, S. *Maternal, Fetal and Neonatal Physiology: A Clinical Perspective*. Philadelphia, PA: Saunders, 2003, p. 443.
15. Blackburn, S. T. Renal function in the neonate. *J. Perinat. Neonat. Nurs.* 8(1):37, 1994.

CHAPTER

37

Immediate Care and Assessment of the Healthy Newborn

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Assessment Prior to Birth

Today, the assessment of the newborn starts long before birth. The midwife's knowledge and careful review of all available data on the prenatal period creates a database for assessment of the child about to be born. The labor and birth history contributes more information to the midwife's assessment of the child. Of particular importance are the characteristics of the fetal heart rate during labor. Information pertinent to the newborn that the midwife should know prior to birth is listed in Table 37-1.

Assessment at the Moment of Birth

Newborn assessment begins when the fetal head is crowning. The midwife can observe the color of the scalp and check the capillary refill by gently depressing scalp tissue. Good color and a quick refill after blanching are two reassuring signs that the infant is well-perfused.

At the moment of birth the midwife's hands and eyes assess the neonate's tone and skin color. The midwife scans the baby's body for signs of any obvious physical deformities. Touching the umbilical cord close to the insertion point in the abdomen

TABLE 37-1 Historical Factors Pertinent to Newborn Care

Genetic Factors	Maternal Factors	Prenatal Factors	Perinatal Factors
Family history of structural or metabolic defects	Cardiac disease	No prenatal care	Preterm/postterm labor
History of genetic syndromes	Diabetes	Bleeding during pregnancy	Prolonged labor
	Kidney disease	Size-dates discrepancy	Drug use in labor
	Liver disease	Pregnancy-induced hypertension	Fetal distress
	Hypertension	Gestational diabetes	Maternal fever
	Sexually transmitted diseases	Polyhydramnios/oligohydramnios	Abnormal presentation or position of fetus
	Substance abuse	Infection	Meconium-stained fluid
	Rh or other isoimmunization		Prolonged rupture of membranes
	History of prior pregnancy losses		Excess bleeding in labor
			Prolapsed cord
			Maternal hypotension
			Fetal acidosis
			Type of delivery

lets the midwife assess the newborn's heart rate. All of these assessments can occur in the few seconds it takes to assist the birth of the infant's body.

With the birth of the neonate, the midwife must vigilantly observe for signs that the child is able to clear mucus and take the first breaths. The neonate is assisted onto the mother's abdomen and is immediately covered with a pre-warmed blanket. If the midwife is distracted at this point by maternal bleeding or placental delivery, it is important that a nurse or trained assistant continue to observe the newborn closely. On occasion, a newborn will make an initial deep breath or cry and then proceed to become apneic or unable to breathe because of mucus or an underlying disorder.

Successful transition to extrauterine life is evaluated with the Apgar score. Developed during the 1950s by Dr. Virginia Apgar [1] to predict survival of the neonate, this score helps the midwife to evaluate transition and the need for resuscitation. A recent retrospective analysis of a large cohort of infants reaffirmed the predictive value of the 5-minute Apgar score. It found that a score of less than 3 predicted the highest incidence of death during the neonatal period (the first 28 days of life), regardless of gestational age [2]. This relationship was even stronger when associated with an umbilical artery blood pH of less than 7.0 at birth.

There have been many attempts to use Apgar scores as predictors of permanent neurological damage. A low 1-minute or 5-minute Apgar score is not predictive of future neurological damage and a high Apgar score, while reassuring, cannot always predict health. If a low Apgar score persists until 10 or 20 minutes after birth, there is a very strong association with the development of cerebral palsy [3].

At this time, the sole use for an Apgar score is to evaluate the newborn in a standardized way to assess the need for resuscitation (see Table 37-2). The Apgar score evaluates neonatal heart rate, respiratory effort, color, overall tone, and reflex irritability. The first Apgar score is assigned at 1 minute of age. Few newborns score a perfect 10 at this point. At 1 minute most newborns are not fully pink. However, the midwife must never withhold resuscitation waiting for the newborn to attain a 1-minute score.

The midwife, a nurse, or a trained assistant may assign the Apgar score. Some settings utilize an Apgar timer that rings at 1 minute and 5 minutes after birth. Only the person making the Apgar assessment should record it in the newborn record.

The healthy term newborn should have an Apgar score of 7 to 10 at both 1 minute and 5 minutes of age. These infants need minimal supportive care from the midwife. They need to be kept warm, have a clear airway, and be evaluated for readiness to feed. Newborns showing signs of a compromised transition to extrauterine life need intervention, as discussed in Chapter 38.

Care During the First Hours After Birth

The Transitional Period

A characteristic set of behaviors is apparent during the transition hours immediately after birth. The midwife who understands these behaviors will attribute the proper meaning to the variations that occur during those hours. The transitional period is the time when the infant stabilizes and adjusts to extrauterine independence. This transitional period was first described by Desmond et al. [4]. The activities of this transitional period reflect a combination of sympathetic responses to the stress of birth (tachypnea, tachycardia) and parasympathetic responses (as evidenced by the presence of mucus, vomiting, and peristalsis), as illustrated in Figure 37-1. The presence of the stress hormones helps to

TABLE 37-2 The Apgar Scoring System

	Score		
Sign	**0**	**1**	**2**
Heart rate	Absent	Slow—below 100	Above 100
Respiratory effort	Absent	Slow—irregular	Good crying
Muscle tone	Flaccid	Some flexion of extremities	Active motion
Reflex irritability	None	Grimace	Vigorous cry
Color	Pale blue	Body pink, extremities blue	Completely pink

Source: From Apgar, V. The newborn (Apgar) scoring system: reflections and advice. *Pediatr. Clin. North Am.* 113(3):645 (August) 1966. Reprinted by permission.

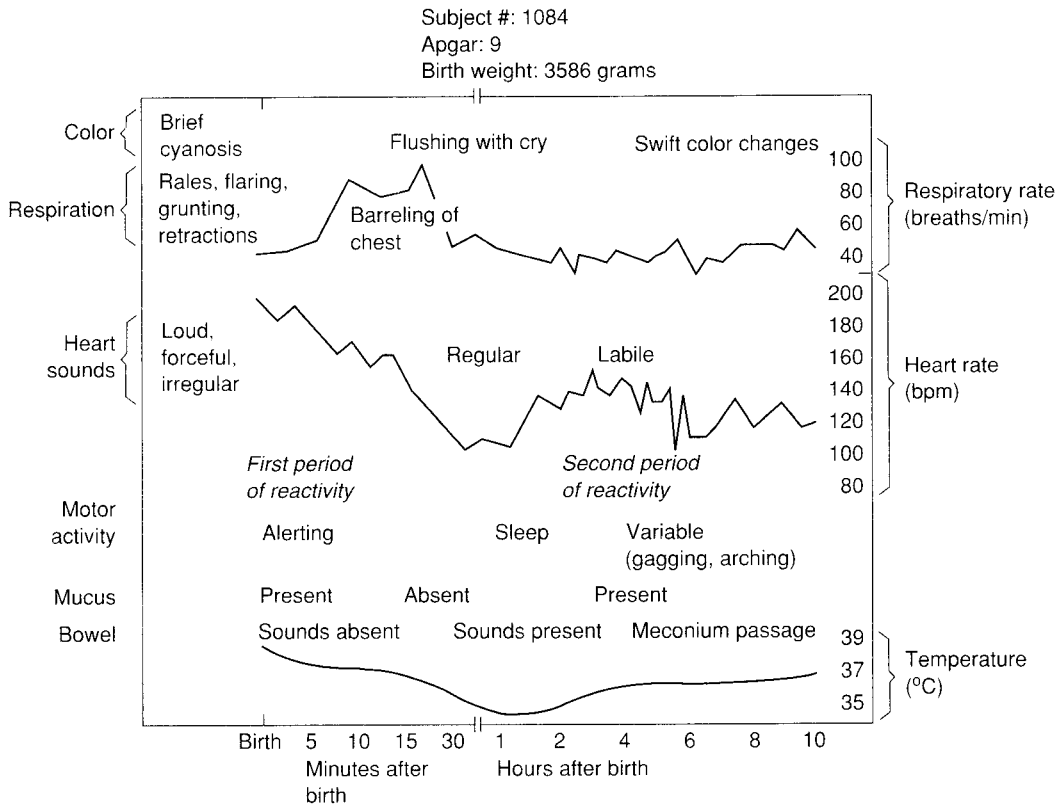

FIGURE 37-1 Autonomic changes during the transitional period after birth.

Source: From Desmond, M. M., Rudolph, A. J., and Phitaksphraiwan, P. The transitional care nursery: a mechanism for preventive medicine in the newborn. *Pediatr. Clin. North Am.* 13(3):656 (August) 1966. Used by permission.

fully activate many of the activities of extrauterine life. The behaviors of the newborn during the transitional period may be altered if the infant was significantly distressed or heavily affected by use of medications in labor.

The period of transition is divided into three stages. The first stage is a reactive period that begins immediately after birth and lasts approximately 30 minutes; the second stage is the interval lasting from 30 minutes until about 2 hours after birth, during which the newborn sleeps; and the third stage is another reactive period that continues from 2 hours after birth until the baby is around 6 hours old. During the entire transition period, the midwife assesses heart rate, respiratory rate, temperature, mucus, neurological function (which includes activity, reactivity, tone, and posture), and bowel function (which includes peristalsis and passage of meconium). These assessments and normal findings are summarized in Table 37-3.

The infant is stressed during the process of birth and should be allowed to stabilize prior to being examined or handled by several people. It is possible to observe and perform unobtrusive yet thorough assessments that cause minimal disruption to mother and baby.

The healthy term newborn has an innate pattern of behavior that will lead it to seek the maternal breast and suckle within the first hour after birth. This behavior, seen in multiple species,

TABLE 37-3 Signs of Normal Transition

Assessment	Normal Value
Tone	Predominantly flexed
Sucking reflex	Intact
Behavior	Alertness alternating with sleep
Bowel sounds	Present after 30 minutes
Pulse	120 to 160 bpm; may vary with sleep or crying from 100 to 180 bpm
Respirations	30 to 60 rpm; diaphragmatic with abdominal wall movement
Temperature	Axillary: 36.5°–37° C (97.7°–98.6°F) Skin: 36°–36.5° C (96.8°–97.7°F)
Dextrostix	Greater than 45 mg %
Hematocrit	Less than 65 to 70 %

should be supported whenever possible [5]. The newborn is left naked on the mother's unclothed abdomen for the first hour after birth, covered with pre-warmed blankets and with a cotton cap on the head. If the birth room is cool, a radiant heat panel can be placed over mother and neonate. The neonate will use odor to locate the female breast and move upward to root and eventually suckle. During this time period of skin-to-skin contact characteristic infant hand massage of the breast occurs, which, along with suckling, promotes the release of oxytocin [6, 7].

The midwife must never fail to remember that both mother and baby continue to need her attention during the time immediately after birth. Procedures that can be deferred include bathing, circumcision, or a fatiguing complete physical and neurological examination.

The First Period of Reactivity

The first period of reactivity begins at birth and lasts 30 minutes. During this time the newborn's heart rate is rapid and cord pulsation is evident. The newborn's color shows transient cyanosis or acrocyanosis. Respirations are rapid at the upper end of the range of normal, and rales and rhonchi are present. The rales should disappear within 20 minutes. The baby may exhibit flaring of the alae nasi with grunting respirations and retractions. The presence of mucus usually is a consequence of the expulsion of retained lung fluid. This mucus is thin, clear, and may have small bubbles.

During the first period of reactivity following birth, the newborn's eyes are open and the baby manifests alert behavior. The baby may cry, startle, or root. During this alert period, every effort should be made to facilitate contact between mother and newborn. Even if breastfeeding is not planned, allowing the mother to hold the infant at this time aids in the acquaintance process. The infant focuses visually on the mother or father when they are in the appropriate field of vision (Figure 37-2). The baby shows increased muscle tone with the upper extremities flexed and the lower extremities extended; this position allows the infant to mold itself into the mother's body while being held.

Many infants will breastfeed during this first period of reactivity. Breastfeeding should be encouraged while the newborn is in this highly alert stage as a protection against the physiological hypoglycemia that occurs after birth (see Chapter 36). The midwife should make every effort to minimize any uncomfortable maternal procedures during this time period, even delaying perineal repair for a short time if the mother so desires.

FIGURE 37-2 Getting acquainted.
Source: Photo used by permission of Tracy Mitchell.

The infant frequently has a stool immediately after birth and bowel sounds are usually present by 30 minutes of age. Bowel sounds indicate the digestive system is capable of functioning. The presence of stool alone, however, does not indicate that peristalsis is present. It only indicates that the anus is patent.

Period of Unresponsive Sleep

The second stage of transition lasts from approximately 30 minutes to 2 hours of age. The newborn's cardiac rate decreases during this period to less than 140 beats per minute. A murmur can be heard; this is merely an indication that the ductus arteriosus has not fully closed and is not considered an abnormal finding. The infant's respiratory rate becomes more slow and even. The infant is in a deep sleep. Bowel sounds are present but diminished. If possible the newborn should not be disturbed for major

examinations or bathing during this period. The first deep sleep allows the newborn to recover from the demands of birth and the immediate transition to extrauterine life.

The Second Period of Reactivity

During the second period of reactivity (third stage of transition), from approximately 2 to 6 hours of age, the baby's heart rate is labile and there are swift changes in color, which are related to environmental stimuli. The respiratory rate is variable and related to activity. The respiratory rate should remain under 60 bpm and there should no longer be rales or rhonchi. Newborns may be interested in feeding and should be encouraged to breastfeed.

Early feeding is critical in the prevention of hypoglycemia and, by stimulation of stool passage, the prevention of jaundice. Early feeding also provides the bacterial colonization of the intestines that leads to the development of vitamin K by the intestinal tract. The newborn may react to the first feeds by spitting milk mixed with mucus. The midwife should assist breastfeeding mothers during the first feeds (see Chapter 43). Infants who are bottle-fed will usually take no more than an ounce per feeding during the first day of life. New mothers should be shown techniques for burping the newborn (see Chapter 40, page 1023).

Any mucus that is present during early feeding may interfere with adequate feeding, particularly if the mucus is excessive. The presence of large amounts of mucus may be an indication of a problem such as esophageal atresia. Bile-stained mucus is always a sign of illness in the newborn infant and feeding should be delayed until the cause has been investigated thoroughly.

Plan of Care for the First Few Days of Life

The period of transition to extrauterine life ends with the second period of reactivity. This occurs approximately 2 to 6 hours after birth. At this point the midwife should make a plan of care for the newborn for the first few days of life. This plan should take into consideration the parents' desires.

In a hospital setting, the newborn's care may be taken over by a pediatric provider. In a birth center or home birth setting the midwife may continue to be responsible for the care of the newborn. The midwife must have an adequate arrangement with a pediatric provider for consultation and referral of newborns. The midwifery practice must also employ adequate nursing help to provide proper care to both mother and newborn.

At some point after the initial transition to extrauterine life, the newborn should be given a complete physical examination and gestational age assessment (see Chapter 39). The gestational age assessment is important because, when plotted on a chart with birth weight and length, it indicates whether the infant is average for gestational age (AGA), small for gestational age (SGA), or large for gestational age (LGA). The complete plan of care will be influenced by these findings.

The skin and gastrointestinal tract of the newborn child have not yet been colonized by many types of bacteria. The newborn therefore is not protected from benign bacteria. All caregivers should scrub their hands and forearms for 3 minutes with an antibacterial soap prior to touching a newborn. Caregivers should rewash their hands briefly between contacts with other babies or the mother. This activity is the single most powerful protection against infection that the newborn has.

Newborn vital signs (temperature, heart rate, and respirations) should be assessed and recorded every 4 hours after the first 2 hours of close assessment. Color, tone, and cry should be noted.

The plan of care for the newborn includes ongoing observation, plans for physical care, feeding, assessment of elimination, blood work, screening tests, and medications. The midwife should observe for signs that the mother and other family members are ready to assume responsibility for care of the newborn.

The midwife should record the time and characteristics of the first urination and passage of stool. The initial newborn stool is a sticky, black substance called meconium. Over the first 3 to 4 days of life the stool will change from black to greenish brown. Passage of meconium and the presence of bowel sounds are reassuring evidence of the integrity of the GI tract. The urinary stream of a male newborn should be strong and forceful. A newborn who has not voided by 24 hours of age should be referred to a pediatric provider.

Current thinking discourages full baths and the use of antibacterial soap in the first days of life. Initial skin care can be "dry care," whereby the infant is dried and the skin folds are wiped clean with soft gauze. Later on day 1, the newborn skin folds and scalp can be washed clean of blood and meconium with warm water and a pH neutral soap,

without dyes or perfumes [8]. An infant who is experiencing temperature lability should not be bathed. There is no routine need to use skin care products, and in fact these can be associated with rashes and inhalation pneumonia. However, the occasional use of a skin emollient may help to hydrate the skin if excess dry skin is a problem. The prevention of skin fissures and cracking can be an important defense against infection.

For many years caregivers used a variety of means to clean and disinfect the umbilical cord, including isopropyl alcohol, triple dye, and antibiotic ointment. Studies have compared alcohol with natural drying and found no increased incidence of infection and a quicker detachment of the cord with air-drying alone [9]. Cord infections are infrequent and the midwife should advise the family to keep the cord dry, clean with water only, and report any odor, pus, or redness that extends onto the abdomen.

Newborns should receive eye prophylaxis against infections caused by gonorrhea or chlamydia. Most states require this and families who defer eye prophylaxis may need to sign a waiver. The best eye protection against gonorrhea and chlamydia is 0.5% erythromycin ointment, which is spread from the inner to the outer canthus of each eye. Irrigation of the eye afterward is not necessary. Eye care should be deferred until after the first period of reactivity, when the alert newborn is searching for the faces of the parents.

Vitamin K is routinely administered to the newborn to prevent hemorrhagic disease. The neonatal gut synthesizes vitamin K, which is used to activate precursor proteins that make blood-clotting proteins. This gut synthesis cannot occur until the gut has been colonized by bacteria. This process takes a few days and can be hampered by a delay in newborn feeding. The clinical manifestations of hemorrhagic disease include bleeding from the intestinal tract, the skin, and the circumcision area. Lab tests reveal markedly long PT and PTT. As a preventive measure, vitamin K is given intramuscularly 1 mg in the lateral thigh for newborns weighing greater than 2.5 kg. It rapidly works to activate the blood clotting precursors. Use of oral vitamin K is not recommended at this time because of questions about its effectiveness [10].

Most practices save cord blood at the time of birth. This can then be sent for newborn blood typing and a direct Coombs test. The practice of "banking" cord blood for a possible future use if the newborn develops certain genetic, hematological, and oncologic disorders is controversial. The chances of the newborn developing one of these conditions are not great. Because there is only a 25 percent match between siblings, use of cord blood for other family members is rarely possible. Current policy of the American Academy of Pediatrics discourages this type of private cord banking unless there is a family member with a known condition that might benefit from cord blood transplantation [11].

A heel stick for a hematocrit and glucose test strip may be part of routine care in the first 2 hours after birth. The midwife should avoid sticks directly on the back of the heel and instead make a puncture on the lateral side of the foot (see Figure 36-4). There are many variations that can occur in glucose testing as a result of testing a capillary sample from a heel stick. The following must be considered possible limitations of this screening procedure [12]:

1. Glucose oxidase reagent strips are affected by venous stasis in an unwarmed foot, leading to false high test results.
2. The strips measure whole blood glucose, which is 10 to 15 percent lower than plasma glucose concentrations.
3. Heel sticks sample venous blood, which has a lower glucose concentration than arterial blood. If a capillary sample from the foot is low (less than 45 mg/dL), or, if it is normal but the newborn is symptomatic, then a plasma glucose sample must be obtained by venipuncture.

The procedure for glucose testing by heel stick is as follows:

1. Gather equipment, including alcohol swabs, cotton ball, sterile gauze square, lancet, glucose strips and bottle, gloves, bandage.
2. Pre-warm foot with warm wet wrap for 30 seconds to decrease stasis.
3. Wash your hands, put on gloves.
4. Grasp foot firmly with hand, using some pressure to briefly occlude blood flow.
5. Prep skin with alcohol and blot dry with sterile gauze.
6. Select an area on the lateral aspect of the foot—not on the heel where a lancet stick can cause permanent damage.
7. Pierce the foot with the lancet. Consider use of a microlancet designed for neonates [13].
8. Following instructions on the glucose test strip bottle, place the correct number of drops of blood on the reagent strip.
9. Time test accurately. Compare color on test strip with chart on bottle.

10. Wipe heel with cotton and place bandage on puncture.

All states require some newborn screening tests for metabolic and genetic conditions. Midwives need to be aware of requirements in the state where they practice. The screening for phenylketonuria and hypothyroidism is required in all 50 states. Neither condition is clinically evident immediately after birth. Left undiagnosed, both cause physical abnormalities and mental retardation. In order to successfully test for phenylketonuria, the newborn needs to have established feeding. A blood sample is taken at 48 hours of age or older. Screening for hypothyroidism (a T4 and TSH) can be done at any time, but it is customarily performed on a blood sample obtained at the same heel stick as the PKU test. If a newborn has an early discharge, the midwife must make sure that a viable plan is in place for obtaining the blood sample.

The Centers for Disease Control recommends that all newborns begin their immunization series for hepatitis B shortly after birth. In part, this provides protection to newborns whose mothers had undiagnosed hepatitis B surface antigen at delivery, with subsequent exposure of the newborn. The vaccine alone is effective at preventing perinatal transmission in many newborns [14]. The midwife should order the first dose of the vaccine, which is administered within 12 hours of birth. Subsequent doses will be given at 1 month and 6 months of age. Some parents are concerned about vaccination because of a mercury-containing additive called thimerosal previously found in hepatitis vaccine. The vaccine is now available without this additive.

If the midwife is not providing direct care of the newborn, she or he should provide written orders for the nurse or birth assistant. Birth centers frequently have standing protocols of care for the newborn until discharge. The following might be included in such a protocol or written orders.

1. Admit to well-baby nursery (in-hospital).
2. Check temperature, pulse, and respirations every 30 minute × 4, then every hour until stable.
3. Record urination and bowel movements.
4. Weigh infant.
5. Administer 1 mg vitamin K intramuscularly into right anterolateral thigh.
6. Administer eye prophylaxis: erythromycin ointment 0.5% in each eye.
7. Use soap and water to care for umbilical cord. Dry and expose to air when possible.
8. Administer sponge bath to infant after temperature has been stable 1 hour.
9. May place infant in bassinet with cotton cap (in-hospital).
10. Offer breast prn or at least every 2 hours or offer bottle (name formula type) every 3 hours.
11. Administer 0.5 ml (10 mcg) hepatitis B vaccine into left anterolateral thigh.
12. Screen for PKU and hypothyroid (others as required by law) as per protocol at 48 hours of age.

Planning Discharge

The new mother and baby should not be unattended for at least 24 hours. If the mother is planning to leave the hospital or birth center shortly after birth, the midwife must explore what assistance the mother will have at home.

Standard practice for postpartum care of women and newborns has evolved to include a very brief stay in most hospitals. Increasingly, insurance companies expect healthy term newborns to be discharged from the hospital after 24 hours. Birth center stays are usually less than 24 hours, sometimes as short as 6 hours. The midwife must continually assess whether mother and baby are healthy enough for discharge.

Ideally, the midwife has spent time during the prenatal period discussing how to prepare the home environment to give the proper support to the new mother and baby. The father, grandmother, or significant other should be involved in some of the prenatal discussion. They must clearly understand that the mother and baby should not be alone during the first few days at home. Typically, in the United States, the mother is showered with baby clothing and equipment but has few support persons during the first week at home. The midwife needs to help the expectant mother be realistic about how tired and overwhelmed she may feel after she comes home.

During the late 1990s, there was scrutiny of the increasing practice of early discharge of mother and baby after birth. Legislation passed at the federal level in 1996 guaranteed the right of the mother and newborn to stay in the hospital for 48 hours after birth if so desired.

Pediatric providers are particularly concerned about feeding problems, weight loss, infection, and hyperbilirubinemia after early discharge. A

Cochrane Review noted that varying methodology in studies made conclusions about the safety of early discharge difficult [15]. A study of a large series of infants in Texas found that 8 percent of term low-risk newborns developed problems requiring special attention and 31 percent of these problems developed after 24 hours of age [16]. The most frequent problems encountered at any age were tachypnea, temperature instability, and cyanotic episodes. Some states now mandate home visits to a mother and newborn after early discharge.

The midwife supervising the discharge of a newborn from a birth center or hospital should evaluate the infant using the criteria established by the American Academy of Pediatrics (Table 37-4) [17]. Assessment of the postpartum mother prior to discharge or prior to the midwife's departure from a home birth is discussed in previous chapters. A midwife who does not believe that the criteria have been met satisfactorily should evaluate whether discharge is safe at this time and be an advocate for the newborn.

If early discharge is indicated, the family should be given written information that is culturally appropriate and written at an appropriate literacy level. It should reiterate any instructions the midwife has already given and describe home assessment of the newborn (see Figure 37-3). The excited and tired family has probably retained only a fraction of the information that has been offered.

TABLE 37-4 Criteria for Short Hospital Stay (<48 Hours) of Term Newborns

The antepartum, intrapartum, and postpartum courses for both mother and baby are uncomplicated.

Delivery is vaginal.

The baby is a single birth at 38 to 42 weeks' gestation and the birth weight is appropriate for gestational age according to appropriate intrauterine growth curves.

The baby's vital signs are documented as being normal and stable for the 12 hours preceding discharge, including a respiratory rate below 60/min, a heart rate of 100 to 160 beats per minute, and an axillary temperature of 36.1°C to 37°C in an open crib with appropriate clothing.

The baby has urinated and passed at least one stool.

The baby has completed at least two successful feedings, with documentation that the baby is able to coordinate sucking, swallowing, and breathing while feeding.

Physical examination reveals no abnormalities that require continued hospitalization.

There is no evidence of excessive bleeding at the circumcision site for at least 2 hours.

There is no evidence of significant jaundice in the first 24 hours of life.

The mother's knowledge, ability, and confidence to provide adequate care for her baby are documented by the fact that they have received training sessions regarding:

1. Breastfeeding or bottle-feeding. The breastfeeding mother–infant dyad should be assessed by trained staff regarding nursing position, latch-on, adequacy of swallowing, and mother's knowledge of urine and stool frequency.
2. Cord, skin, and infant genital care.
3. Ability to recognize signs of illness and common infant problems, particularly jaundice.
4. Proper infant safety (e.g., proper use of a car seat and positioning for sleeping).

Family members or other support person(s), including health care providers, such as the family pediatrician or his/her designees, familiar with newborn care and knowledgeable about lactation and the recognition of jaundice and dehydration are available to the mother and the baby for the first few days after discharge.

Laboratory data are available and reviewed, including: Maternal syphilis and hepatitis B surface antigen status. Cord or infant blood type and direct Coombs' test result as clinically indicated.

Screening tests are performed in accordance with state regulations. If the test is performed before 24 hours of milk feeding, a system for repeating the test must be assured during the follow-up visit.

Initial hepatitis B vaccine is administered or a scheduled appointment for its administration has been made within the first week of life.

A physician-directed source of continuing medical care for both the mother and the baby is identified. For newborns discharged in less than 48 hours after delivery, a definitive appointment has been made for the baby to be examined within 48 hours of discharge.

Source: Abridged from the American Academy of Pediatrics, Committee on Fetus and the Newborn. Hospital stay for healthy term newborns. *Pediatrics* 96:4, Pt. 1, 788–790, 1995. Adapted with permission.

Your New Baby—the First Few Days

Eating
Your baby will probably be hungry every 2 to 4 hours around the clock. To help your baby adjust to a schedule like yours, wake him or her to feed every 3 to 4 hours when you are awake. Babies need only breast milk or formula for the first six months. Feeding your baby anything else will not help him or her to sleep better and may cause an allergic reaction. Remember to help the baby burp up swallowed air after each feeding (whether formula or breast milk).

Sleeping
Babies need a lot of sleep. To help your baby sleep when you want to sleep, provide a restful atmosphere and minimize interruptions or stimulation. Place your baby on his or her back to sleep.

Bowel Movements
Babies have greenish-black sticky stool for the first two days or so. This is called meconium. Breastfed babies' stool will then become golden-green, soft, and seedy-looking. Bottlefed babies have dark brown, pasty, or formed stools. Your baby may have one to four stools a day. If your baby goes without a bowel movement for more than 2 days, contact your pediatrician or nurse-practitioner.

Voiding
Your baby should wet at least 4 to 5 diapers per day. This may be hard to tell if you are using paper diapers. If you have questions, use cloth.

Skin Care
Wash your baby with mild soap such as Ivory or Dove. Do not immerse the baby completely until the cord stump has fallen off and dried. This will happen in 1 to 2 weeks. Before then, wipe around the base of the cord with a damp cloth. Fold the front of the baby's diaper down so that the cord is not irritated by it. When changing diapers, wash the baby's bottom with soap and water. Avoid using powder and perfumed creams to help prevent diaper rash.

Safety
It is Pennsylvania and New Jersey State law that babies ride in car seats. Keep your baby as safe as he or she has been for the first nine months! Newborns can roll, so they must never be left unattended on changing tables, dressers, tables, or beds. Do not keep pillows, stuffed animals, quilts, and extra blankets in the baby's crib, because they can prevent the baby from getting enough air to breathe.

Danger Signs
Contact your prediatrician or nurse-practitioner immediately if:

- The baby becomes listless, will not eat, or behaves in an unusual way.
- The baby does not urinate within the first 24 hours.
- The baby has no bowel movement for 48 hours.
- The cord starts to smell bad or has pus oozing from it.
- The baby's temperature is below 97 degrees or above 99 degrees when taken under the baby's arm.
- The whites of the baby's eyes become yellow and the skin color looks yellow, tan, or peach.

Newborn Home Assessment

As your baby adjusts to life outside of your uterus, he or she will undergo many changes. To ensure that the changes your baby is experiencing are normal, it is helpful to check each of the following twice a day. Report any variations from normal to your midwife or physician.

	Day 1		Day 2		Day 3	
	9 AM	5 PM	9 AM	5 PM	9 AM	5 PM
Temperature Take under the baby's arm for 3–5 minutes. The temperature should be between 97° and 99°						
Skin Check for jaundice or yellowing in the skin and whites of the eyes. Look at the baby in daylight near a window. Press on the baby's nose or breatbone; note the skin color when you release the pressure.						
Urination Note each time the baby has a wet diaper. There should be 5 or more a day.						
Bowel Movement Note color and number of bowel movements.						
Feeding The baby should be nursing or feeding every 2 to 3 hours for 15 to 20 minutes (2 to 4 ounces).						
Cord should become black and hard. Any pus or blood oozing from the stump is abnormal.						

FIGURE 37-3 Example of written instructions to be sent home with the new family.
Source: From the Birthing Suite, Pennsylvania Hospital, Philadelphia. Reprinted by permission.

References

1. Apgar, V. The newborn (Apgar) scoring system: reflections and advice. *Pediatr. Clin. North Am.* 13(3):645–650 (August) 1966.
2. Casey, B., McIntire, D., and Leveno, K. The continuing value of the Apgar score for the assessment of newborn infants. *N. Eng. J. Med.* 344(7):467–471, 2001.
3. Goldenberg, R., and Nelson, K. Cerebral palsy. In Creasy, R., and Resnick, R. *Maternal-Fetal Medicine*, 4th ed. Philadelphia, PA: Saunders, 1999, p. 1203.
4. Desmond, M., Rudolph, A., and Phitaksphraiwan, P. The transitional care nursery: a mechanism for preventive medicine in the newborn. *Pediatric. Clin. North Am.* 13(3):656 (August) 1966.
5. Anderson, G. C., Moore, E., Hepworth J. T., and Bergman N. Early skin-to-skin contact for mothers and their healthy newborn infants (Cochrane Review). In *The Cochrane Library*, Issue 1. Oxford, England: Update Software, 2002.
6. Matthiesen, A., Ransjo-Arvidson, A., Nissen, E., and Uvnas-Moberg, K. Postpartum maternal oxytocin release by newborns: effect of infant hand massage and sucking. *Birth* 28(1):13–18, 2001.
7. Ransjo-Arvidson, A., Matthiesen, A., Lilja, G., Nissen, E., Widstrom, A., and Uvnas-Moberg, K. Maternal analgesia during labor disturbs newborn behavior: effects on breastfeeding, temperature and crying. *Birth* 28(1):5–11, 2001.
8. Lund, C., Kuller, J., Lane, A., Lott, J., and Raines, D. Neonatal skin care: the scientific basis for practice. *JOGNN* 28(3)241–254, 1999.
9. Dore, S., Buchan, D., Coulas, S., et al. Alcohol versus natural drying for newborn cord care. *JOGNN* 27:621–627, 1998.
10. American College of Obstetricians and Gynecologists. *Guidelines for Perinatal Care*, 4th ed. Elk Grove Village, IL: American Academy of Pediatrics, 1997.
11. American Academy of Pediatrics/Work Group on Cord Blood Banking. Cord blood banking for potential future transplantation. Subject Review (RE9860). *Pediatrics* 104(1):116–118, 1999.
12. Kalhan, S., and Parimi, P. Metabolic and endocrine disorders. In Fanaroff, A. A., and Martin, R. J. (Eds.) *Neonatal and Perinatal Medicine* Vol 2, *Diseases of the Fetus and Infant*, 7th ed. St. Louis, MO: Mosby, 2002, pp. 1351–1376.
13. Kellam, B., Sacks, L. M., Waiter, J. L., et al. Tenderfoot Preemie vs. a manual lancet: a clinical evaluation. *Neonatal Network* 20(7):31–36 (October) 2001.
14. Hurie, M. B., Saari, T. N., and Davis, J. P. Impact of the Joint Statement by the American Academy of Pediatrics/US Public Health Service on Thimerosal in Vaccines on Hospital Infant Hepatitis B Vaccination Practices. *Pediatrics* 107(4):755–757 (April) 2001.
15. Brown, S., Davis, P., Faber, B., Krastev, A., and Small, R. Early postnatal discharge from hospital for healthy mothers and term infants (Cochrane Review). In *The Cochrane Library*, Issue 1. Oxford, England: Update Software, 2002.
16. Jackson, G., Kennedy, K., Sendelbach, D., Aldridge, C., Vedro, D., and Laptook, A. Problem identification in apparently well neonates: implications for early discharge. *Clin. Pediatr.* October, 581–589, 2000.
17. American Academy of Pediatrics/Committee on Fetus and the Newborn. Part 1: Hospital stay for healthy term newborns. *Pediatrics* 96:4, 788–790, 1995.

CHAPTER

38

Resuscitation at Birth

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Infrastructure for Safe Resuscitation of the Newborn

Any midwife attending births has a moral and ethical obligation to provide a birth environment in which resuscitation of the newborn can be effectively accomplished. To achieve that goal, the midwife needs (1) training in resuscitation techniques; (2) available and functional resuscitation equipment; (3) adequate support personnel; and (4) a clear-cut system for neonatal transport and/or referral to pediatric providers.

The content in this chapter reflects the latest guidelines for neonatal resuscitation established by the International Cardiopulmonary Resuscitation and Emergency Cardiac Care conference, last held in the year 2000. The conference meets every five years and its recommendations are adopted by the American Academy of Pediatrics (AAP) and the American Heart Association (AHA). Midwives should regularly check the AAP Web site (www.aap.org/nrp) for new developments and online review materials.

Every midwife and birth assistant attending births should be certified in neonatal advanced life support. The training course, the Neonatal Resuscitation Program (NRP), was jointly developed by the American Heart Association and the American Academy of Pediatrics and is available nationally. Midwives interested in taking the course can find a local course at the AAP Web site. After initial certification, annual skill refreshers are essential.

In a hospital setting, the midwife should be familiar with the neonatal personnel who will attend the birth of a compromised infant. This information should be part of the orientation of any new midwife. The midwife can then request appropriate help and explain the neonatal support team to worried parents.

In a free-standing birth center or home birth practice the midwife has an obligation to establish a clear-cut mechanism for transport and/or referral of compromised newborns. There must be access to both pediatric providers and a hospital nursery capable of providing acute care for a compromised newborn. Occasionally, a consultation can take place on site at a birth center. More typically, a transport team from the receiving hospital, or a local ambulance team, will pick up the compromised newborn. The responsibility for initiating the consultation and transport rests with the midwife attending the birth. During the interval before the transport team arrives, the midwife must continue to care for the newborn. The National Association of Childbearing Centers (NACC) has national standards related to the organization of a birth center's newborn care contingencies [1].

Equipment for Resuscitation

The basic equipment necessary for resuscitation of the newborn should be available in all sites (see Table 38-1). Certain medications, electrocardiograms, and an umbilical artery catheterization tray may only be available in a hospital site where trained neonatal providers will make use of them. In a hospital setting, nursing staffs are usually responsible for checking and maintaining equipment and supplies. In a birth center or home birth practice this responsibility may remain with the midwife or a nurse. Equipment should be checked at frequent intervals and a signature log should be kept.

TABLE 38-1 Neonatal Resuscitation Supplies and Equipment

Suction Equipment	Bag-and-Mask Equipment	Intubation Equipment	Medications	Miscellaneous
Bulb syringe Mechanical suction and tubing Suction catheters, 5F or 6F, 8F, 10F or 12F 8F feeding tube and 20-mL syringe Meconium aspirator	Neonatal resuscitation bag with pressure-release valve or pressure manometer; the bag must be capable of delivering 90 to 100% oxygen Face masks, newborn and premature sizes (cushioned rim masks preferred) Oxygen with flowmeter (flow rate up to 10 L/min) and tubing	Laryngoscope with straight blades, no. 0 (preterm) and no. 1 (term) Extra bulbs and batteries for laryngoscope Endotracheal tubes, 2.5, 3.0, 3.5, 4.0 mm internal diameter (ID) Stylet (optional) Scissors Tape or securing device for endotracheal tube Alcohol sponges CO_2 detector (optional) Laryngeal mask airway (optional)	Epinephrine 1:10,000 (0.1 mg/ml) in 3-mL or 10-mL ampules Isotonic crystalloid (normal saline, or Ringer's lactate) for volume expansion—100 or 250 ml. Sodium bicarbonate 4.2% (5 mEq/10mL) in 10-mL ampules Naloxone hydrochloride 0.4 mg/mL in 1-mL ampules or 1.0 mg/mL in 2-mL ampules Dextrose 10%, 250 mL Normal saline for flushes Feeding tube, 5F (optional) Umbilical vessel catheterization supplies: Sterile gloves Scalpel or scissors Povidone-iodine solution Umbilical tape Umbilical catheters, 3.5F, 5F Three-way stopcock Syringes, 1, 3, 5, 10, 20, 50 ml Needles, 25, 21, 18 gauge, or puncture device for needleless system	Gloves and appropriate personal protection Radiant warmer (see text) Firm, padded resuscitation surface Clock (timer optional) Warmed linens Stethoscope (neonatal head preferred) Tape, 1/2 or 3/4 inch Cardiac monitor and electrodes or pulse oximeter and probe (optional for delivery room) Oropharyngeal airways (0, 00, 000 sizes or 30-, 40-, 50-mm lengths)

Source: From Kattwinkel, J. *Textbook of Neonatal Resuscitation*, 4th ed. Elk Grove Village, IL: American Heart Association and American Academy of Pediatrics, 2000, pp. 1-18, 1-19. Reproduced by permission.

Pathophysiology of Asphyxia

The underlying pathophysiological events in asphyxia include lack of oxygenation of cells, excess carbon dioxide retention, and metabolic acidosis. These three events combine to cause cell damage and a biochemical environment that is incompatible with life. The goal of resuscitation is timely intervention that reverses the biochemical effects of asphyxia, thus preventing irreversible brain and organ damage that may have sequelae throughout life.

The onset of hypoxia causes a series of reactions outlined in Figures 38-1 and 38-2. The heart rate and blood pressure initially rise and the infant will make gasping attempts. The infant will then enter a period of primary apnea. Infants receiving adequate stimulation during primary apnea will begin respiratory effort again. Stimulation can con-

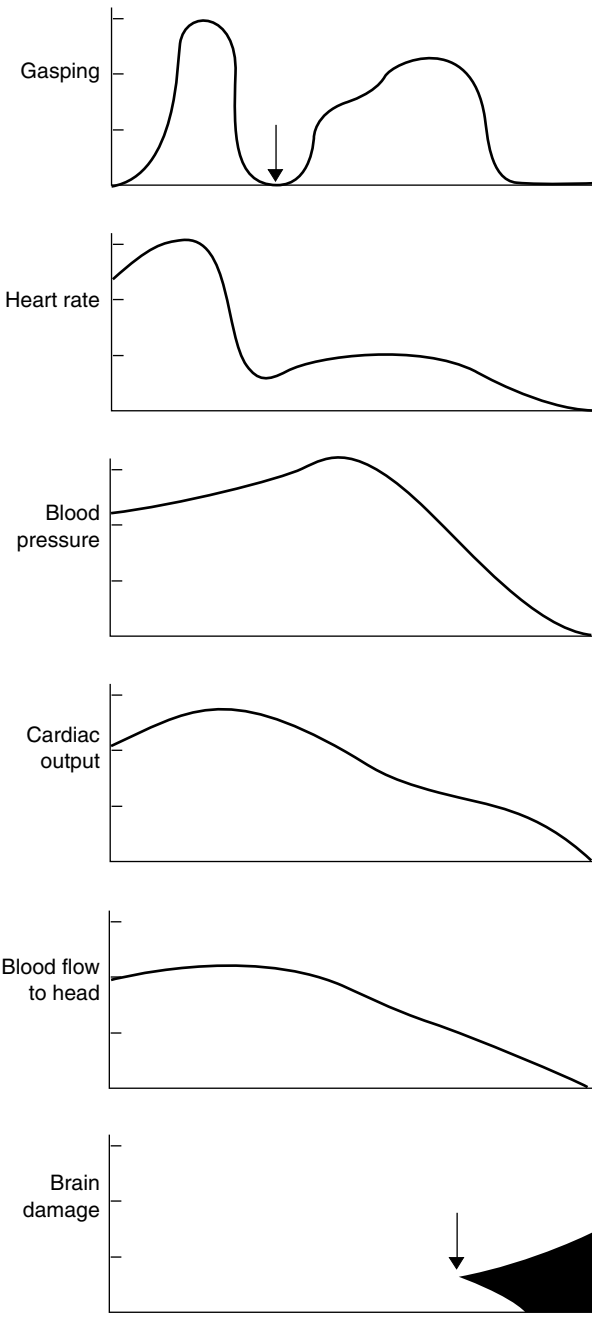


FIGURE 38-1 Physiological effects of asphyxia. Arrow in the topmost graph indicates the point of primary apnea; arrow in the lowest graph indicates the point at which brain damage begins.

Source: From Bloom, R. Delivery room resuscitation of the newborn. In Fanaroff, A., and Martin, R. *Neonatal Perinatal Medicine: Diseases of the Fetus and Infant*, 5th ed. St. Louis, MO: Mosby, 1992, p. 306. Modified from Dawes, G. *Fetal and Neonatal Physiology*. Chicago, IL: Year Book Medical Publishers, 1968, and from Phibbs, R. Delivery room management for the newborn. In Avery, G. (Ed.) *Neonatology*, 3rd ed. Philadelphia, PA: Lippincott, 1987. Reproduced by permission.

sist of tactile stimulation (drying the infant) and thermal stimulation (provided by the cooler temperature of the birth room).

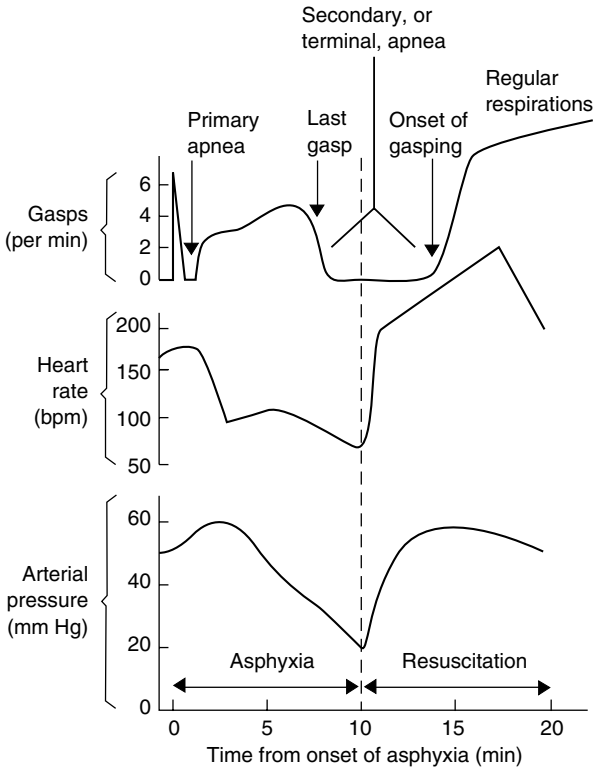


FIGURE 38-2 Response of Rhesus monkeys to asphyxia and resuscitation.

Source: From Dawes, G. *Fetal and Neonatal Physiology*. Chicago, IL: Year Book Medical Publishers, 1968, p. 149. Reproduced by permission.

Infants further along in the asphyxial process are in a stage of secondary apnea. Secondary apnea will quickly lead to death if the infant is not fully supported with artificial respiration and, as needed, cardiac compression. During secondary apnea, the heart rate and blood pressure plummet. Color changes from blue to white as the newborn shuts down peripheral circulation in an attempt to maximize blood flow to organs such as the heart, the kidneys, and the adrenals.

The midwife assisting at the birth of an apneic newborn can only know retrospectively whether the newborn was in primary or secondary apnea. The fetus may have started the asphyxial gasping prior to birth and may be born dying. Recovery from secondary apnea is prolonged and is directly related to the length of asphyxia.

During apnea, the decreased available oxygen causes constriction of the blood vessels in the lungs. This vasoconstriction causes the lungs to be resistant to expansion, thus compounding the work of resuscitation. One of the effects of hypoxia on the

circulation in the heart is persistent fetal circulation. The foramen ovale continues to shunt blood from the right to the left atrium and the ductus arteriosus continues to shunt blood to the aorta, past the constricted lungs. The newborn in a state of asphyxia retains many of the features of fetal circulation.

During hypoxia, serious biochemical changes cause a buildup of the by-products of anaerobic metabolism. Because of the lack of adequate ventilation, the newborn quickly builds up carbon dioxide. This hypercarbia leads to a respiratory acidosis that will further depress respiratory efforts.

Within a short period of time, the lack of oxygen causes the newborn to switch to an anaerobic pathway for metabolism, especially of the glucose needed for emergency fuel. This leads to an accumulation of lactate and metabolic acidosis. Metabolic acidosis will only clear over a significant period of time and is a residual problem even after adequate respirations and heart rates are established.

The effect of hypoxia on the brain is especially pronounced. With initial hypoxia, the blood flow to the brain increases, as part of a compensatory mechanism. This can only provide a partial adjustment and, in the face of continuing hypoxia, is quickly overwhelmed. Among the many effects of hypoxia on the brain cells, some of the most severe come from the lack of energy-providing substances such as ATP; a cessation of the transcellular pumping of ions; an accumulation of water, sodium, and calcium; and damage from oxygen free radicals. As the flow of oxygenated blood decreases, amino acids that promote swelling of brain tissues are released. This process can lead to gross or subtle neurological damage. Seizures may start during the first 24 hours after birth. The onset of seizures during this period is an ominous sign and signals the increased probability that there has been permanent brain damage [2].

Care of the Newborn Following Resuscitation

The seriousness of the newborn's distress at birth can be estimated after the resuscitation is completed. As noted above, quick recovery of respiratory abilities after tactile stimulation or very brief artificial ventilation is consistent with primary apnea. Secondary apnea requires a longer recovery period that starts with a few gasps followed many minutes later by regular respirations. The Apgar score can be used to evaluate the successful recovery from asphyxia. However the Apgar score, which is not assigned until minutes 1 and 5, is not used to lead decisions regarding resuscitation. The midwife will be making resuscitation decisions from the moment the neonate's color can be first evaluated.

Deviations in blood gases will also reflect the seriousness of the asphyxia at birth (see Table 38-2). The midwife can estimate the acidosis present at delivery by sending cord blood to the lab to evaluate acid-base balance. The midwife should attempt to draw blood from the umbilical artery, which contains blood exiting from the fetus. If that is not possible, a sample can be obtained from the umbilical vein. In studies of thousands of neonates, umbilical artery mean pH levels were 7.28 and umbilical vein means were between 7.32 and 7.35. Values below a pH of 7.0 from the umbilical artery are considered significantly acidotic [3]. (See Chapter 27, page 813 for more information about cord blood pH.)

During and after resuscitation, blood gas measurements will reflect the success of the interventions offered to the newborn. Many facilities have equipment to indirectly measure oxygenation. One technique uses pulse oximetry and measures oxygen saturation. This noninvasive procedure involves attachment of a sensor to one of the infant's extremities. From the underlying arterial pulsations in the extremity, the sensor computes the arterial oxygen saturation. A second type of testing involves the placement of a heated electrode on the abdomen and transcutaneously measures the partial pressure of oxygen—the $tcPO_2$. In this measurement the caregiver needs to be concerned with long-term skin care issues, especially in a premature infant. The midwife may initiate use of a pulse oximeter or a transcutaneous electrode on the neonate while awaiting a transport team or neonatal backup.

After a successful resuscitation, the asphyxiated infant must be observed carefully for residual effects of ischemia and metabolic acidosis and for temperature stability, adequate blood pressure, blood glucose and serum electrolytes, and adequate urine output. Glucose should be given prophylactically, with the route of administration dependent on the severity of the asphyxia. Metabolic acidosis may need to be treated with medications like sodium bicarbonate. Ultrasounds, EEGs, or CT scans of the resuscitated infant's brain will be used for follow-up of the severely asphyxiated newborn.

TABLE 38-2 Normal Blood Gases After Birth

	Immediately After Birth					
	Value	*Standard Deviation*	*Range*	*5 min*	*10 min*	*1 hr*
pH						
Umbilical artery	7.28	± .05	7.20–7.43			7.3
High altitude	7.32	± .05	7.20–7.42			
Umbilical vein	7.35	± .05	7.26–7.48			
pCO_2 (mm Hg)						
Umbilical artery	47.5	± 7	30–40			38.8
High altitude	44.7	± 7	23–65			
Umbilical vein	38	± 5.6	25–50			
pO_2 (mm Hg)						
Umbilical artery	17.5	± 6.4	4–37			85
High altitude	18.1	± 5.4	6.8–33			
Umbilical vein	29	± 6.2	15–47			
HCO_3 (mEq/L)						
Umbilical artery	22	± 2.5	15–27			
High altitude	22.9	± 2.3	16.7–28			
Umbilical vein	20.4	± 2.3	16–25			
O_2 sat (%)						
Umbilical artery	26.3	± 16	2.2–71			
High altitude	27	± 12.6	3.6–68.6			
Umbilical vein	54	± 14	18.5–83.5			
Right hand	72	± 6.5		83.3	90.7	
Right foot	63	± 4.3		76.6	87.1	

Source: From Kelley, S. (Ed.) *Pediatric Emergency Nursing*, 2nd ed. Norwalk, CT: Appleton and Lange, 1994, p. 156. Reprinted by permission.

The Process of Resuscitation

Neonatal resuscitation is not an isolated procedure. It is instead a complex web of decisions about care. If resuscitation is done correctly, the newborn is exposed to the proper level of support and intervention needed for a successful transition to extrauterine life. The midwife making resuscitation decisions will be following the same critical thinking process used in every area of midwifery care: data collection, problem identification, formulation of a plan, action, and evaluation. Failure to follow the critical thinking process can lead to resuscitation that is needlessly vigorous—or worse, woefully inadequate.

Decision-Making in Newborn Resuscitation

One of the most serious errors a midwife can make is to be unprepared for newborn resuscitation. There are many factors that predispose a newborn to need resuscitation. It is estimated that approximately 6 percent of newborns will need some type of resuscitation [4]. Some of the most common reasons for resuscitation are summarized in the "TAMMSS" acronym devised by McCollum [5]:

T = Trauma
A = Fetal asphyxia
M = Maternal medication
M = Malformations
S = Sepsis
S = Shock

Based on the presence or likelihood of these factors, the midwife should decide, prior to the birth, the safest site and personnel for the birth. In labor at home or in a birth center, there may be such a high likelihood of the need for resuscitation that the midwife will choose a hospital transfer during

labor. In a hospital birth, the midwife may choose to call in the neonatal team for the birth.

The amount of obstetrical trauma and maternal medication that affect a newborn are closely related to the quality of the midwifery care given during labor. Of the four common reasons for resuscitation, asphyxia is the most common. Whether asphyxia can be predicted is questionable [6]. Events from the antepartal, intrapartal, and immediate neonatal periods can overlap to increase the deleterious effects of any hypoxia. At present, our ability to foretell fetal asphyxia and subsequent neonatal outcomes is limited. The duration of the hypoxia is currently the most reliable indicator of subsequent neonatal sequelae [7]. Table 38-3 summarizes situations that cause asphyxia in utero.

The infant who needs resuscitation secondary to maternal medication or malformations may be pink, take a few breaths, and then decompensate. As emphasized in Chapter 37, the need for vigilant observation of the newborn continues throughout the first hour of life. Newborns who are well-wrapped and nestled on their mother's abdomen must be frequently checked for ongoing healthy transition to extrauterine life.

If, at birth or later, the midwife has any concerns about the newborn's respiratory effort, color, heartbeat, or muscle tone, the newborn should be placed in the resuscitation area for a full assessment under good lights and an adequate heat source.

Some general principles underlie any resuscitation decisions.

1. Resuscitation equipment should always be available and functioning and the midwife should know how to use it.
2. Thermal stress should be avoided.
3. A blocked newborn airway cannot be easily ventilated.
4. Adequate ventilation is the most important part of neonatal resuscitation.
5. Adequate circulatory support prevents long-term metabolic sequelae.
6. Personnel attending the infant should follow universal precautions.

With these premises in mind, the midwife attending a birth should move ahead assertively with the following activities:

1. Dry and cover the newborn.
2. Observe the newborn for signs of a vigorous first breath and subsequent regular breaths.
3. Assess the heartbeat and tone of the infant.
4. Watch for a change of color from dusky to pink.

If the midwife is not satisfied with the assessment of the newborn, she or he should recall the classic "ABC" priorities of resuscitation: airway, breathing, and circulation. The midwife then begins those activities that will support newborn oxygenation and circulation at a level appropriate for the situation. In the hospital, the neonatal team may take over at this point. However, until a team of experienced neonatal caregivers arrives, it is the midwife's duty to direct and/or perform resuscitation.

Because midwives specialize in the care of low-risk women, a midwife's experience with neonatal resuscitation may be limited. Aside from participating in yearly NRP recertification, every midwife should mentally review on the way to every birth the steps of decision-making and assessment that are part of a smooth resuscitation. In particular, the midwife should review the points at which resuscitation efforts should be started, stopped temporarily for an assessment, or stopped permanently because of success. The midwife should reflect on those situations in which the typical steps of resuscitation do not yield a positive result and be prepared for unusual problems like diaphragmatic hernia and upper airway obstruction that require the use of alternative methods of resuscitation.

TABLE 38-3 Conditions Under Which Fetal Asphyxia Is Likely

Problem	Pathophysiology	Type
Cord prolapse (overt/occult)	Decreased blood flow to fetus	Acute
Placenta previa	Disruption of placental flow	Acute
Abruptio placentae	Disruption of placental flow	Acute
Cord compression	Intermittent umbilical vein flow	Acute/chronic
Fetal isoimmunization	Destruction of red blood cells	Chronic
Placental insufficiency	Inadequate placental function	Chronic
Maternal vascular disease	Poor oxygenation of mother/fetus	Chronic
Maternal hypotension	Inadequate placental blood flow	Acute
Uterine overstimulation	Inadequate placental oxygenation	Acute

The following cardinal principles, part of the resuscitation overview of the NRP [8], should contribute to decision-making regarding neonatal resuscitation (see Figure 38-3):

1. Clear the airway.
2. If heart rate is less than 100 bpm, begin resuscitation with positive pressure ventilation (PPV).

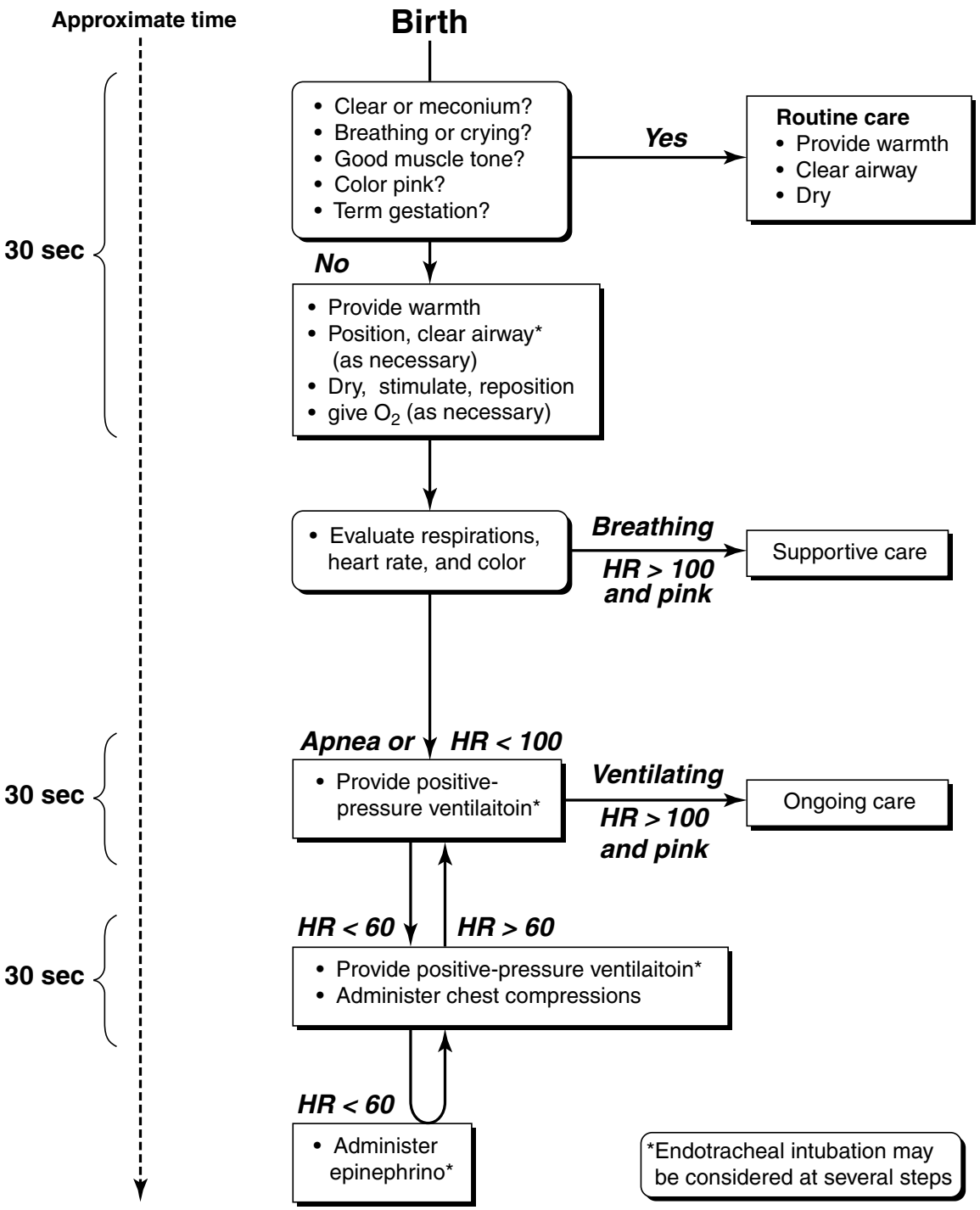


FIGURE 38-3 Algorithm for resuscitation of the newly born infant.

Source: Niermeyer, S., Kattwinkel, J., Van Reempts, P., et al. International guidelines for neonatal resuscitation: an excerpt from the guidelines 2000 for cardiopulmonary resuscitation and emergency cardiovascular care. International consensus on science, contributors and reviewers for the neonatal resuscitation guidelines. *Pediatrics* 106(3):E29, September 2000. Used by permission.

3. After 30 seconds, evaluate heart rate while continuing PPV.
4. If heart rate is less than 60 bpm, start chest compressions with PPV. Evaluate at 30 seconds. Continue PPV. If heart rate is above 60, stop chest compressions and continue PPV.
5. Perform endotracheal intubation if PPV seems ineffective (inadequate chest expansion, signs of diaphragmatic hernia).
6. Consider use of Naloxone or epinephrine if there is no increase in heart rate.
7. Stop PPV if there are spontaneous respirations. Continue free-flow oxygen.

Techniques for Effective Newborn Resuscitation

Techniques to Establish Adequate Respiration Basic support of the newborn needing resuscitation starts with the establishment of an adequate airway. Newborns who do not make immediate efforts to breathe and clear their own mucus should be suctioned: first the mouth, then the nose. The greatest amount of fluid is in the oropharynx. Bulb suction or wall suction (less than 100 mg Hg) can be used. The use of DeLee suction catheters is in decline because of the small chance of operator exposure to the newborn's bodily secretions. Occasionally, an oral airway may need to be inserted in an infant with a congenital defect of the mouth, nose, tongue, or palate to encourage adequate respiration in a mouth-breather. Infants showing respiratory compromise should be positioned on their backs with a very slight extension of the neck. This helps to minimize tracheal narrowing and maximizes air flow. If an infant has a very swollen occiput, it may be necessary to put a half-inch roll of cloth under the shoulders in order to keep the airway slightly hyperextended.

Breathing efforts should be evaluated next. Tactile stimulation should be enough to stimulate most infants to breathe. Apneic infants who respond to tactile stimulation were in a period of primary apnea.

If there are spontaneous regular respirations but the infant's color is dusky, the infant can be given 100 percent free-flow oxygen. To deliver this free-flow oxygen, the midwife should use either oxygen tubing with a face mask or an anesthesia bag with mask placed near the newborn's face. Self-inflating resuscitation bags will not deliver any oxygen in a free-flow manner and should not be used to administer free-flow oxygen. An increasingly pink color will be a sign of success from this intervention. As color improves the oxygen can be gradually withdrawn.

If there are not spontaneous, regular respirations or if the newborn color remains dusky, the midwife should start positive pressure ventilation using a resuscitation bag and mask (see Table 38-4 and Figure 38-4). The oxygen source should be set at a liter flow of 5–10 L/min. There are two types of bags—flow-inflating and self-inflating—and the midwife needs to become familiar with the type of bag used at each facility. Flow-inflating bags need

TABLE 38-4 Procedure for Positive Pressure Ventilation

Equipment	Method	Precautions
1. Anesthesia bag with pressure gauge (manometer) or self-inflating bag with oxygen reservoir attachment 2. Infant- and premature-size face masks 3. Stethoscope 4. Feeding tube 5. Source of humidified oxygen with flowmeter	1. Suction nares and oropharynx to clear secretions. 2. Place infant's head in a neutral position (when hyperextended, air enters esophagus). 3. Place mask over nose and mouth, making sure seal is tight. 4. Pressure for first breath should be 40–50 cm H_20. 5. Subsequent breaths need about 25 cm H_20 or the lowest pressure that will allow you to see the chest wall expanding. 6. Ventilate 40–50 times per minute for 23 minutes. 7. Have assistant auscultate anterior upper lobes of the lungs for aeration. 8. Continue to provide free-flow 0_2 by face mask after infant has established respirations.	1. Inadequate ventilation may be caused by poor seal around mask, flexed or hyperextended neck, or inadequate pressure of ventilation. 2. Face mask pressure near the infant's eyes can cause tissue damage. 3. Positive pressure ventilation will cause air retention in the stomach. After bagging for a brief period of time, vent the stomach by passing a feeding tube. Any gastric contents should also be emptied. If bagging is going to continue over time (e.g., while awaiting a transport team), stop momentarily to slip a tube into the stomach to vent the stomach and prevent or reduce distention. Secure tube in place while continuing to ventilate.

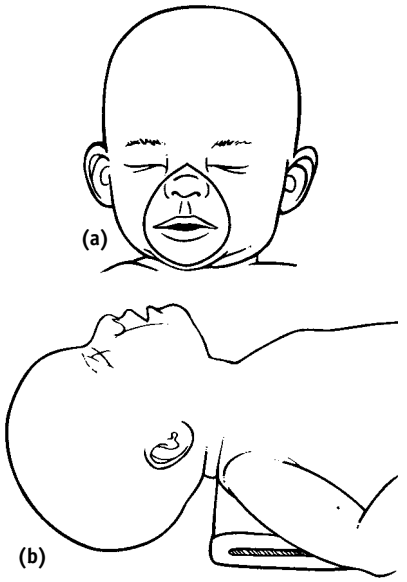


FIGURE 38-4 (a) Correct-sized mask covers mouth, nose, and tip of chin, but not the eyes. (b) Correct position for assisted ventilation.

Source: From Kattwinkel, J. *Textbook of Neonatal Resuscitation*, 4th ed. Elk Grove Village, IL: American Heart Association and Academy of Pediatrics, 2000, p. 3-22. Used with permission of the American Academy of Pediatrics.

compressed oxygen to inflate and can be used to deliver different pressures and concentrations of oxygen. If not used properly, they can inflict damage from pressure on the newborn lungs. A flow-inflating bag should be adjusted to have a resting pressure of 5 cm H_2O and a peak pressure of 30–40 cm H_2O.

Self-inflating bags are easier to manage if a midwife performs resuscitation only occasionally. They deliver a peak pressure of 30–40 cm H_2O, after which they "pop-off" extra pressure. However, self-inflating bags will not deliver high concentrations of oxygen (90–100 percent) unless they have a closed-ended reservoir attached to them. It is recommended that a self-inflating bag be used to deliver room air to a neonate if there is no functional source of compressed oxygen [9].

Problems connected with positive pressure ventilation include a poor seal between mask and face, inadequate oxygen delivery, blockage of the airway by the tongue, and a poor technique that delivers too few or too many breaths to the newborn.

The midwife should be assisted in the resuscitation. During positive pressure ventilation, the bag should be positioned so that it does not obstruct the ability of the assistant to evaluate chest expansion and heart rate. Between 40 and 60 breaths per minute should be delivered via PPV. The rhythm that can be developed is illustrated in Figure 38-5. The PPV should be stopped for a moment every 30 seconds to see if there are spontaneous respirations.

If the PPV continues for more than a brief period, the newborn stomach will have to be vented of air by passage of an orogastric (feeding) tube. The PPV should be stopped for the 10 seconds it will take to pass the feeding tube through the mouth. Failure to do this will lead to an accumulation of air that may compromise lung expansion. The midwife should be comforted to know that if adequate respirations are delivered, most newborns will show prompt signs of recovery.

Technique of Cardiac Compression The new AAP/AHA guidelines recommend initiating cardiac compressions if the heart rate is less than 60 bpm [9]. The goal of cardiac compression is to provide the proper frequency of compression accompanied by a pressure that is effective yet avoids damage to internal organs. It will be nearly impossible for the midwife to continue resuscitation successfully if there is not assistance from a second trained person. During cardiac compressions, ventilatory support must continue.

The caregiver's fingers should give pressure downward, without splaying pressure out in a lateral direction. The fingers or thumbs can be posi-

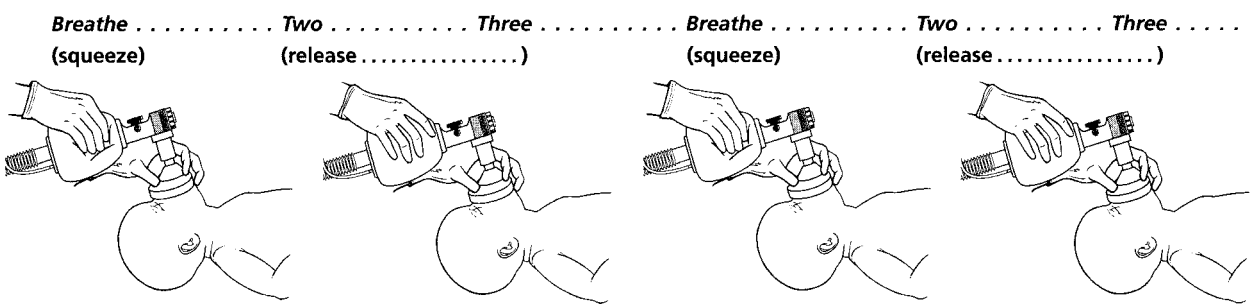


FIGURE 38-5 Rhythm for effective positive pressure ventilation. Count out loud to maintain a rate of 40 to 60 breaths per minute.

Source: From Kattwinkel, J. *Textbook of Neonatal Resuscitation*, 4th ed. Elk Grove Village, IL: American Heart Association and American Academy of Pediatrics, 2000, p. 3-26. Reproduced by permission.

tioned side-by-side in either the thumb technique or the two-finger technique (see Figure 38-6). The fingers should be applied to the lower third of the sternum, the area that would be directly below a line drawn between the nipples. The sternum should be compressed to a depth of one-third of the anterior-posterior diameter of the chest. Between compressions, it is important that the caregiver not remove his or her fingers from the newborn. Repositioning of fingers wastes time and increases the chances that compressions will occur lateral to the sternum.

Cardiac compressions should be delivered at the rate of 90 compressions per minute. The compressions must be interspersed with adequate ventilations in a ratio of 3:1, or three cardiac compressions to one ventilation every 2 seconds. After 30 seconds, the caregiver should pause and evaluate the heart rate for 6 seconds. If the heart rate is above 60 bpm, cardiac compressions can be discontinued. However, PPV must continue until there are spontaneous respirations. If the heart rate is less than 60 bpm, cardiac compressions must continue. At this point, the newborn may be in need of medications that will strengthen and increase the heart rate so that cardiac output will be adequate. If the heart rate is over 100 bpm, the cardiac compressions can be stopped and PPV gradually decreased.

Techniques of Endotracheal Intubation The midwife may choose to perform endotracheal intubation on a newborn in certain situations, including (1) when diaphragmatic hernia is suspected; (2) when the newborn needs prolonged ventilation (i.e., during a transport to another facility); (3) if the newborn must be on a ventilator; (4) when adequate oxygenation cannot be achieved with bag and mask; or (5) when the midwife must suction meconium in a nonvigorous newborn. The procedure is outlined in Table 38-5.

Skillfulness at endotracheal intubation arises in part from detailed knowledge of the anatomy of the pharynx, trachea, and bronchi. The midwife should frequently review the anatomic landmarks in this area. The endotracheal tube is passed between the vocal cords within the glottis (see Figure 38-7). The opening to the glottis can be seen only if the epiglottis (the covering of the glottis) is lifted out of the way. This is accomplished by positioning the tip of the laryngoscope blade so that pressure in the space between the tongue and the epiglottis (the vallecula) causes the epiglottis to be open (see Figure 38-8). It is important to note that the blade of the laryngoscope is not creating the space for the tube—the blade is merely causing the epiglottis to be open so that the tube can be passed down further. If the blade is not inserted far enough, you will see only the tongue; if the blade is inserted too far, you will see the esophagus.

For a term infant, the usual endotracheal tube (ET) diameter is 3.5 to 4.0 millimeters. Tubes should be precut to be approximately 13 centimeters long and should have an adaptor on top that will fit onto the resuscitation bag. Tubes should be prepared and the laryngoscope light bulb should be checked prior to the birth of the infant. Adhesive tape should also be cut and ready.

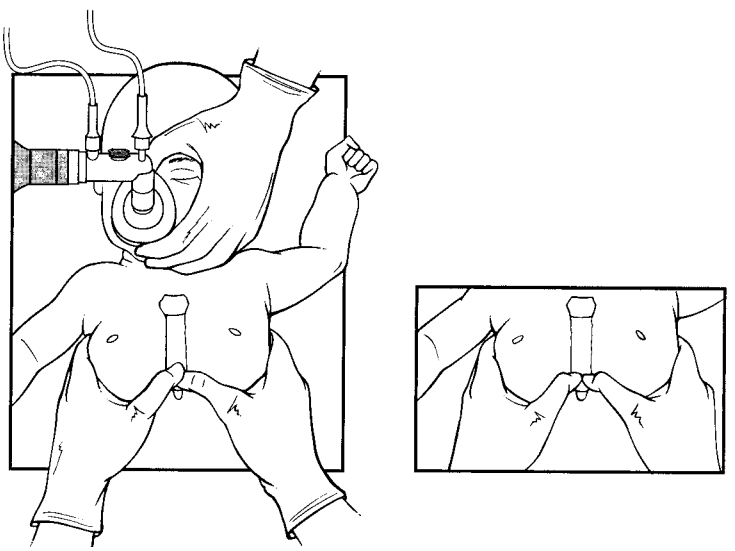


FIGURE 38-6 Thumb technique of chest compressions for small (left) and large (right) babies.

Source: From Kattwinkel, J. *Textbook of Neonatal Resuscitation*, 4th ed. Elk Grove Village, IL: American Heart Association and Academy of Pediatrics, 2000, p. 4-6. Used with permission of the American Academy of Pediatrics.

TABLE 38-5 Endotracheal Intubation

Equipment	Method	Precautions
1. DeLee suction catheters **2.** Endotracheal tubes, various sizes with adapters **3.** Laryngoscope with blades **4.** Positive pressure bag **5.** Towel **6.** Tape	**1.** Place infant with head in slightly extended position; may place towel under infant's shoulders. **2.** Introduce laryngoscope at the right corner of the mouth. **3.** Advance laryngoscope 2 to 3 cm while rotating it to midline and moving tongue to left. **4.** When tip of blade is between the base of the tongue and the epiglottis, a slight elevation of the blade will expose the glottis (sometimes a gentle compression of the external larynx by an assistant will more easily expose the glottis). **5.** Insert the endotracheal tube at the right side of the mouth and through the vocal cords, being sure you can easily see the tube; (the tube must be small enough to allow an air leak—i.e., there should be room around it; this space ensures easy expiration and reduces the risk of tissue damage). **6.** Suction secretions if needed. **7.** When the endotracheal tube is inserted, hold it firmly but gently in place and withdraw the laryngoscope slowly. **8.** Attach the endotracheal tube to the adapter on the bag. **9.** Ventilate with oxygen by bag; assistant should check for adequate ventilation of both lungs with stethoscope.	**1.** If you have difficulty with the procedure, remove laryngoscope and ventilate with mask; try again in 2 min. **2.** If tube is passed too far into the airway, it enters into the mainstem bronchus and breathing sounds on the left decrease. If this occurs, withdraw the tube slowly until breath sounds on the left increase. **3.** If tube is left in place, suction as necessary with a sterile suction catheter when excess secretions are detected (possibly every 30–60 min).

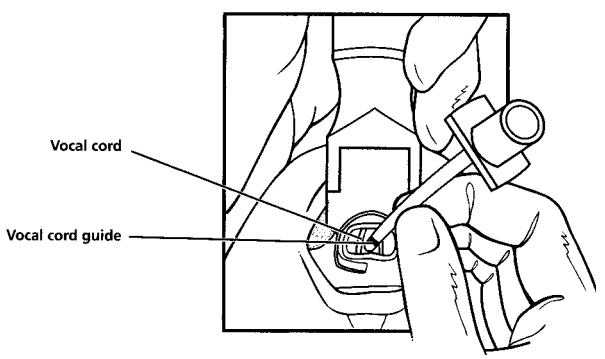


FIGURE 38-7 Insertion of endotracheal tube between vocal cords.

Source: From Kattwinkel, J. *Textbook of Neonatal Resuscitation*, 4th ed. Elk Grove Village, IL: American Heart Association and American Academy of Pediatrics, 2000, p. 5-13. Reproduced by permission.

Some caregivers like to use a stylet in the ET tube to serve as a guide for the flexible tube. If a stylet is used, its tip must not extend too far past the end of the ET tube because of the danger of the stylet perforating the trachea. The stylet will be removed as soon as the tube is below the vocal cords.

The ET tube (with or without stylet) should be placed into the right side of the mouth and advanced into the glottis until the black line on the lower part of the tube is at the level of the vocal cords (see again Figure 38-7). Once the tube has been inserted, breath sounds should be checked. Tubes that are advanced too far will deviate into the right mainstem bronchus and can be slightly pulled back. They must then be taped securely in place (see Figure 38-9).

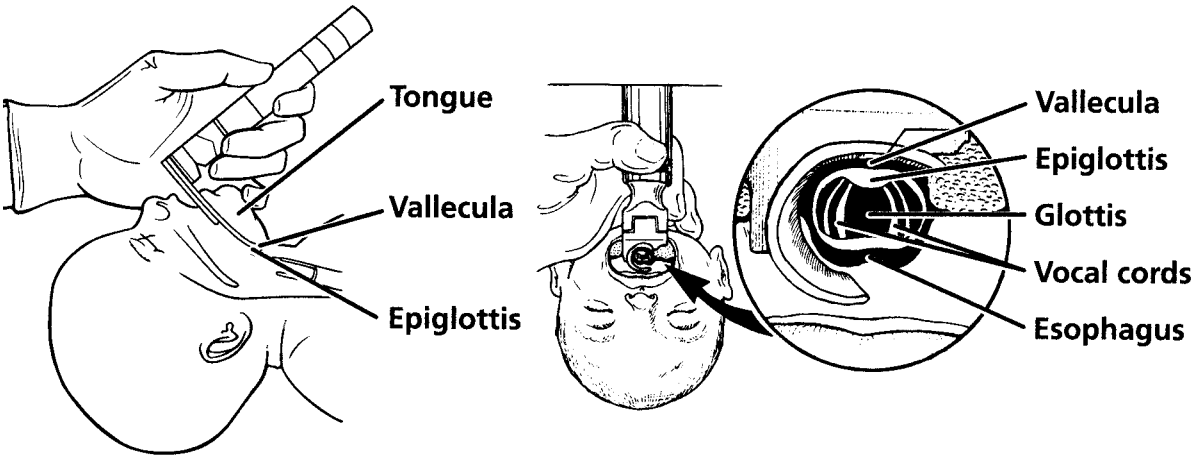


FIGURE 38-8 Identification of landmarks before placing endotracheal tube through glottis.

Source: From Kattwinkel, J. *Textbook of Neonatal Resuscitation*, 4th ed. Elk Grove Village, IL: American Heart Association and American Academy of Pediatrics, 2000, p. 5-12. Reproduced by permission.

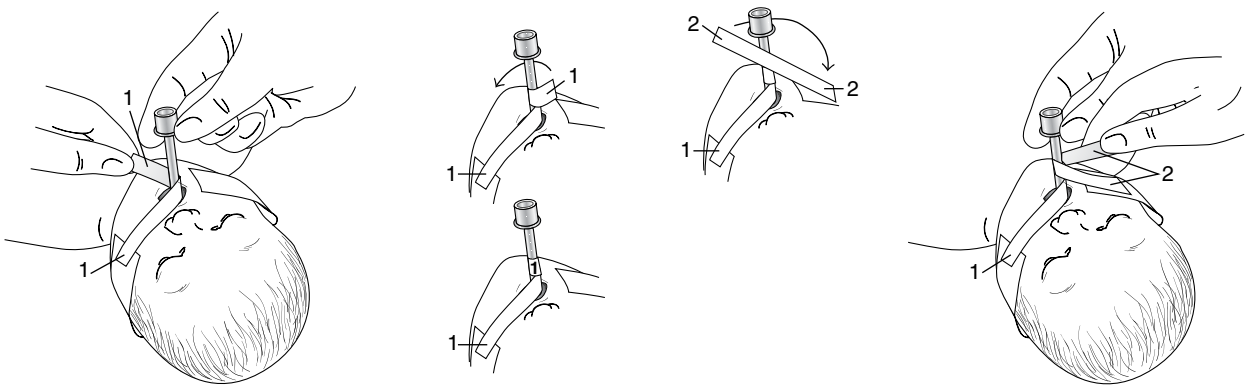


FIGURE 38-9 Taping an endotracheal tube. The cheeks and sides of the face are painted with tincture of benzoin. (Some neonatal intensive care units currently do not use benzoin because of its absorption and potential toxic effects.) Wide pieces of elastic tape are placed over the sides of the face and pinnae. With the tube pulled to the right side of the mouth, a thin piece of tape (1) secures the tube on the left side of the face. Another piece of tape (2) then secures the tube on the right side of the face in a similar fashion.

Source: From Hoekelman, R. A., Adam, H. M., Nelson, N. M., et al. *Primary Pediatric Care*, 4th ed. St. Louis, MO: Mosby, 2001, p. 2095. Reproduced by permission.

Use of Resuscitation Medications by the Midwife The use of neonatal resuscitation medications by midwives is an area of advanced practice and will depend on the midwife's training and the policies at the site of practice. If the standard of practice in the hospital or birth center includes the use of medications by the midwife, special theoretical and clinical education is required. To be effectively administered, most emergency medications need to be given through the umbilical vein. Intramuscular or subcutaneous medications will not be effectively transported through the newborn body in situations of hypotension or decreased peripheral circulation.

Some medications can be given in a noninvasive manner through the ET tube (see Figure 38-10). This technique is valuable for the midwife to know and master. In order to use this route of administration effectively, the midwife must place the ET tube in the trachea correctly. A very small volume of medication will be used. Therefore, it is recommended that this medication be diluted with 1–2 mL of normal saline, thus increasing the chance that most of the medication will actually reach lung tissue rather than adhering to the walls of the ET tube. Alternatively, the midwife may thread a small feeding tube into the ET tube and push the medication and diluent through the feeding tube. Regardless of which method is used, the midwife must give the medication and then use PPV to ensure distribution of the medication throughout the lungs.

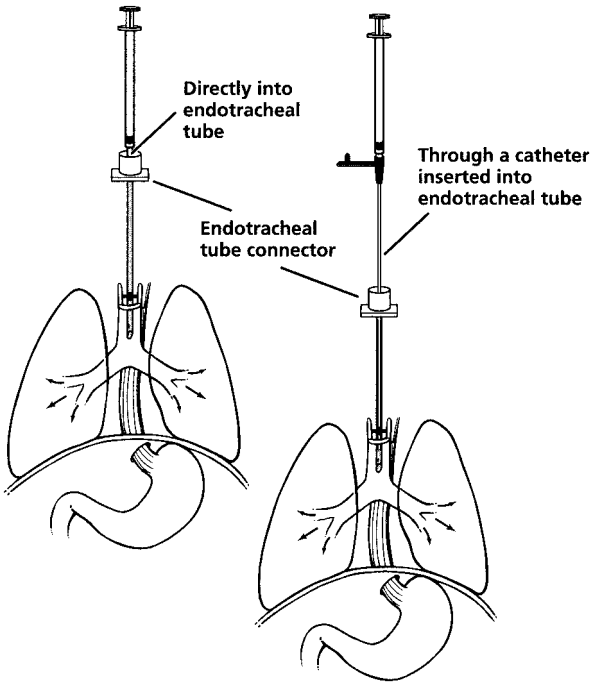


FIGURE 38-10 Medication (epinephrine) may be administered directly into the endotracheal tube (left) or through a catheter inserted into the endotracheal tube (right).

Source: From Kattwinkel, J. *Textbook of Neonatal Resuscitation*, 4th ed. Elk Grove Village, IL: American Heart Association and American Academy of Pediatrics, 2000, p. 6-5. Reproduced with permission.

If there is a high likelihood that resuscitation medications will be needed, they should be drawn up into labeled syringes prior to the birth. This saves valuable time. (If the medications are not needed, the financial consequence is small.)

One medication that can be administered in this noninvasive way is epinephrine. Epinephrine is a potent cardiac stimulant, a catecholamine with vasoconstrictive properties. Epinephrine will increase the newborn blood pressure, thereby increasing perfusion to the heart [10]. Epinephrine can be administered through an endotracheal tube; the recommended dose is 0.1–0.3 mL/kg of a 1:10,000 concentration [8]. Note the lower concentration used for neonates. Therefore, a term infant who weighed 3 kilograms would require a dose of 0.3–0.9 mL of 1:10,000 epinephrine (diluted in 1–2 mL saline). Epinephrine should be used if a newborn has no heartbeat or if the heart rate remains less than 60 bpm after 30 seconds of PPV and cardiac compressions.

Another medication that can be administered by ET tube is naloxone hydrochloride (Narcan), a narcotic antagonist that should be used if the mother received narcotics in labor that could cause newborn respiratory depression. It should never be used in a newborn whose mother is a narcotic (opiate) addict because of the possibility of causing abrupt narcotic withdrawal syndrome. Naloxone hydrochloride should be given in the dosage of 0.1 mg/kg [8]. A 3-kilogram infant would therefore receive 0.3 mg (diluted in 1–2 mL of saline). The midwife needs to know what concentration of this medication is available in a particular institution since it can be packaged in concentrations of 0.4 mg/mL or 1.0 mg/mL.

Special Situations in Neonatal Resuscitation

Care of the Neonate Born in Meconium-Stained Amniotic Fluid

Between 10 and 30 percent of fetuses pass meconium prior to birth that is retained in the amniotic fluid. The passage of meconium prior to birth is directly related to increasing gestational age. Many researchers and clinicians have tried to assign meaning to the passage of meconium [11]. Theories include (1) that it is a maturational event of no significance; (2) that it is a symptom of chronic hypoxia during the fetal period; or (3) that it is a symptom of acute hypoxia during labor that stimulates a vagal response.

Regardless of the reasons for the passage of meconium, the fact remains that meconium can damage the newborn lungs in one of two ways: it can act as a chemical irritant causing pneumonitis or it can cause direct blockage of the airways. The type of damage inflicted by meconium is related in part to how deeply meconium is inhaled into the lungs.

The goal of care for the meconium-exposed newborn is prevention of aspiration. This is best accomplished by a thorough, deep suctioning of the baby's head as it rests on the perineum and prior to the chest recoil that occurs with the birth of the newborn body. With chest recoil, a negative pressure is established that can suck upper airway fluid lower into the lungs.

The midwife needs to convince the woman giving birth not to push the newborn body out until this suctioning can be accomplished. This discussion should occur as early in labor as possible, before the discomfort of late labor distracts the mother. Suctioning can be done manually or with wall suction. Use of wall suction (less than 100

mg/Hg) attached to a meconium aspirator will allow a thorough suctioning. The mouth and posterior pharynx should be suctioned first.

The newborn should then be placed on the resuscitation surface for observation and evaluation. Recommendations about care have recently changed. The international guidelines, adopted by the AAP/AHA [9] recommends no special care for a vigorous newborn. Results of a multicenter international collaborative trial involving 2094 neonates with expectant management led to the same outcomes as aggressive management in vigorous, full-term newborns [12].

In nonvigorous newborns, aggressive care is instituted whenever possible. This includes either intubation and suctioning of the cords with a meconium aspirator attached directly to the ET tube or direct suctioning with wall suction while observing the cords. In a home birth, aggressive management would include direct DeLee suctioning after visualization of the cords by laryngoscope. Most authors agree that intubation and suctioning are warranted in a very depressed newborn. The midwife should discuss with her or his pediatric colleagues the standard of care in the local community and a particular institution.

Care of the Newborn with Possible Diaphragmatic Hernia

A newborn born with an initially vigorous respiratory effort who then quickly decompensates may have a diaphragmatic hernia. Some, but not all, of these infants will present with an abdominal contour that is unusually flat or concave (scaphoid). With a diaphragmatic hernia, part of the abdominal contents is above the diaphragm and in the chest cavity. The degree of the symptoms is related to the severity of the displacement.

There are two problems with this condition. The most serious issue is whether there has been any lung development during the fetal period. If the herniation occurred early and is extensive, there is little lung development. Many of these newborns die, even with aggressive resuscitation and surgery. The second problem occurs as a by-product of the first attempts at resuscitation. As the midwife tries to ventilate these newborns with a bag and mask, the air that is necessarily pushed into the stomach and bowel as a side effect of bag and mask ventilation causes swelling that takes up even more room in the chest. This limits the ability of existing lung tissue to become expanded.

The inability to successfully resuscitate with bag and mask will lead to a decision to intubate. If the midwife suspects this problem, the newborn should be immediately intubated and an orogastric tube should be passed to vent air in the stomach and intestines.

Quality Assurance and Risk Management

The birth of an infant who is sick or damaged is stressful and heartbreaking for all involved. Unfortunately, some newborns will need expensive ongoing medical and supportive care throughout life. This reality, combined with the grieving and anger at having a damaged child, can lead parents to seek redress through the legal system.

Each midwife should accept the challenge of preparing oneself and the birth environment for effective, high-quality, well-documented resuscitation efforts. If the midwife has the proper system in place to provide this type of resuscitation and has been formally trained in techniques of neonatal resuscitation, she or he will know that every possible effort was exerted to ensure the well-being of the newborn.

The midwife should develop a collegial relationship with the local pediatric providers who will be accepting the care of sick newborns. If written midwifery guidelines are required by state law, pediatric providers should be asked to review and comment on them. If written guidelines are not required, the midwife should still consider the merits of such a document, which can delineate clearly the proposed scope of the midwife's involvement with newborns.

If a newborn needs resuscitation, it is critical that an ongoing accurate record of the resuscitation be maintained [13]. This can be done by designated support personnel. A summary note, although also needed, will not adequately reflect the timing and sequence of actions during resuscitation. Figure 38-11 illustrates a brief but comprehensive flow sheet that adequately reflects the sequence of activities during resuscitation.

The midwife should make sure that the roles and responsibilities of the personnel attending a birth are clear. In a birth center or home birth environment, this can be discussed at staff meetings. In a hospital setting, the midwife should explore this issue with the nursing staff during orientation to the facility.

Patient Identification		Date	Time	Maternal History	Infant History	Code Team Members
Date: __ / __ / __	Birth	__ / __ / __	_____	1. _____	1. _____	1. _____
EGA: _____	CPR Began	__ / __ / __	_____	2. _____	2. _____	2. _____
Apgars: __ __ __ __	CPR Ended	__ / __ / __	_____	3. _____	3. _____	3. _____
1 5 10 15						

TIME		PHYSICAL EXAM						ACTION	LAB VALUES	MEDICATIONS
24 Hour Clock	Minutes after start of CPR	HR	RR	Color	Tone Reflex	Capillary Refill/BP	Breath Sounds	(e.g., Suction, Bagging, Intubation)	(Glucose, SaO_2)	(Drug, Dose, Route)

Outcome: _____

Color		Tone	Breath Sounds	
P, Pink	J, Jaundiced	L, Limp	C, Clear	R, Rales
PL, Pale	M, Mottled	F, Some flexion	E, Equal	W, Wheezing
D, Dusky	R, Ruddy	A, Active motion	D, Diminished	
C, Cyanotic				

Signature and title of person completing record

FIGURE 38-11 Newborn resuscitation flow sheet.

Source: From Grady Health System. Reproduced by permission.

References

1. NACC Standards Committee. *National Association of Childbearing Centers Standards*. Perkiomenville, PA: National Association of Childbearing Centers, 1995.
2. Brann, A., and Wiznitzer, M. Seizures. In Fanaroff, A., and Martin, R. (Eds.) *Neonatal Perinatal Medicine: Diseases of the Fetus and Infant*, 5th ed. St. Louis, MO: Mosby, 1992, p. 706.
3. Gilstrap, L. Fetal acid-base balance. In Creasy, R., and Resnik, R. (Eds.) *Maternal Fetal Medicine*, 4th ed. Philadelphia, PA: Saunders, 1999, p. 336.
4. Leuthner, S., Jansen, R., and Hageman, J. Cardiopulmonary resuscitation of the newborn: an update. *Pediatr. Clin. North Am.* 41(5):893, 1994.
5. McCollum, L. Resuscitation and stabilization of the neonate. In Kenner, C., Lott, J., and Flandermeyer, A. (Eds.) *Comprehensive Neonatal Nursing: A Physiologic Perspective*. Philadelphia, PA: Saunders, 1998, p. 190.
6. Low, J., Simpson, L., Tonni, G., and Chamberlain, S. Limitations in the clinical prediction of intrapartum fetal asphyxia. *Am. J. Obstet. Gynecol.* 172(3):801, 1995.
7. Volpe, J. *Neurology of the Newborn*, 3rd ed. Philadelphia, PA: Saunders, 1995, p. 315.
8. Kattwinkel, J. *Textbook of Neonatal Resuscitation*, 4th ed. Elk Grove Village, IL: American Heart Association and American Academy of Pediatrics, 2000.
9. Niermeyer, S., Kattwinkel, J., Van Reempts, P., et al. International guidelines for neonatal resuscitation: an excerpt from the guidelines 2000 for cardiopulmonary resuscitation and emergency cardiovascular care. International consensus on science, contributors and reviewers for the neonatal resuscitation guidelines. *Pediatrics* 106(3):E29, 2000.
10. Bloom, R. Delivery room resuscitation of the newborn. In Fanaroff, A., and Martin, R. (Eds.) *Neonatal Perinatal Medicine: Diseases of the Fetus and Infant*, 5th ed. St. Louis, MO: Mosby, 1992, p. 317.

11. Richey, S., Ramin, S., Bawdon, R., et al. Markers of acute and chronic asphyxia in infants with meconium-stained amniotic fluid. Part 1. *Am. J. Obstet. Gynecol.* 172(4):1212, 1995.

12. Wiswell, T. Delivery room management of the apparently vigorous meconium-stained neonate: results of a multicenter, international collaborative trial. *Pediatrics* 105(1, pt. 1):1–7, 2000.

13. Thigpen, J. Neonatal resuscitation record. *Neonatal Network* 14 (1):57, 1995.

CHAPTER

39

Examination of the Newborn

MARY KATHLEEN MCHUGH, CNM, MSN

Structuring the Newborn Examination

Components of the Newborn Examination

The complete newborn examination is composed of three parts: (1) a newborn history, (2) the gestational age assessment, and (3) the physical examination. From the results the midwife will ascertain the newborn's level of wellness and identify potential or existing problems. A plan of care appropriate for that newborn and family can then be developed. This chapter discusses the components of a complete exam. Chapter 80 provides an extensive guide to the content and findings of the newborn physical exam and should be reviewed in detail by the student midwife.

Appreciation for the role of the newborn history and the gestational age assessment has grown in recent years. With increased knowledge of genetic inheritance, fetal development, and the effect of maternal conditions on fetal well-being, we know that birth is merely a continuation of a life already influenced by many variables. An accurate history of these variables becomes a critical piece in the midwife's full assessment of the newborn.

The development of gestational age assessment procedures in the 1960s revolutionized neonatal care. Prior to the development of these procedures, gestational age was determined by maternal recollection and newborn birth weight. The clinical implications were enormous: Small newborns might be treated as preterm even though they could be suffering from intrauterine growth retardation at advanced gestation. Preterm infants of diabetic mothers might be classed as term and normal because their birth weight was large. With the ability to determine gestational age accurately came the ability to predict risk based on the relationship between gestational age and birth weight.

Approach to the Newborn Examination

The midwife's goal in examination of the newborn is to maximize the amount of information gathered while minimizing upset to the newborn and parents. Parents usually show appropriate concern about any handling or examinations that cause their child to cry. The midwife is well advised to examine the newborn approximately 1 hour after a feeding, when the baby is most likely to be content.

Prior to starting a physical examination and gestational age assessment, the midwife should review the maternal prenatal records, the labor and delivery records, the record of immediate newborn transition, and the interval newborn history.

The examination must be done in an environment that provides proper lighting, cleanliness, and warmth. The midwife should gather the equipment needed for the examination: gestational age and physical exam forms, measuring tapes, stethoscope, and ophthalmoscope. Prior to any physical contact with the newborn, the midwife should perform a 3-minute scrub of hands and forearms with a bactericidal soap.

The midwife should explain to the mother and/or father the goal and purpose of the examination and approximately how long it will take. During the exam or immediately after the midwife can offer feedback to the parents on the strengths and attributes of their newborn and any significant findings. As part of this exchange, the midwife can provide the parents with information and further assess their readiness for parental responsibilities.

The midwife's ultimate goal is the integration of examination and commentary. An experienced midwife can perform a comprehensive newborn examination in the presence of the family and provide appropriate feedback about the newborn's attributes and any significant findings during the examination. However, for the learner, the presence of family members can distract from the learning experience and the performance of a smooth, comprehensive examination that is as brief as possible. You are strongly encouraged to examine the newborn when the mother is preoccupied by self-care activities like showering. With the mother's permission, the newborn can be temporarily taken to the nursery or, in a birth center, to the newborn resuscitation area.

Newborn History

The newborn history is gathered through chart review and interviews with the mother and (if possible) the father of the newborn. As the information is gathered, the midwife develops a mental list of areas of concern, including environmental, genetic, social, maternal medical, perinatal, and neonatal factors.

Environmental and Genetic Factors Environmental factors influencing the newborn can include prenatal exposure at the mother's workplace to hazardous materials such as x-rays, other radiation, solvents, infectious agents, fumes, or gases. In the home environment factors that can cause fetal or neonatal damage or illness include unsafe drinking water, paints or solvents, infections transmitted by house pets, poorly ventilated heaters, excess maternal intake of certain freshwater fish, and living near a hazardous waste site.

The genetic history should include information about any family members, alive or deceased, with physical or mental defects and/or inherited diseases. The midwife should note the names of any family members with unexplained multiple pregnancy losses. The midwife should also note whether the newborn's parents, siblings, and second degree relatives (aunts, uncles) are alive and well.

Social Factors The social history includes information on the mother's place of residence, pattern of prenatal care, and socioeconomic status. The midwife should note how the family supports itself, who lives in the home, and who will be the primary caregiver to the newborn. The midwife should ask the mother to clarify if a current male partner is the father of the newborn or her other children. If the mother is in a lesbian relationship, the midwife should inquire whether the biological father is known to her or her partner and what role (if any) he will take in the child's life. It is important to understand whether the mother's relationship with her current partner is stable or disintegrating because it will affect the mother's ability to focus on her maternal tasks. The midwife should try to ascertain who is the decision-maker in the household (mother, father, partner, grandmother, foster parent) so he or she may be included for certain discussions.

If the mother has other children, the midwife should note whether they live with her and, if not, why not. The midwife should inquire about the health and well-being of the children, paying particular attention to any accident pattern that may indicate abuse or neglect. One key question that may indicate proper attention is whether her children are up to date on their immunizations.

The midwife should make every effort to ascertain any substance abuse by the mother and members of the newborn's household. Newborns and small children exposed to passive smoking have a much higher incidence of respiratory illness. Newborns living in an environment where there is regular substance abuse may be vulnerable to neglect if the mother forgets to care for them or uses up the household money on purchases of drugs or alcohol. The possibility for exposure to violence, direct or secondary, is also increased.

Maternal Medical and Perinatal Factors The midwife should note the maternal age, last menstrual period, and expected date for delivery. The number of prenatal visits is noted along with any prenatal problems. All lab work and prenatal testing, including ultrasound reports, should be reviewed.

There are many maternal medical, prenatal, and intrapartal conditions that can significantly affect the newborn's health and well-being. The midwife must know the sequelae of certain medical and perinatal situations. Table 39-1 lists maternal medical conditions and indicates the possible fetal and newborn implications.

Neonatal Factors Valuable data from the immediate neonatal period include the Apgar scores at 1 and 5 minutes. The midwife should note the type and duration of any resuscitation efforts carried out at birth. Any information that indicates newborn asphyxia is important, as is evidence of hypothermia/hyperthermia and hypoglycemia.

The midwife should review the notes of the nurse or birth assistant regarding vital signs and the newborn's behavior in the time since birth. Positive

TABLE 39-1 Medical and Perinatal Factors and Neonatal Impact

Factors	Possible Implications for the Newborn
Maternal Medical Factors	
Cardiac disease	Chronic intrauterine hypoxia
Diabetes	Large for gestational age; trauma; hyperbilirubinemia; stillbirth
Kidney disease	Prematurity, IUGR
Hypertension	Growth retardation; prematurity; abruptio placentae
Sexually transmitted diseases	Perinatal transmission
Substance abuse	Neonatal withdrawal syndrome
Rh or other isoimmunization	Anemia; jaundice; hydrops fetalis
History of prior pregnancy losses	Genetic syndromes
Prenatal Factors	
No prenatal care	Maternal substance abuse; lack of social supports
Bleeding during pregnancy	Placental defects; placenta previa
Size-dates discrepancy	Growth restriction; large newborn; trauma
Pregnancy-induced hypertension	Growth restriction; prematurity
Gestational diabetes	Macrosomia; birth trauma
Polyhydramnios	Neonatal kidney problems, inability to swallow
Oligohydramnios	Amniotic band defects; dehydration syndromes, neonatal kidney/bladder abnormalities
Infection	Perinatal transmission
Perinatal Factors	
Preterm/postterm labor	RDS; asphyxia
Prolonged labor	Neonatal trauma
Drug use in labor	Neonatal respiratory distress
Fetal distress	Asphyxia
Elevated maternal temperature	Perinatal transmission of infection
Abnormal presentation or position of fetus	Neonatal trauma
Meconium-stained fluid	Meconium aspiration pneumonia
Prolonged rupture of membranes	Perinatal transmission of infection
Excess bleeding in labor	Newborn hypovolemia; hypoxia
Prolapsed cord	Asphyxia
Maternal hypotension	Asphyxia
Fetal acidosis	Newborn acidosis

behaviors include sucking, the ability to feed, alertness, voiding, and passage of meconium. Behaviors of concern include jitteriness, lethargy, poor or absent sucking, and unusual cry.

Any lab tests performed in the birthing room should be noted on the history. Typically these include peripheral glucose samples, hematocrits, or blood gases. The midwife should carefully note the site from which the sample was obtained.

Recording the Newborn History Some institutions have forms for record-keeping involving the newborn. These forms may not allow the collection of the social or environmental information that is integral to midwifery care. The midwife can make use of a blank progress note to record these pertinent areas of the history.

As the midwife begins the examination of the newborn, she or he should recall any areas of concern from the newborn history that may manifest themselves in physical characteristics or deviations.

The Art of Observation Of the four techniques of physical assessment, observation is particularly powerful and useful in newborn assessment. Judicious use of observation minimizes the handling of the newborn—so newborn, parents, and midwife are all less upset. If the newborn is sick, less turning and handling allows the baby to conserve oxygen and glucose.

The experienced examiner begins with a thoughtful, thorough period of observation. The midwifery tenet of "hands off the breech" can be extended here to "hands off the newborn." Key components of both the gestational age assessment and the physical exam can be achieved by observation alone (see Table 39-2).

TABLE 39-2 Information Gathered by Observation

Gestational Age Assessment	Physical Assessment
Skin attributes	Central and peripheral body color
Genital maturation (female)	Muscle tone
Posture	Characteristics of cry
Lanugo	Characteristics of respirations
	Body proportions and formation of visible body parts
	Abdominal contours
	Presence of hair, fingernails, toenails
	Symmetry of eyes; movements of mouth, arms, legs
	Presence of normal external genitalia
	Straight, intact spine

Gestational Age Assessment

Scales for Gestational Age Assessment

Standardized forms of gestational assessment have been in use in this country since the 1960s. They achieved a wide level of use after research published by Dubowitz in 1970 described the Dubowitz exam [1]. The Dubowitz exam combined assessment of both physical and neurological characteristics. In 1979 Ballard published a simplified method for assessing gestational age [2]. The Ballard Scale, based on the work of Dubowitz and others, involves less handling of sick newborns and relies less on a quiet, rested newborn for accurate results. The scale has been revised to accurately assess extremely premature newborns and provide more accuracy with term newborns [3]. It is now known as the New Ballard Scale (NBS).

The NBS (Figure 39-1) can date newborns of gestational ages as low as 20 weeks. Very premature newborns should be assessed soon after birth because of rapid changes in their skin and overall condition. The NBS and other scales are accurate within a range of 2 weeks. The test is standardized and performed most accurately by a trained examiner. Recent studies have found that prior knowledge of the obstetric assessment of gestational age does not bias the examiner performing the NBS [4]. The student midwife should be validated by a preceptor during several gestational age assessments on babies with different gestational ages.

Technical competence in performance of the NBS is critical to an accurate outcome. The proper procedure for the neuromuscular evaluation is as follows:

1. *Posture:* With the infant supine and quiet, score as indicated on Figure 39-1.
2. *Square window:* Flex the hand at the wrist; exert pressure sufficient to get as much flexion as possible.
3. *Arm recoil:* With the infant supine, fully flex the forearm for 5 seconds, then fully extend by pulling the hands, and release.
4. *Popliteal angle:* With the infant supine and the pelvis flat on the examining surface, the leg is flexed on the thigh and the thigh fully flexed using one hand; with the other hand, the leg is then extended.
5. *Scarf sign:* With the infant supine, take the infant's hand and draw it across the neck and as far across the opposite shoulder as possible; assist the elbow by lifting it across the body.
6. *Heel-to-ear maneuver:* With the infant supine, hold the infant's foot with one hand and move it as near to the head as possible without forcing it; keep the pelvis flat on the examining surface.

The proper procedure during assessment of physical maturity includes the following:

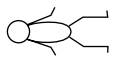
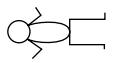
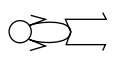
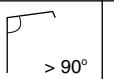
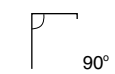
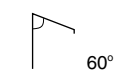
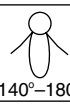
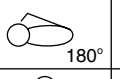
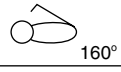
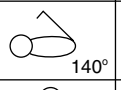
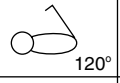
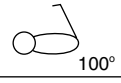
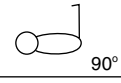
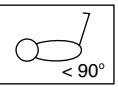
1. Check lanugo on the back with a direct light in order to get a clear view.
2. Palpate the entire pinna of the ear for presence of cartilage.
3. Palpate to accurately assess breast tissue.

Because the NBS is a standardized tool, it is important for the midwife to record findings as the assessment is made and not to rely on memory. The NBS takes approximately 2 or 3 minutes to perform and should be recorded directly on the standardized form found in most nurseries. After scores for each category of physical and neuromuscular maturity have been assigned, they are added and the aggregate score is plotted to obtain gestational age.

Application of Gestational Age Assessment

When applied to the maturity rating on the NBS form, the gestational age assessment score yields a gestational age accurate within a range of 2 weeks.

NEUROMUSCULAR MATURITY

	–1	0	1	2	3	4	5
Posture							
Square window (wrist)	 > 90°	 90°	 60°	 45°	 30°	0°	
Arm recoil		 180°	 140°–180°	 110°–140°	 90°–110°	 < 90°	
Popliteal angle	 180°	 160°	 140°	 120°	 100°	 90°	 < 90°
Scarf sign							
Heel to ear							

PHYSICAL MATURITY

Skin	Sticky, friable, transparent	Gelatinous, red, translucent	Smooth, pink, visible veins	Superficial peeling and/or rash, few veins	Cracking, pale areas, rare veins	Parchment, deep cracking, no vessels	Leathery, cracked, wrinkled
Lanugo	None	Sparse	Abundant	Thinning	Bald areas	Mostly bald	
Plantar surface	Heel-toe 40–50 mm: –1 < 40 mm: –2	> 50 mm, no crease	Faint red marks	Anterior tranverse crease only	Creases anterior two-thirds	Creases over entire sole	
Breast	Imperceptible	Barely perceptible	Flat areola, no bud	Stippled areola, 1–2 mm bud	Raised areola, 3–4 mm bud	Full areola, 5–10 mm bud	
Eye/Ear	Lids fused loosely: –1 tightly: –2	Lids open; pinna flat, stays folded	Slightly curved pinna, soft, slow recoil	Well-curved pinna, soft but ready recoil	Pinna formed and firm, instant recoil	Thick cartilage, ear stiff	
Genitals (male)	Scrotum flat, smooth	Scrotum empty, faint rugae	Testes in upper canal, rare rugae	Testes descending, few rugae	Testes down, good rugae	Testes pendulous, deep rugae	
Genitals (female)	Clitoris prominent, labia flat	Clitoris prominent, labia minora small	Clitoris prominent, labia minora enlarged	Labia majora and minora equally prominent	Labia majora large, labia minora small	Labia majora cover clitoris and labia minora	

MATURITY RATING

Score	Weeks
–10	20
–5	22
0	24
5	26
10	28
15	30
20	32
25	34
30	36
35	38
40	40
45	42
50	44

FIGURE 39-1 The New Ballard Scale (NBS).

Source: From Ballard, J. New Ballard Scale, expanded to include extremely premature infants. *J. Pediatr.* 119:417, 1991. Reproduced by permission.

The newborn will then be considered to be in one of the following categories [5]:

1. *Preterm:* gestational age of less than 38 weeks
2. *Term:* gestational age of 38 to 42 weeks
3. *Postterm:* gestational age of more than 42 weeks

It is possible to estimate risk based on gestational age. However, a more sophisticated relationship is that between gestational age and birth weight [6]. Within each of the three categories of gestational age there will be some newborns who are larger and some who are smaller. These patterns of accelerated or diminished growth are associated with certain newborn problems and predispositions.

In order to establish the birth weight/gestational age relationship, the midwife must have ac-

cess to both an accurate birth weight and an accurate gestational age. It is important to note that birth weights vary in accord with altitude, race, country of origin, and socioeconomic class. Thus there is no international standard of birth weight.

The older charts that graphed weight in relation to gestational age are limited because they determined gestational age based on the menstrual history alone. More recent studies have studied birth weight in comparison to a gestational age assigned by Ballard scores and ultrasound [7]. It is important that the midwife use a table that contains anthropomorphic data appropriate to her or his region.

Having charted birth weight in relation to gestational age, the midwife will now characterize the newborn as being in one of three categories:

1. Small for gestational age (SGA)
2. Appropriate for gestational age (AGA)
3. Large for gestational age (LGA)

Combining the gestational age categories (preterm, term, and postterm) with the weight/gestational age categories, the midwife can then classify the newborn as being in one of the following nine categories:

1. Preterm, small for gestational age
2. Preterm, average for gestational age
3. Preterm, large for gestational age
4. Term, small for gestational age
5. Term, average for gestational age
6. Term, large for gestational age
7. Postterm, small for gestational age
8. Postterm, average for gestational age
9. Postterm, large for gestational age

After accurately categorizing the newborn, the midwife can develop a plan for potential problems related to that newborn's birth weight and gestational age. The work done by Lubchenco in the 1960s (see Figure 39-2) expanded our horizons to include this type of newborn management [5, 6]. The midwife can expect that the term AGA newborn will experience the fewest neonatal problems. The immediate care of postterm, SGA, and LGA newborns is discussed in Chapter 41.

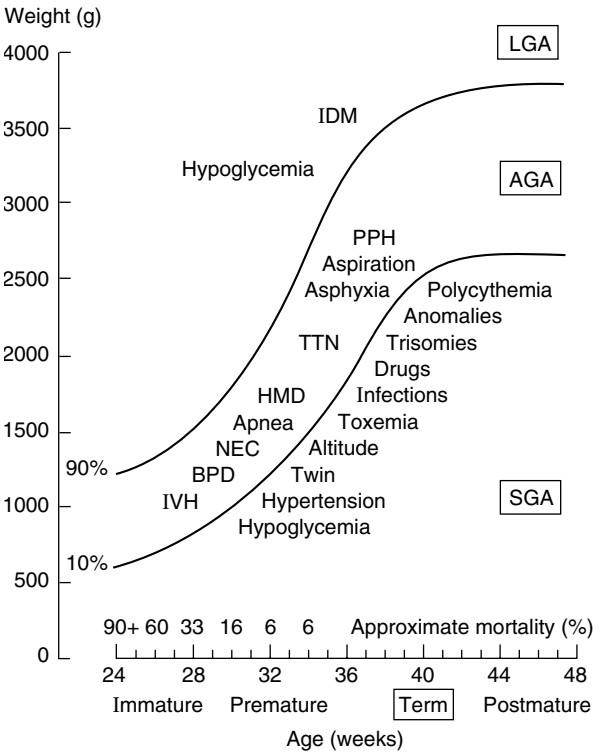


FIGURE 39-2 Conditions associated with birth weight/gestational age categories. Specific clinical conditions frequently encountered in the three major developmental channels: (1) large for gestational age (*LGA*); (2) appropriate for gestational age (*AGA*); (3) small for gestational age (*SGA*). Expected approximate overall mortality is indicated on the abscissa.
IDM, Infant of a diabetic mother; *IVH*, intraventricular hemorrhage; *BPD*, bronchopulmonary dysplasia; *NEC*, necrotizing enterocolitis; *HMD*, hyaline membrane disease; *TTN*, transient tachypnea of the newborn; *PPH*, persistent pulmonary hypertension or persistent fetal circulation.
Source: Battaglia, F., and Lubchenco, L. A practical classification of newborn infants by weight and gestational age. *J. Pediatrics* 71:159, 1967. Reproduced by permission.

Physical Examination of the Newborn

Basic Approach to the Exam

During examination of the newborn, the midwife will utilize the four basic techniques of physical examination: (1) inspection, (2) palpation, (3) auscultation, and (4) percussion. The value of observation has been discussed above. The complete examination will involve three types of evaluation: (1) anthropomorphic measurements, (2) evaluation of organ systems, and (3) neurological evaluation.

The physical exam of the newborn is designed to screen for physical variations and malformations and the overall state of health of the newborn. There are many differences between components of an adult physical examination and that of a newborn. There are also many minor newborn physical and behavioral variations that are within normal. Chapter 80 includes an extensive guide to the content and findings of the newborn exam and discusses variations (both minor and serious).

Learning how to conduct a newborn exam is somewhat like learning a foreign language. There are many unique terms and names, and many eponyms used in deference to the person who first described the finding. It is advisable to start with a medical dictionary. If a midwife is unfamiliar with the characteristics of normal newborns, extra observational experiences should be arranged. When writing notes, the midwife should properly name any variations present and avoid use of the nondescript phrase "within normal."

Most textbooks and physical examination records assume an exam that proceeds from head to toe. The midwife should feel free to modify this progression. If the newborn is quiet or sleeping, many examiners start their hands-on exam with auscultation of heart and bowel sounds and palpation of the femoral pulses. In an awake alert newborn, the examiner may check the red reflex first. A crying newborn presents the opportunity for inspection of the mouth and throat. The midwife should curb any nervous impulses that lead to excessive handling and thus overstimulation of the newborn. This is a common mistake, similar to the excessive touching by an inexperienced midwife performing a cervical exam. Many times the newborn can be calmed during an exam by being given a pacifier or finger to suck on.

Anthropomorphic Measurements

The midwife may be responsible for measuring the infant's length and chest and head circumference. The newborn body has a unique appearance. Normally, the head circumference is larger than the chest circumference, the abdomen is protuberant, and the tone is flexed (Figure 39-3). Measurements must be done in a standardized fashion. The newborn length is most accurately assessed if the head of the newborn is flush against a firm surface. The legs can then be extended and a mark made on the examining table paper. After the newborn is moved, the midwife can then measure the distance in centimeters.

The newborn head circumference is measured from the occiput around the head just above the eyebrows. This measurement may change in the first week of life as swelling from birth recedes (see Figure 39-4). Chest circumference is measured under the armpits and across the nipple line. The baby's weight should be assessed on a scale with a drape between the newborn and the metal. The scale should be calibrated to account for the weight of the drape. This prevents heat loss and infection from cross-contamination.

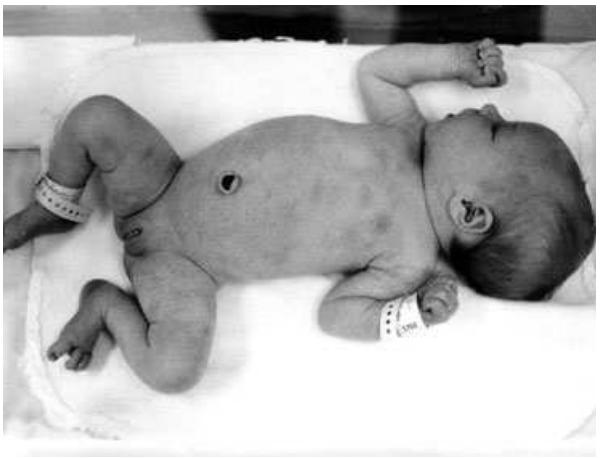


FIGURE 39-3 Normal newborn body proportions.

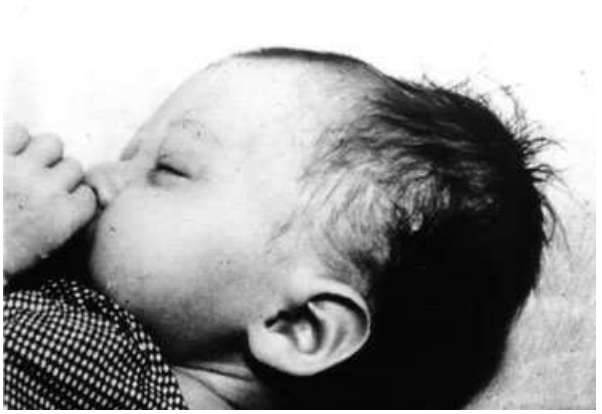


FIGURE 39-4 Swelling of newborn head caused by cephalohemotoma.

Table 39-3 lists mean birth weights, lengths, and head circumferences of term newborns (38–42 weeks) born in the United States. Dombrowski et al. established the means by studying 38,818 live infants (born between 1984 and 1991) whose gestational age was determined by obstetrical age and confirmed by ultrasound [7].

Assessment for Birth Defects and Genetic Disease

The midwife who examines a newborn is in a unique position to note physical variations that may be indicative of more serious underlying problems. Although no caregiver wishes to bear bad news to parents, the midwife must make sure to let parents know about any potential problems and to refer them to a physician for more extensive evaluation.

Many parents believe that a normal prenatal test provides assurance that their fetus is normal.

TABLE 39-3 Mean Birth Weights, Lengths, and Head Circumferences of Term Newborns

Gestational Age (weeks)	Weight (g)	Length (cm)	Head Circumference (cm)
38	3050	48.3	33.6
39	3225	49.0	34.0
40	3364	49.5	34.3
41	3501	50.2	34.7
42	3598	50.5	34.9

Source: Adapted from Dombrowski, M., Wolfe, H., Brans, Y., Saleh, A., and Sokol, R. Neonatal morphometry: relation to obstetric, pediatric and menstrual estimates of gestational age. *Am. J. Dis. Children* 146:852 (July) 1992. Reprinted by permission.

Unfortunately, all prenatal tests have limitations. Our ability to diagnose genetic disease prenatally remains limited to a few major chromosomal disorders. Ultrasound is valuable for major physical defects but is limited in its ability to reveal cardiac and musculoskeletal defects [8].

Variations in physical appearance may be due to inconsequential human variation or familial traits. However, the midwife should remember that many genetic disorders can be diagnosed based on the newborn's physical appearance. Approximately 3 to 4 percent of live births involve some congenital defect—some serious, some minor. The presence of three minor malformations is suggestive of a major underlying malformation [9]. Among the common minor malformations are the following:

- Large fontanel
- Epicanthal folds
- Hair whorls
- Widow's peak
- Low posterior hair line
- Preauricular tags and pits
- Minor ear anomalies: protruding, rotated, lowset
- Darwinian tubercle
- Digital anomalies: clinodactyly (curved finger); camptodactyly (bent finger); syndactyly (webbed finger)
- Transverse palmar crease
- Shawl scrotum
- Redundant umbilicus
- Widespread nipples
- Supernumerary nipples

Early evaluation and intervention can help prevent serious sequelae of malformations, such as infection, intestinal perforation, spinal cord injury, or retardation. Table 39-4 provides a list of visual clues that the midwife may note during physical examination and the serious conditions that they may indicate.

Newborns presenting with ambiguous genitalia are a particular challenge. These newborns present with external genital characteristics of both males and females. A midwife who examines a newborn and has doubts about the genitalia should consult with a neonatal team immediately. In some instances this finding is associated with congenital adrenal hyperplasia, a condition that will cause life-threatening dehydration shortly after birth. Families should be informed of the examiner's concern and should be encouraged not to assign a sex to the newborn.

Proper assessment of an infant with physical variations should be performed by a specialized team that includes a neonatologist, a geneticist, an endocrinologist, and a primary nurse. Unfortunately it may take weeks before genetic karyotypes are complete. Extensive additional testing will be necessary to evaluate the type and extent of the malformation.

The midwife's role is to support the anxious and grieving family. It is helpful if one or two midwives from a large practice accept the responsibility for staying in touch with the family during this time of testing and waiting.

The Neurological Examination

The procedure of assessing reflexes, cranial nerves, and special senses is integrated into the overall physical examination outlined in Chapter 80. However, it is important to reflect on the neurological exam as an indicator of the integrity of the nervous system. Both diminished (hypo) and accentuated (hyper) responses are cause for concern. Diminished response can result from a congenital absence of a nerve or damage to sensory or motor pathways. Diminished or accentuated response to stimulation can also reflect a central neurological deficit.

During the neurological exam, the midwife will be making assessments of the newborn's senses. Sight, hearing, and smell can all be evaluated in a newborn. Poor or absent response to stimulation may indicate damage to the nerve itself (optic, auditory, or olfactory).

An absent or diminished response to an elicited reflex may mean a variety of things. Sometimes the reflex is partial or diminished because of newborn

TABLE 39-4 Visual Clues That Suggest Birth Defects and Genetic Conditions

Diagnosis	Visual Clues
Mendelian Inheritance	
1. Autosomal Dominant (AD)	
Neurofibromatosis I	Cafe au lait spots
Tuberous sclerosis	Ash leaf spot
Myotonic dystrophy	Myopathic facies
Multiple epiphyseal dysplasia	Bumps at end of long bones
Waardenburg syndrome	White forelock
Peutz-Jehger syndrome	Brown lip macules
Van der Woude syndrome	Lip pits
Holt-Oram syndrome	Thumb anomaly
2. Autosomal Recessive (AR)	
Tay-Sachs disease	Cherry red spot
Galactosemia	Cataracts and neonatal jaundice
Cystic fibrosis	Meconium ileus, rectal prolapse
Congenital adrenal hyperplasia	Ambiguous genitalia
Mucopolysaccharidoses	Corneal clouding, joint contracture
Meckel-Gruber syndrome	Polydactyly, encephalocele
Rhizomelia chondrodysplasia	Short proximal limbs, cataracts
3. X-Linked Recessive (X-LR)	
Fragile-X syndrome	Large testes
Duchenne muscular dystrophy	Large calf muscle
Menke Kinky Hair syndrome	Steel-wool like hair
Usher syndrome	Retinitis pigmentosa
Lesch-Nyhan syndrome	Gravel urine, self-mutilation
4. X-Linked Dominant (X-LD)	
Incontinentia pigmenti	Pigmented skin swirls
Rett syndrome	Hand wringing
Vitamin D resistant ricketts	Bowed legs
Non-Mendelian Inheritance	
1. Mitochondrial	All associated with muscle weakness, ophthalmoplegia, and recurrent episodes of acidosis
Kearns-Sayre	
Lebers disease	
MELAS	
MERRF	
2. Uniparental Disomy	
Prader-Willi	Obesity, small hands and feet
Angelman	MR, recurrent bouts of laughter
3. Gonadal Mosaicism	
Osteogenesis Imperfecta	Blue sclera, brittle bones
Teratogen	
Alcohol	Microcephaly, short palpebral fissures
Dilantin	Nail hypoplasia
Hyperpyrexia	Neural tube defects (NTD)
Tegretol	NTD
Coumadin	Flat nasal bridge
Accutane	Facial and limb anomalies

TABLE 39-4 Visual Clues That Suggest Birth Defects and Genetic Conditions (*continued*)

Diagnosis	Visual Clues
Multifactorial	
Clubfoot	Same as diagnosis in each case
Cleft lip/palate (CLP)	
NTD	
Dislocated hip	
Congenital heart	
Hypospadies	
Chromosomal	
Trisomy 21	Hypotonia, single palmar crease, prominent tongue
Trisomy 18	Finger and joint contracture,webbed neck
Trisomy 13	Polydactyly, CLP, scalp defects
45 XO	Short stature, webbed neck
Klinefelter	Small testes, gynecomastia
Cat-cry 5p(–)	Natal mewing
Sporadic Multiple Pattern Syndrome	
Cornelia de Lange	Synophrys, phocomelia
Rubinstein-Taby	Large thumbs and great toes
Williams syndrome	Elfin facies
Sturge-Weber	Nevus flammeus
VATER ASSN	TE-fistula
Congenital Defects Minor and Major Malformations	
Preauricular tags and sinus tracts	Deafness and renal disease
Nasal dermoids	Nasal sinus tract to septum and to brain in some cases
Lip pits	Cleft lip and palate
Bifid uvula	Submucous cleft
Enlarged tongue	Hypothyroidism
Two-vessel cord	Renal disease
Lumbar hair tuft	Spinal cord lesions

Source: Wardinsky, T. Visual clues to diagnosis of birth defects and genetic disease *J. Pediatr. Health Care* 8(2):63, 1994. Reprinted by permission.

depression secondary to medications. The response may not be optimal because the sensory pathway conducting the stimulation has been damaged, reflecting a spinal or central nervous system lesion. Sometimes a reflex cannot be elicited because of temporary motor nerve damage that prevents the muscles in the affected area to respond to a stimulation, as with a weak palmar grasp after a breech delivery or facial nerve paralysis after a forceps delivery (see Figure 39-5). Sometimes damage is permanent, as in some brachial plexus injuries and some spinal cord defects.

The midwife's role involves the elicitation of the following reflexes as part of the physical exam:

1. *Eyes:* Pupillary reflex, red reflex, doll's eye reflex, blink reflex
2. *Upper extremities:* Palmar grasp reflex

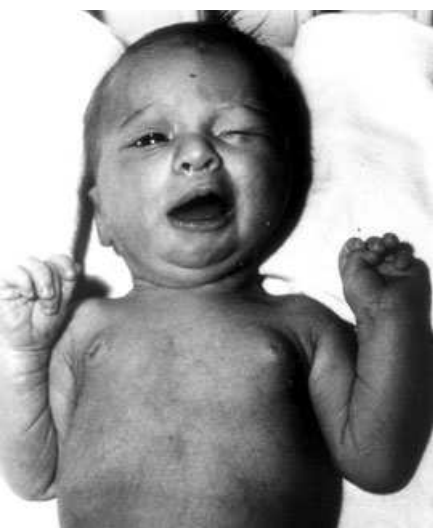


FIGURE 39-5 Facial nerve paralysis.

3. *Lower extremities:* Patellar reflex, plantar reflex, Babinski reflex
4. *Torso:* Anal wink, tonic neck reflex

Elicitation of these reflexes (see Figures 39-6 and 39-7) is described in Chapter 80. Absent, markedly diminished, or accentuated reflexes should be noted on the physical exam form; asymmetrical reflexes should also be noted. The midwife should then consult with a pediatric provider about further testing and follow-up.

The most commonly used evaluation of the neurological status of the newborn is the Moro reflex, or embracing reflex. In normal infants the response is symmetrical and disappears by 2 to 4 months. The Moro reflex consists predominantly of abduction and extension of the arms with hands open and the thumb and index finger semiflexed to form a C. Leg movements may occur, but they are not as uniform as the arm movements. With return of the arms toward the body, the infant either relaxes or cries.

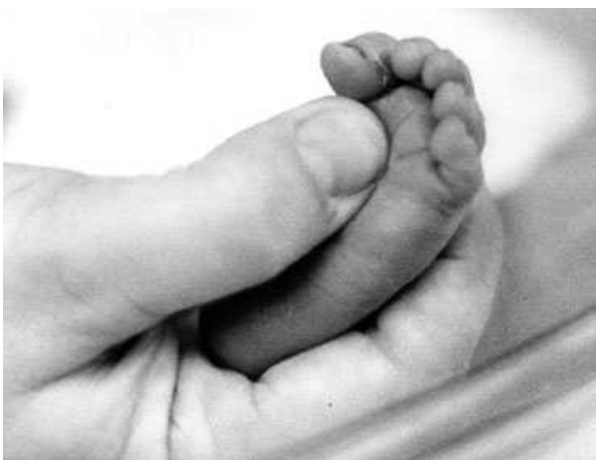


FIGURE 39-6 Plantar reflex.

FIGURE 39-7 Babinski reflex.

The midwife must take care to elicit a Moro reflex and avoid "startles." Acceptable ways to elicit a Moro reflex include the following:

1. Striking the examining table near the head of the baby
2. Allowing a semi-sitting infant to fall backward (onto the examiner's open hand) from an angle of 30 degrees
3. Jarring the table suddenly
4. Making a loud noise or handclap

Medical consultation is required if any of the following deviations is found with the Moro reflex test:

1. Absence of the reflex indicates possible intracranial lesions.
2. Asymmetrical response may indicate birth injury involving the brachial plexus, clavicle, or humerus.
3. Abnormal persistence of embrace gesture indicates hypertonicity.
4. Persistence of entire Moro reflex after 4 months indicates delay in neurological maturation.

Becoming Confident at Newborn Physical Examination

If you have little experience with the appearance and physical characteristics of newborns, it is important to increase your base of knowledge by observing as many newborns as possible and studying reference books that contain color pictures of newborn deviations [10, 11]. Observing other experienced caregivers, in person or on videotape, will help you develop that intuitive, confident recognition of normal that is the basis of midwifery practice.

References

1. Dubowitz, L., Dubowitz, V., and Goldberg, C. Clinical assessment of gestational age in the newborn infant. *Pediatrics* 77:1, 1970.
2. Ballard, J., Novak, K., and Driver, M. A simplified score for assessment of fetal maturation of newly born infants. *J. Pediatr.* 95(5):771, 1979.
3. Ballard, J., Khoury, J., Wedig, K., et al. New Ballard Scale, expanded to include extremely premature infants. *J. Pediatr.* 119:417, 1991.

4. Smith L. N., Dayal, V. H., and Monga, M. Prior knowledge of obstetrical gestational age and possible bias of Ballard score. *Obstet. Gynecol.* 93(5):712–714, 1999.
5. Battaglia, F., and Lubchenco, L. A practical classification of newborn infants by weight and gestational age. *J. Pediatr.* 71:159, 1967.
6. Lubchenco, L., Hansman, C., and Boyd, E. Intrauterine growth in length and head circumference as estimated from live births at gestational ages from 26 to 42 weeks. *Pediatrics* 37:403, 1966.
7. Dombrowski, M., Wolfe, H., Brans, Y., Saleh, A., and Sokol, R. Neonatal morphometry: Relation to obstetric, pediatric and menstrual estimates of gestational age. *Am. J. Dis. Children* 146:(8)52, 1992.
8. Goncalves, L., Jeanty, P., and Piper, J. The accuracy of prenatal ultrasound in detecting congenital anomalies. *Am. J. Obstet. Gynecol.* 171(6):1606, 1994.
9. Wardinsky, T. Visual clues to the diagnosis of birth defects and genetic disease. *J. Pediatr. Health Care* 8(2):63, 1994.
10. Zitelli, B., and Davis, H. *Atlas of Pediatric Physical Diagnosis*. St. Louis, MO: Mosby, 1987.
11. Jones, K. *Smith's Recognizable Patterns of Human Malformation*, 4th ed. Philadelphia, PA: Saunders, 1988.

CHAPTER

40

Primary Care of the Newborn: The First Six Weeks

MARY KATHLEEN MCHUGH, CNM, MSN

The Midwife's Role in Neonatal Well-Child Care

The role of the midwife during the newborn's first month of life varies markedly. In some locales, the midwife has little formal role once the newborn leaves the birthing room. In other practices, usually multidisciplinary ones, the midwife will continue care of the mother and newborn throughout the first 6 weeks after birth. These midwives work in a collegial relationship with pediatric providers and the well-child care gradually shifts to pediatric or family health care providers.

The American College of Nurse-Midwives expects nurse-midwives to be competent in the care of the well neonate. The *Core Competencies for Basic Nurse-Midwifery Practice*, revised in 2002, states that the nurse-midwife "independently manages the care of the newborn during the first 28 days of life" [1, sec. 6.2]. Regardless of the formal expectation regarding the role of the midwife, the reality is that many parents will call the midwife with questions related to the care and well-being of their newborn. The midwife, conscious of the exquisite connection between mother and child, promotes family well-being by her involvement in care and advice to both the mother and new child.

Well-Child Surveillance: The First Four Weeks

All newborns should have at least two physical examinations before being discharged from the birth center or hospital or before the midwife leaves the home after a home birth. The first exam is a screening exam that is conducted at birth, as discussed in Chapter 37. The second, more comprehensive, exam includes the gestational age assessment, as discussed in Chapter 39. If a newborn is discharged after a short stay (6 to 12 hours), most pediatric providers prefer to see the newborn again on the third to fifth day after birth. If the child was in-hospital for 48 hours, the first visit can be delayed until the baby is 10 to 14 days old. The purpose of this visit is to reexamine the newborn and to review teaching and anticipatory guidance with parents.

If metabolic screening was not done prior to the infant's discharge from the birth center or hospital, it should be done on this visit. All states currently require screening for congenital hypothyroidism and phenylketonuria (PKU). Some states require screening for other metabolic diseases [2]. It is the midwife's responsibility to understand the screening requirements of the state in which she or he practices and to be prepared to take a proper blood specimen, usually from the heel. There are many incorrect techniques; most faulty samples either under- or over-sample the blood. The midwife should carefully read the instructions regarding the technique that will optimize results. The test for PKU is accurate after an infant has had at least 48 hours of feedings; until then the damaging phenylalanine has not accumulated. Therefore, drawing these tests before an early discharge, although sometimes required by law, is inadequate. A second test should be scheduled.

The purpose of a well-child visit is threefold: (1) to identify symptoms of disease; (2) to offer screening measures; and (3) to educate and support parents [3]. When a parent brings a newborn in for a well-child visit, every effort should be made to keep the child from exposure to sick children in the waiting area. Whenever possible, the mother and father should be escorted into an exam room as soon as they arrive with their child. Sometimes the well-child visit is combined with the mother's postpartum visit. The midwife should have a plan for the initial well-child visit, which should include the following:

1. Review maternal history, birth history, immediate neonatal course.
2. Observe parents and interview regarding family adjustment.
3. Take a newborn interval history: feeding, alertness, and crying, as well as bowel, bladder, and other problems.
4. Measure weight, length, and head circumference.
5. Perform physical exam.
6. Review need for metabolic screening.
7. Provide teaching and anticipatory guidance.
8. Schedule visit in 6 to 8 weeks for further immunization and checkup.
9. Review how to reach the pediatric provider for emergencies.

The visit starts with a brief interview of the mother or father. Particular attention should be paid to unresolved issues related to the labor and delivery experience or the immediate care of the baby following birth. Parents need to be able to discuss any memories or misinterpretations they may have of that time period.

The midwife should assess the well-being of the mother and father and look for signs of depression or inability to cope with the demands of the new baby. Inquiries should be made about help in the home, sibling reaction to the new baby, and reaction of other relatives to the newborn.

Questioning should move on to the behavior and characteristics of the newborn. Particular emphasis should be paid to feeding patterns, levels of alertness, bowel and bladder patterns, and crying patterns. The midwife should ask, "Do you have any worries or concerns about the baby?" in order to elicit unspoken fears.

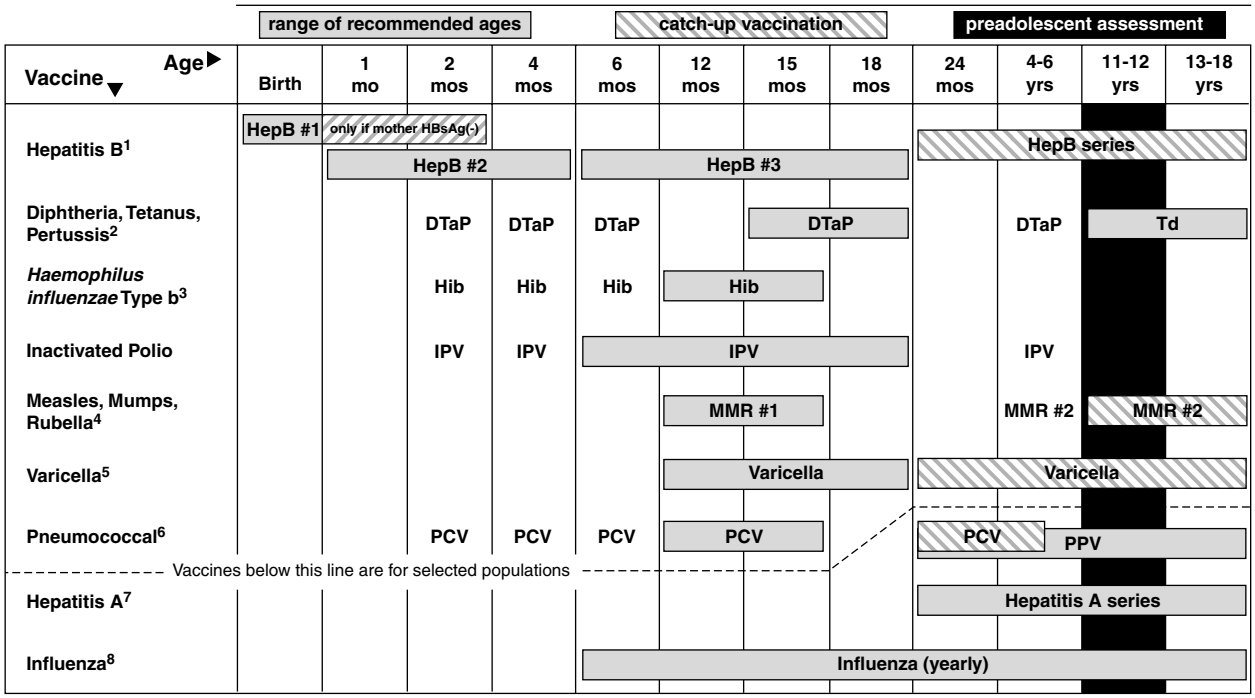
Next the midwife conducts a complete physical exam and checks the baby's reflexes. The physical exam should include a weight check and measurement of length and head circumference. Head circumference may measure slightly less than at birth if the newborn's head was swollen at delivery. During the physical exam, the midwife is looking for evidence that the newborn is hydrated and well cared for. Particular attention should be paid to level of alertness, the heart sounds, and the abduction of the hips. Many metabolic diseases present a number of days after birth, with symptoms of hypotonia or irritability, and feeding problems.

During the physical exam the midwife has an ideal chance to observe for signs of parental attachment to the newborn. This will be evidenced by the parents' use of the newborn's name and by appropriate efforts to protect and comfort the newborn. The midwife has a chance to observe whether the parents are at ease in handling the newborn. If there is an opportunity to observe a feeding, this can be particularly valuable.

The greatest part of the initial well-child visit should be spent soliciting parental concerns and offering guidance and anticipatory advice. As with all teaching, the midwife must ascertain whether the parent is able to pay attention and really hear the guidance. Parents distracted by fatigue or worried about an emergent problem may hear and retain only certain pieces of information. Written instructions can be provided to the parent on common newborn issues.

The second well-child visit usually takes place when the baby is between 6 and 8 weeks old. Parents can be told to expect that the immunization series (which began with the first hepatitis B immunization immediately after birth) will continue then [4]. Standard immunization recommendations are noted in Figure 40-1. Weight and measurement are measured again and another physical examination is conducted.

Any midwife providing well-child care should have an explicit agreement with a pediatric provider for consultation and/or referral of any newborn presenting with signs of illness or disorders. This relationship should be clear to all concerned—the parents, the midwife, and the pediatric caregivers. Depending on state law, the midwife may need to state this relationship formally, in writing.



This schedule indicates the recommended ages for routine administration of currently licensed childhood vaccines, as of December 1, 2002, for children through age 18 years. Any dose not given at the recommended age should be given at any subsequent visit when indicated and feasible. ▨ Indicates age groups that warrant special effort to administer those vaccines not previously given. Additional vaccines may be licensed and recommended during the year. Licensed combination vaccines may be used whenever any components of the combination are indicated and the vaccine's other components are not contraindicated. Providers should consult the manufacturers' package inserts for detailed recommendations.

1. Hepatitis B vaccine (HepB). All infants should receive the first dose of hepatitis B vaccine soon after birth and before hospital discharge; the first dose may also be given by age 2 months if the infant's mother is HBsAg-negative. Only monovalent HepB can be used for the birth dose. Monovalent or combination vaccine containing HepB may be used to complete the series. Four doses of vaccine may be administered when a birth dose is given. The second dose should be given at least 4 weeks after the first dose, except for combination vaccines which cannot be administered before age 6 weeks. The third dose should be given at least 16 weeks after the first dose and at least 8 weeks after the second dose. The last dose in the vaccination series (third or fourth dose) should not be administered before age 6 months.

Infants born to HBsAg-positive mothers should receive HepB and 0.5 mL Hepatitis B Immune Globulin (HBIG) within 12 hours of birth at separate sites. The second dose is recommended at age 1–2 months. The last dose in the vaccination series should not be administered before age 6 months. These infants should be tested for HBsAg and anti-HBs at 9-15 months of age.

Infants born to mothers whose HBsAg status is unknown should receive the first dose of the HepB series within 12 hours of birth. Maternal blood should be drawn as soon as possible to determine the mother's HBsAg status; if the HBsAg test is positive, the infant should receive HBIG as soon as possible (no later than age 1 week). The second dose is recommended at age 1–2 months. The last dose in the vaccination series should not be administered before age 6 months.

2. Diphtheria and tetanus toxoids and acellular pertussis vaccine (DTaP). The fourth dose of DTaP may be administered as early as age 12 months, provided 6 months have elapsed since the third dose and the child is unlikely to return at age 15–18 months. **Tetanus and diphtheria toxoids (Td)** are recommended at age 11–12 years if at least 5 years have elapsed since the last dose of tetanus and diphtheria toxoid-containing vaccine. Subsequent routine Td boosters are recommended every 10 years.

3. *Haemophilus influenzae* type b (Hib) conjugate vaccine. Three Hib conjugate vaccines are licensed for infant use. If PRP-OMP (PedvaxHIB® or ComVax® [Merck]) is administered at ages 2 and 4 months, a dose at age 6 months is not required. DTaP/Hib combination products should not be used for primary immunization in infants at ages 2, 4, or 6 months, but can be used as boosters following any Hib vaccine.

4. Measles, mumps, and rubella vaccine (MMR). The second dose of MMR is recommended routinely at age 4–6 years but may be administered during any visit, provided at least 4 weeks have elapsed since the first dose and that both doses are administered beginning at or after age 12 months. Those who have not previously received the second dose should complete the schedule by the 11–12-year-old visit.

5. Varicella vaccine. Varicella vaccine is recommended at any visit at or after age 12 months for susceptible children, i.e., those who lack a reliable history of chickenpox. Susceptible persons aged ≥13 years should receive two doses, given at least 4 weeks apart.

6. Pneumococcal vaccine. The heptavalent **pneumococcal conjugate vaccine (PCV)** is recommended for all children age 2–23 months. It is also recommended for certain children age 24–59 months. **Pneumococcal polysaccharide vaccine (PPV)** is recommended in addition to PCV for certain high-risk groups. See *MMWR* 2000;49(RR-9);1-38.

7. Hepatitis A vaccine. Hepatitis A vaccine is recommended for children and adolescents in selected states and regions, and for certain high-risk groups; consult your local public health authority. Children and adolescents in these states, regions, and high risk groups who have not been immunized against hepatitis A can begin the hepatitis A vaccination series during any visit. The two doses in the series should be administered at least 6 months apart. See *MMWR* 1999;48(RR-12);1-37.

8. Influenza vaccine. Influenza vaccine is recommended annually for children age ≥6 months with certain risk factors (including but not limited to asthma, cardiac disease, sickle cell disease, HIV, diabetes, and household members of persons in groups at high risk; see *MMWR* 2002;51(RR-3);1-31), and can be administered to all others wishing to obtain immunity. In addition, healthy children age 6–23 months are encouraged to receive influenza vaccine if feasible because children in this age group are at substantially increased risk for influenza-related hospitalizations. Children aged ″12 years should receive vaccine in a dosage appropriate for their age (0.25 mL if age 6–35 months or 0.5 mL if aged ≥3 years). Children aged ″8 years who are receiving influenza vaccine for the first time should receive two doses separated by at least 4 weeks.

For additional information about vaccines, including precautions and contraindications for immunization and vaccine shortages, please visit the National Immunization Program Web site at www.cdc.gov/nip or call the National Immunization Information Hotline at 800-232-2522 (English) or 800-232-0233 (Spanish).

Approved by the Advisory Committee on Immunization Practices (www.cdc.gov/nip/acip), the American Academy of Pediatrics (www.aap.org), and the American Academy of Family Physicians (www.aafp.org).

FIGURE 40-1 Recommended schedule for immunizations of infants and children.

Source: American Academy of Pediatrics. Recommended childhood and adolescent immunization schedule—United States, 2003. *Pediatrics* 111(1):212 (January) 2003. Reprinted by permission.

Newborn Behavior

Parents of newborns are particularly interested in the behavior and sensory capabilities of their children. The midwife can help the parents be realistic in their expectations during the first few weeks of life. Parents with exaggerated views of newborn abilities may become more easily frustrated.

Newborn infants are in a period of behavioral instability. By the time parents figure out a pattern of newborn behavior, the pattern will have changed. A good rule of thumb for the first month of life is, "There is no pattern."

Sleep-Wake States

Newborns have two major categories of behavior: periods of waking and periods of sleeping. Although many researchers have further characterized these two categories, Brazelton developed the most common classification scheme, noting six behavioral states of the newborn [5]. The waking states include crying, considerable motor activity, alert, and drowsy. The sleep states include active (light) sleep and deep sleep.

Knowledge of infant behavioral states is helpful to both midwife and parent. The newborn's abilities to feed and connect visually with the environment are most pronounced in the alert state. This is also the optimal time to check for some reflexes. However, term newborns spend only approximately 15 percent of their daytime hours in the alert state.

The crying state is the most perturbing to parents. Parents of a newborn have not yet learned to decode the cries of their newborn. Midwives can help parents try to gauge whether the cry expresses a need to be fed, to be held, to be stimulated, to suck, or to sleep. Crying is inevitable, but prolonged and frequent crying has physiological sequelae that include increased heart rate and blood pressure, oxygen depletion, aerophagia, and increased cortisol levels [6]. The experienced midwife realizes that some of these physiological parameters also change in the stressed caregiver of the crying infant. Occasionally, crying expresses pain [7]. A newborn who cries excessively may cause a negative interaction with caregivers and can be the source of family conflict. Many parents are focused on not spoiling even very young infants. A discussion of the child's primal needs may give parents the permission they need to spend time calming their newborn.

The two types of sleep appear very different to the observer. In active (light) sleep the newborn may exhibit varying depths and rates of respiration. The variation can concern parents. Motor movements are frequent and the infant can startle while sleeping. In deep sleep the infant has few motor movements. Respirations are deep and regular and the infant appears peaceful.

During the first month of life the percentage of time spent in each of these states changes. Healthy newborns spend up to 60 percent of their time sleeping. However, much of this sleeping is in short naps. As the first month of life progresses, infants shift away from active (light) sleep and toward more deep sleep. Similarly, there is a shift in the waking states toward an increase in alertness. Infants who are crying begin to be able to remain alert to the environment while crying.

Newborn Reflexes

The newborn has two categories of reflexes: proprioceptive and exteroceptive. The exteroceptive reflexes are best evoked when the baby is quiet and alert, since they are stimulated by light touch. They include the rooting, grasping, plantar, and superficial abdominal reflexes. The proprioceptive reflexes include gross motor reflexes such as the Moro reflex. This can be checked at any time. Complete absence of any of these reflexes is a cause for alarm. However, there are frequent instances of an incomplete elicitation of a reflex. This condition can be caused by neurological depression secondary to medication. The loss of a previously strong reflex in the first month of life is a cause for alarm and should be reported to a pediatric provider.

Parents can be involved in a discussion of the self-protecting nature of some reflexes. As they gain an appreciation of a newborn's innate ability to root, suck, latch on to or withdraw from stimuli, and are shown evidence of prewalking behavior, they will come to appreciate their newborn as a competent person.

Sensory Capabilities

Research during the last 30 years has shown that the newborn's ability to use the five senses is more highly developed than previously suspected [8]. Sensory capabilities are strongly related to gestational age. There are dramatic increases in the sensory stimulation just after birth that can lead to neonatal exhaustion, exhibited in fussiness or aversion. The midwife should teach the parents how to "read" the neurobehavioral clues of the newborn (see Table 40-1).

TABLE 40-1 Infant Neurobehavioral Cues

Distress/ Disengagement Cues	Stability/ Engagement Cues
Bradycardia, apnea	Facial gaze
Rapid heart or respiration rate	Smiling
Grunting	Vocalization
Stooling	Feeding posture
Mottled skin	Flexion of arms and legs
Dusky color	Eyes alert
Cyanosis	Stable heart rate
Tremor	Stable respiratory rate
Finger splay	Smooth movements
Fingers interlaced	Hand to mouth
Arching	Finger folding
Hyperalert face	Smooth state transitions
Facial grimace	Sucking and mouthing
Limb extension	Consolable
Gaze aversion	"Ooh" face
Eyes closed	Alert
Slack jaw	Eye-to-eye contact
Open mouth	Grasping
Tongue thrusting	
Sighing	
Regurgitation	
Jittery	
Flaccid	
Vomiting	
Hand to ear	
Worried face	
Rapid state change	
Eyes floating	
Staring	
Hyperextension	
Glassy eyed	
Tongue protrusion	
Flushed	
Hiccough	
Startle	
Yawn	
Flaccidity	
Sneezing	

Source: From Blackburn, S. *Maternal, Fetal and Neonatal Physiology*. Philadelphia, PA: W. B. Saunders, 2003, p. 587. Reprinted by permission.

At term the newborn shows an ability to fix on and track objects visually. Many studies have shown a strong newborn preference for patterns of stripes. During the first month of life, newborns become preferentially interested in patterns with contours that resemble the human face. The ability to see in color is limited at first, so newborns prefer black and white patterns or strong colors like red. Newborns in the alert behavioral state will spend some minutes staring at patterns. Within the first two weeks, newborns also show an ability to mimic human facial expressions.

The newborn has the ability to discriminate among distinctive odors. A newborn can discriminate the odor of its mother's breast pad from the odors of the breast pads of other nursing women. Newborns react strongly to variations in taste and show a strong preference for sweet liquids. They suck longer and with an increase in heart rate when presented with a sweet liquid in a bottle.

Newborns have acute hearing and are able to localize sound in the environment. They can discriminate finely among sounds and show a preference both for real voices as opposed to synthesized voices and for the mother's voice. By the end of one month, newborns prefer sound with a pattern similar to speech.

Prior to birth, the fetus experienced touch in the shifting of the amniotic fluid. At birth the newborn is dry for the first time and is subject to many and varied forms of touch. The ability of the newborn to respond to touch is well demonstrated with the elicitation of the various exteroceptive reflexes such as rooting, grasping, abdominal reflexes, and spinal curving.

Regulation of Behavior

Each infant shows a unique ability to react to stimulation presented by the environment and its own bodily functions. Infants vary in their ability to cope with these stimuli. Within a short period of time parents and caregivers characterize newborns as "quiet" or "active," terms related to characteristics of behavior described by Brazelton [5]. The newborn learns best in the alert state. Therefore, the ability of the newborn to regulate itself so as to spend more time in the alert state is critical. At times, parental intervention in the form of rousing the baby or decreasing environmental stimuli may be essential if the newborn is to achieve the alert state.

On occasion a midwife may recommend to parents that their newborn be given the full Brazelton Neonatal Behavioral Assessment Scale (NBAS). This is especially indicated if the midwife is aware that the parents are having trouble coping with a newborn. This test is standardized and can only be reliably given by a trained examiner. However, every midwife should learn the components tested on the scale. The NBAS starts with the newborn in a sleeping state. Both behavioral and neurological

responses (reflexes) are tested. Repeated stimulations are offered and the examiner observes how the newborn adjusts to the stimuli. The behavioral parts of the NBAS assesses the infant's ability to do the following tasks:

1. Organize behavioral states.
2. Decrease motor activity to cope with sensory input.
3. Become alert and oriented to auditory and visual stimuli.
4. Interact with a caregiver through cuddling.
5. Able to console self.
6. Habituate to repeated stimulation.

The abilities to quiet down and focus, to smile and cuddle with a caregiver, and to ignore extraneous stimulation are key to coping in the world. Midwives can utilize the results of an NBAS to work with parents who need to understand the unique features of their child. Testing that indicates the newborn has trouble calming, cuddling, or habituating to stimuli should be discussed with parents, with emphasis on the parents' support of their newborn's special needs.

Developmental Milestones in the First Six Weeks

Term infants should reach certain developmental milestones during the first 6 weeks of life. Of the various methods of developmental screening available, only the Denver II is accurate in early infancy. The Denver II, a revision and restandardization of the Denver Developmental Screening Test, is based on more testing on various ethnic groups and population mixes. (The Denver II materials are available from DDM, Inc., PO Box 371075, Denver, CO, 80237-5075.)

Within the first 2 months of life, term newborns should progress in all four areas tested on the Denver II. Personal-social skills should include spontaneous and responsive smiling and attentiveness to a face. Some infants will attend to their own hands. Fine motor movements will include visual following to midline and progress toward visual following past midline. In the language area infants will vocalize spontaneously and respond to a bell. Gross motor capabilities include symmetrical movements and lifting the head, occasionally to 45 degrees. Knowledge of these normal developmental milestones should shape the advice a midwife gives to new parents.

The Denver II is a growth chart of development, not a test that a child passes or fails. Findings of any significant developmental difference need to be weighed against other information such as previous developmental patterns and the degree of delay [9].

Psychological Tasks of Early Infancy

During the first months after birth, a profound psychodynamic develops between the young infant and the principal caregiver (usually the mother). The infant is performing the psychological task of differentiation: seeing himself or herself as a separate being in relation to other beings. Human infancy and childhood, unlike that of other species, is lengthy and full of dependence. Young infants must be able to trigger their caregivers to feed, clothe, and shelter them—otherwise they will die. They trigger these protective reactions in adult humans by their sweet, curved physical appearance, their cuddliness, their cries, and their social smiles. A growing body of research implicates the maternal hormone oxytocin in the initiation and maintenance of human attachment behaviors [10, 11]. The brain is a target organ for oxytocin activity, known to contain oxytocin receptors. In animal research, nonpregnant animals given oxytocin suddenly initiate maternal behaviors including grooming, feeding, building nests, and defense of young animals [11].

As the first few months of life progress, the infant and mother form a psychological attachment to each other. First described by Ainsworth and Bowlby in the 1950s, attachment theory has profoundly shaped our knowledge of healthy caregiver-child interaction. Ideally the baby develops secure attachment, fostered by predictability on the part of the mother who responds to and accurately interprets the cues of the baby. The psychological dance of the mother-infant pair is a significant determinant of well-being later in childhood and establishes patterns that can influence attachments throughout life [12]. Infant attachment is best facilitated by caregiver sensitivity, which can be defined as (1) emotional availability, (2) sensitive responses and appropriate stimulation, and (3) consistency over time.

Infants who form a secure attachment with the mother consider the mother as a secure base from which it is safe to foray into the greater world (see Figure 40-2). In the first year of life, secure infants

FIGURE 40-2 Mother as secure base: Susan, Riley Clay, and Shelby Elizabeth (in utero).
Source: Photo ©1982 Gabrielle Beasley; used with permission.

will venture out, crawling or toddling in a strange environment. They return often to the mother, usually for a quick nursing, a pat, or a cuddle. The mother is a safe harbor, predictable in her availability and response.

Mothers and infants who do not form a secure attachment do form other types of attachment. Researchers have characterized two types: insecure attachment and avoidant attachment [13, 14]. In both, the key determinants are the inability of the mother to interpret infant cues successfully and to respond in a predictable way. Infants showing evidence of insecure attachment are anxious and cope poorly with changes or distance from the mother. Their behavior may show extremes of fussiness or other attention-getting behaviors. These infants seem to feel that mother's attention is best gained by a negative display. The mother may be distracted, tired, or too young to know how to play well with an infant. She will, however, respond to screaming or other negative displays. Reinforcement, even negative attention, is enough to encourage the infant.

Infants showing evidence of avoidant attachment seem detached from the mother—as though her lack of predictable response had caused them to shut down emotionally. Babies born to women with significant mental illness or substance abusers may show evidence of avoidant attachment. The effects of the substance abuse can change the mother's personality unpredictably. One day the mother may be tense, one day stuporous, one day nervous from drug withdrawal. The infant receives inconsistent messages that cause emotional shutdown.

The ability of mother and baby to form a secure attachment is key to preventing many other problems of childhood. Longitudinal studies begun when subjects were infants have shown a high correlation between insecure or avoidant attachment in infancy and patterns of school problems and delinquency [15].

The midwife can help the new parents understand the importance of forming this secure attachment. Some mothers need validation of their desire to spend time with their babies. The midwife can explain to both parents the critical importance of parental response to infant cues. This advice can help shape the parents' response to crying and the infant's attempts to communicate through smiling and eye contact. Mothering capability and desire to build this attachment can be undermined by failures at soothing or feeding. Mothers who *perceive* themselves as successful develop a feeling of confidence and competence. Midwives must take the time to talk with the mother about her perception of herself as a caregiver, and help to reframe expectations that may be unrealistic [16]. Although most of the literature discusses maternal-infant attachment, the midwife should be cognizant of other possible "secure bases" for infants, including fathers and grandmothers [17].

Some women never experienced quality mothering when they were children. They have no memory or imprint of a secure attachment. The task of mothering may seem overwhelming to these women and they are at high risk for frustration during the early months of motherhood. Whenever possible the midwife should attempt to refer these women to a counselor or parenting group during the weeks immediately after birth.

Parents need to understand that to a young infant, the whole world is represented by the parent. If the infant is to learn the basic human emotion of trust, it is imperative that attempts to communicate receive an appropriate response.

Physical Care of the Newborn

Parents have many concerns regarding the physical care of their newborn. Overall, they should be reassured that there is more than one right way to approach many physical aspects of their child's care.

An infant does not need a full bath daily. Newborns need to have their heads and diaper areas sponged whenever those areas are dirty. This "tops and tails" routine should be done with a mild, nondeodorized soap and the areas should be well dried. A full bath can be given occasionally when the parent has the time to make it a relaxing event for the newborn. Parents must be urged never to leave a newborn unattended in the bath. The soap, towels, shampoo, and clean clothes should all be organized before starting the bath. Slip-proof bath mats are inexpensive and help prevent the infant from slipping.

Care of the umbilicus starts immediately after birth. As noted in Chapter 37, "dry care" of the umbilicus is sufficient. There is no need to ask the parents to use alcohol on the cord at home. The cord should continue to dry and will most likely fall off in 2 weeks. Cords with a strong odor can be cleansed with hydrogen peroxide. Parents should call the midwife if the cord oozes pus or red streaks appear on the abdomen near the umbilicus.

Care of the skin covered by the diaper is essential if diaper rash is to be prevented. Skin care should start with regular diaper changes and a thorough cleansing of the skin with soap and water or a commercial diaper wipe. There is no need to use powder or cream on a regular basis. Use of a barrier cream containing zinc oxide (e.g., Desitin) can sometimes stop diaper rash at the earliest stages.

Parents frequently have strong feelings about what type of diaper to use: paper disposable or cloth. Disposable diapers present environmental issues related to paper/plastic waste. On the other hand, commercial diaper services often use large amounts of bleach and the delivery trucks create pollution. A few parents will choose to wash their own diapers. They must carefully pre-soak diapers (in bleach and detergent) and wash them twice in very hot water in order to ensure that bacteria are destroyed. It is important that the washer not be overloaded so that adequate rinse water can circulate.

Parents are frequently encouraged by family members to dress babies in excessive layers of clothing. A general rule of thumb is to clothe the infant with as many layers as other persons in the room are wearing, plus one layer. Because babies cannot sweat effectively, symptoms of overheating are mainly a red skin color, irritability, and body warmth. Eventually the overheated infant will appear lethargic. Newborns also cannot cope well with cold winds. They will rapidly cool through inspired cold air. Infants taken outside on windy, cold days should have a nonrestrictive covering near their face while they are outdoors.

From the earliest moments at home with a newborn, parents should be scanning for environmental hazards that present safety risks. In the first months of life these risks are mainly related to falling (from a changing table or baby seat) or getting stuck between crib bars. Parents using hand-me-down baby equipment need to check the reliability of safety straps and measure that the space between crib bars is less than $2^{3}/_{8}$ inches and that the mattress fits tightly into the crib. Parents of newborns should also think about hanging mobiles out of reach and removing soft pillows and toys that may lead to suffocation.

There is strong evidence that infants should be positioned for sleep in the supine position (on their backs). This position helps to minimize the risk of sudden infant death syndrome (SIDS). The American Academy of Pediatrics Task Force on Infant Sleep Position and Sudden Infant Death Syndrome first recommended the change from a prone to a supine sleep position in 1992. Since then, the deaths from SIDS have dramatically decreased (see Figure 40-3). Research continues on other factors that contribute to SIDS. Association has been noted with soft sleep surfaces, loose bedding, maternal smoking, bed sharing (especially with multiple family members), overheating, and preterm birth [18, 19]. The midwife is in an ideal position to speak with the family members about the sleeping arrangements, and to urge that no one smoke in the house where the baby resides. Current data do not support the widely held belief that newborns must be positioned on their abdomens in order to prevent aspiration of regurgitated food. Infants consistently placed in the supine position for sleep may have delays in reaching the developmental milestone of rolling over, previously expected by four months of age [20].

All parents using a car for transportation need to have a child safety seat. Small infants should be placed in the backseat of the car, facing the rear of the car. Some states have car seat loaner programs for indigent families. Parents who are buying a new seat should be encouraged to look for infant car seats that double as baby seats in the home. These

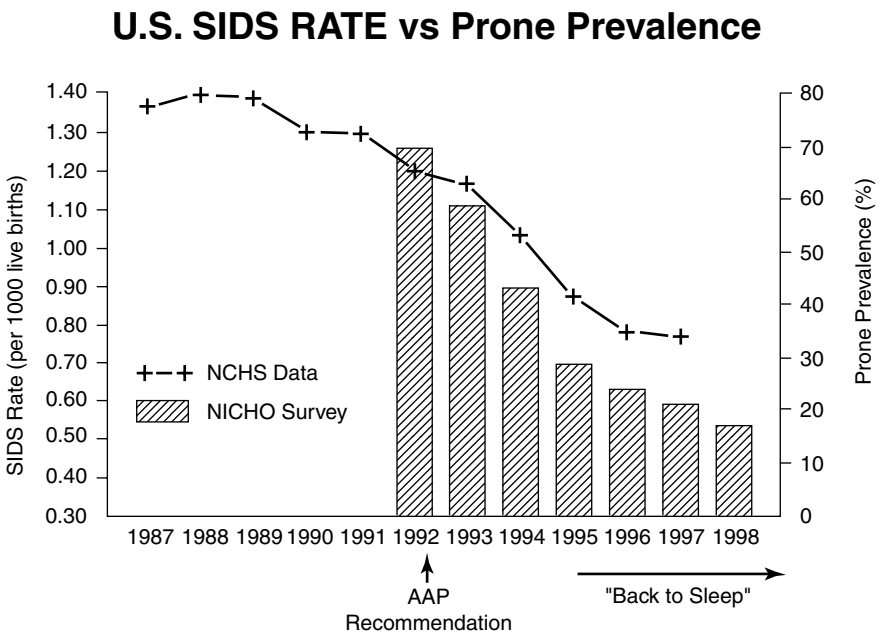


FIGURE 40-3 Change in incidence of SIDS since encouragement of the supine sleeping position.

Source: American Academy of Pediatrics. Changing concepts of sudden infant death syndrome: implications for infant sleeping environment and sleep position (RE9946). *Pediatrics* 105(3):650–656 (March) 2000. Used with permission of the American Academy of Pediatrics.

will have the adequate harness that will prevent infant falls within the home.

The Circumcision Decision

In the United States, circumcising male newborns became prevalent in the 1950s. A complex web of religious, cultural, and family traditions surrounds each family in this decision. Certain religious traditions (Jewish, Muslim) have practiced male circumcision for centuries.

The procedure of circumcision involves the cutting of adhesions and retraction of the foreskin covering the glans of the penis. This procedure is customarily done in the hospital or during the first month of life as a religious ceremony. Complications from circumcision are unusual but can be serious. The most frequent complications are local infection and bleeding, seen in only 0.2 to 0.6 percent of infants [21]. Although the foreskin of newborns is rarely able to be retracted, by age 3 the foreskin can be retracted on 80 to 90 percent of male children.

The contemporary medical rationale for circumcision is a source of controversy. Proponents of circumcision maintain that because the circumcised penis can be kept clean more easily, circumcised males experience lower incidence of medical problems including cancer, urinary tract infection (UTI), and sexually transmitted disease (STD). Cancer of the penis is a rare cancer, especially in the cooler climates of the Northern Hemisphere. The relationship between circumcision and UTIs seems clear: all studies that have examined the association between UTI and circumcision status show an increased risk of UTI in uncircumcised males, with the greatest risk in infants younger than 1 year of age [22]. The relationship between circumcision and STDs remains complex. A number of studies have found a positive correlation between men who were uncircumcised and incidence of STDs, including HIV. However many other contributing factors such as socioeconomic class and sexual practices have clouded the association. Routinely circumcising newborns prevents the small percentage of men with phimosis (inability to retract the foreskin) from developing problems with edema and inflammation of the glans.

Opponents of circumcision maintain that modern sanitary conditions in the United States eliminate the need for this procedure. They believe that the procedure is a painful violation of an unconsenting infant to get rid of a functional body part. The American Academy of Pediatrics makes the fol-

lowing statement: "Existing scientific evidence demonstrates potential medical benefits of newborn male circumcision; however, these data are not sufficient to recommend routine neonatal circumcision" [22]. The Academy further recommends that if circumcision is performed adequate analgesia be provided via a dorsal penile nerve block or an anesthetic cream [23].

Parents choosing not to circumcise should be taught the normal anatomy of the penis and its development. As the child matures, he should be taught to retract the foreskin gently while bathing in order to clear any collection of smegma. Parents must be urged not to retract a foreskin forcefully, since the resultant irritation and edema may cause further adhesions.

In some areas, midwives have added circumcision to their practice [24]. Since this is not a core competency taught in midwifery educational programs, the midwife must utilize the ACNM *Guidelines for the Incorporation of New Procedures into Nurse-Midwifery Practice*. This is a procedure that must be carefully taught by an experienced preceptor who can observe the midwife as she or he learns the new skill. The technique of circumcision is described in Chapter 81. Whether midwives can add this skill to their clinical practices depends on state regulation regarding circumcision in midwifery practice. All midwives, regardless of their personal position on the subject, must be prepared to present the pros and cons of circumcision to parents.

Nonnutritive Sucking

Each family will have its own preference regarding thumb sucking or the use of pacifiers with newborns. Developmentally, nonnutritive sucking serves many functions. Newborns use sucking as a calming activity and are better able to regulate to an alert state when they suck on a thumb or pacifier. There is some evidence that use of a pacifier is associated with a lower incidence of SIDS [18]. Some fetuses start sucking their thumb in utero and continue postnatally with this preference.

Many families use pacifiers to help calm newborns. If parents choose to use a pacifier, they should be advised to clean it regularly and check for signs of dirt or mold. Most pacifiers today have a design that promotes proper development of the muscles of the mouth. Pacifiers should never be placed on a string around the baby's neck because of the risk of strangulation. Some newborns never accept a pacifier and parents must devise other methods to help the newborn become calm (walking the baby, distracting the baby, encouraging thumb sucking).

When a baby is left sucking on a bottle for a prolonged period of time, the residual sugars from the milk or juice may contribute to childhood dental caries, or "baby bottle mouth." The accumulation of milk in the back of the oropharynx may also lead to ear infections. Therefore, prolonged bottle-feeding should never be used to calm an infant.

Feeding

The decision to bottle-feed or breastfeed a newborn is one full of emotion for many parents, especially mothers. Midwives are, by and large, strong advocates of breastfeeding. This choice and its attendant benefits and management are discussed in Chapter 43. Whenever possible, the midwife should express strong support for breastfeeding. However, there are some situations in which the decision to bottle-feed an infant is a logical, prudent choice.

The decision to bottle-feed is logical when the woman's preference is overwhelmingly in this direction. Some women or their significant others are repulsed by the process of breastfeeding. Other women, because of life demands, will share child rearing with other family members or partners and will not be available to breastfeed. Heavy smoking or substance abuse by the mother makes bottle-feeding a safer choice for the infant. Women experiencing certain infections such as HIV or women on certain medications may not safely choose breastfeeding.

Commercial formula is usually heat-treated, nonfat cow's milk to which vitamins, minerals, fats, and sugars have been added (see Table 40-2). Some formula preparations are based on soy products. All are protected by standards set by the Food and Drug Administration (FDA). Commercial formula preparations in the United States come in three types: ready-to-use, concentrated, and powdered. The midwife should become familiar with all three types. In most states only concentrated liquid formula can be purchased with the Women-Infant-Children (WIC) coupons. Parents must be instructed to pay attention to the difference in formula types. Newborns receiving overdiluted formula will fail to gain weight, and newborns fed undiluted formula will receive an osmolar load that will eventually be dangerous to the kidneys.

TABLE 40-2 Comparison of Human Milk, Cow's Milk, and Formula

Nutrient (Unit)	Minimum Level Recommended[1]	Mature Human Milk	Typical Commercial Formula	Cow's Milk (Mean)
Protein (g)[2]	1.8	1.3–1.6	2.3	5.1
Fat (g)[3]	3.3	5	5.3	5.7
Carbohydrate (g)	—	10.3	10.8	7.3
Linoleic acid (mg)	300	560	2300	125
Vitamin A (IU)	250	250	300	216
Vitamin D (IU)	40	3	63	3
Vitamin E (IU)	0.3 FT 0.7 LBW 1 g linoleic	0.3	2	0.1
Vitamin K (μg)	4	2	9	5
Vitamin C (mg)	8	7.8	8.1	2.3
Thiamin (μg)	40	25	80	59
Riboflavin (μg)	60	60	100	252
Niacin (μg)	250	250	1200	131
Vitamin B_6 (μg)	15 μg/g protein	15	63	66
Folic acid (μg)	4	4	10	8
Pantothenic acid (μg)	300	300	450	489
Vitamin B_{12} (μg)	0.15	0.15	0.25	0.56
Biotin (μg)	1.5	1	2.5	3.1
Inositol (mg)	4	20	5.5	20
Choline (mg)	7	13	10	23
Calcium (mg)	5	50	75	186
Phosphorus (mg)	25	25	65	145
Magnesium (mg)	6	6	8	20
Iron (mg)	1	0.1	1.5 in fortified	0.08
Iodine (μg)	5	4–9	10	7
Copper (μg)	60	25–60	80	20
Zinc (mg)	0.5	0.1–.05	0.65	0.6
Manganese (μg)	5	1.5	5–160	3
Sodium (meq)	0.9	1	1.7	3.3
Potassium (meq)	2.1	2.1	2.7	6
Chloride (meq)	1.6	1.6	2.3	4.6
Osmolarity (mosm)	—	11.3	16–18.4	40

[1] Committe on Nutrition, American Academy of Pediatrics

[2] Protein of nutritional quality equal to casein

[3] Includes 300 mg essential fatty acids

Source: From Hambridge, K., and Krebs, N. Normal childhood nutrition and its disorders. In Hay, W., et al. *Current Pediatric Diagnosis and Treatment*, 12th ed. Norwalk, CT: Appleton and Lange, 1995, p. 273. Reprinted by permission.

Parents who are unable to afford commercial formula may choose to make formula. They must be carefully instructed not to use plain cow's milk for an infant younger than 1 year old. Cow's milk has a very high protein content, mainly of hard-to-digest casein. It also contains a high solute load that adds a renal burden and is inadequate in vitamins and iron. If the midwife learns that a family cannot afford commercial formula, the use of an evaporated milk formula may be helpful. Formula can be prepared as follows:

1. Measure 15 ounces of hot water into a pitcher.
2. Add 1 level tablespoon of table sugar.
3. Add 10 ounces of evaporated milk. (Wipe the lid before opening the can.)
4. Yield is 25 ounces of formula at 20 calories/ounce.

The heating process in the preparation of evaporated milk helps to make the protein more digestible. Babies on evaporated milk formulas should receive a multivitamin with iron preparation daily; this can be given orally with a dropper.

There is variable iron storage by the fetus. The American Academy of Pediatrics recommends that

infants who are not breastfed or are partially breastfed should receive an iron-fortified formula (containing between 4.0 and 12 mg/L of iron) from birth to 12 months [25]. Iron in fortified formula is inefficiently absorbed and is helpful only if the newborn receives it routinely. Many caregivers use the iron-fortified formula from birth onward. However, some fear gastrointestinal upset, including constipation from iron-fortified formula. The midwife needs to check with the family about any barriers to use of the iron-fortified formula, carefully explaining the benefits.

Breast milk has very low concentrations of iron, calcium, and zinc. However, all of these elements are extremely bioavailable and, therefore, efficiently absorbed. Breastfed babies will not need iron supplementation until 4 to 6 months of age, when the prenatal stores are used up because of rapid growth.

When using ready-to-use formula or when using unfluoridated water to prepare formula, it is recommended that fluoride supplement be given; the fluoride can be given orally by dropper. Fluoride is a trace element that strengthens the enamel of the tooth and makes it more resistant to acids. Although it is currently recommended that breastfed babies receive fluoride after 6 months of age, some dental caregivers believe that supplementation should start earlier. The introduction of fluoride into public drinking water has caused a dramatic decrease in dental caries in the United States. Each midwife should make inquiries regarding the availability of fluoridated water in her area of practice.

Some families will give a baby water from time to time. This is unnecessary except in very hot weather. Any water given to an infant should be unsweetened. If, for cultural reasons, parents insist on sweetening the water, they may use $^1/_2$ teaspoon of table sugar in 4 ounces of water. Parents should be urged never to use honey or corn syrup as sweeteners because of the risk of contamination with botulism spores of the bacillus *Clostridium botulinum*.

In most areas of the United States there is no need for parents to sterilize bottles, nipples, or water for formula. Cleaning these items with a bottle brush and soapy hot water or in a dishwasher is adequate. However, parents using well water or any uncertain water supply may need to sterilize bottles and formula. This can be accomplished by setting cleaned bottles filled with formula in a large pot and boiling them for 25 minutes. The nipples and bottle caps should only be screwed on loosely during the boiling process. They can be tightened after the entire pot has cooled and is safe to touch.

The most important instruction for parents is to refrigerate formula promptly once it is mixed. Parents who are traveling can use powdered formula with peace of mind.

Parents should be strongly encouraged to hold and cuddle a newborn during a feeding. One of the major benefits of breastfeeding is the comfort of being cuddled. Newborns who are fed from propped-up bottles cannot be observed properly for choking and the need to burp. They also are being deprived of several hours of visual, olfactory, and auditory stimulation each day.

Newborns who are bottle-fed should be held in a position comfortable for both the infant and the mother. Some mothers prefer a semisitting position with the baby resting in the curve of the arm, as when breastfeeding. Stroking the baby's lip with the nipple allows the baby to root for the nipple and grasp it, which is more relaxing than forcing the nipple into the mouth. The bottle should be held so that the milk is in the nipple and neck of the bottle (see Figure 40-4). This keeps the infant from swallowing any more air than necessary.

An infant who has cried for a period of time before the feeding may have swallowed enough air to need burping prior to feeding or after taking a swallow or two of formula. Burping or bubbling can be done several ways and the mother should use the method most comfortable to her and the baby. She can place the baby over her shoulder, set the baby upright in her lap while supporting the chest and jaws with one hand, or lay the baby over her legs while patting or rubbing the back to bring up the bubble of air (see Figure 40-5).

FIGURE 40-4 Technique of bottle-feeding.

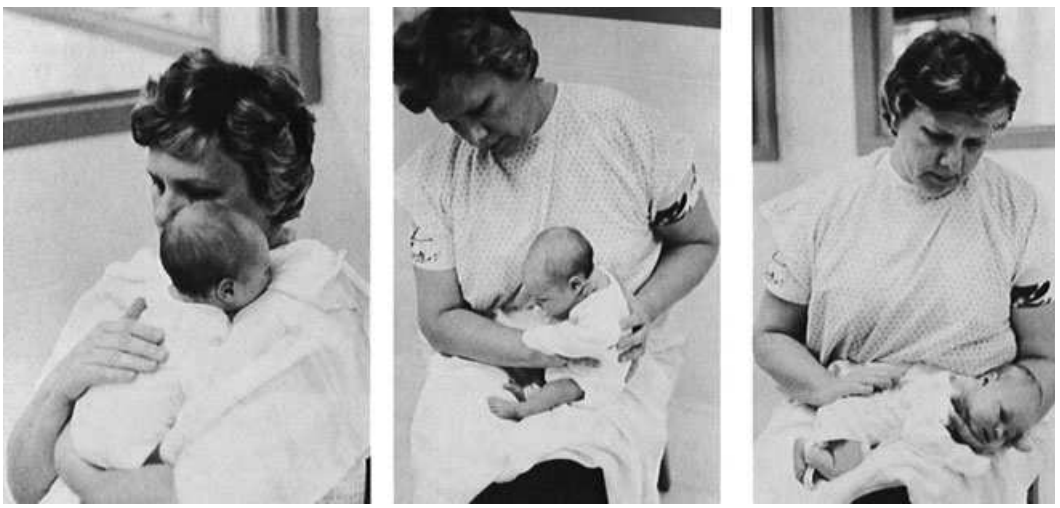


FIGURE 40-5 Methods of burping the newborn.

Hiccups are common and are more annoying to the mother than to the infant. They are due to spasmodic contractions of the diaphragm caused by irritation from regurgitation of gastric contents. Usually a few swallows of water to wash down the irritating material will help the contractions stop quickly. Some babies are more prone to hiccups than others.

The average amount to feed a term infant during the first 2 weeks is 30 to 60 milliliters every 2 to 3 hours. During the first 2 weeks of life, the newborn should be wakened to feed at least every 4 hours. After that, if the infant is gaining weight, longer sleep periods (especially at night) can be allowed.

There is no medical reason for a young infant to be fed anything other than breast milk or formula. Infants are developmentally ready to transfer food to the back of the tongue for swallowing at approximately 4 to 6 months of age. This coincides with an ability of the gastrointestinal tract to digest other foods. If parents insist on giving their infant another food before this age, they should restrict themselves to rice-based cereal in small amounts.

Common Variations in the First Six Weeks

There are certain variations among infants that are of concern to parents and caregivers alike. In each case the midwife must stay alert for signs and symptoms that point to a more serious underlying problem.

Diaper Rash

Most diaper rash is a reaction of the skin to the ammonia in urine and the bacterial contamination from fecal material. It is important to note the location and distribution of the problem and note whether there is generalized redness, a rash, or both. Simple diaper rash of the irritant variety presents as flat, reddened areas without too much skinfold involvement (Figure 40-6[a]). The affected skin should be cleaned with mild soap and tepid water. The infant will be in distress when the area is cleaned. Whenever possible, the diaper area should be left uncovered so that air can circulate. If diapers must be used, frequent diaper changes are necessary. Most diaper rash will rapidly clear up with this regimen. In the early stages of irritation a zinc oxide barrier cream (e.g., Desitin) may prevent further skin problems.

Infants presenting with pronounced erythematous confluent lesions, skinfold involvement, and "satellite lesions" at some distance from the perineum and anus may have a fungal diaper rash caused by *Candida albicans* (Figure 40-6[b]). This is best treated with a topical antifungal preparation such as topical nystatin, miconazole, or clotrimazole; fungal diaper rash will resist most other treatments. Babies with fungal diaper rash will be in pain. A 1% hydrocortisone cream may help lessen the inflammation and can be used concurrently with the fungal preparation [26]. Frequent diaper changes and sponging with tepid water will also assist healing.

A newborn must be evaluated if the parent reports peeling skin, vesicles, or an exudate. Sometimes

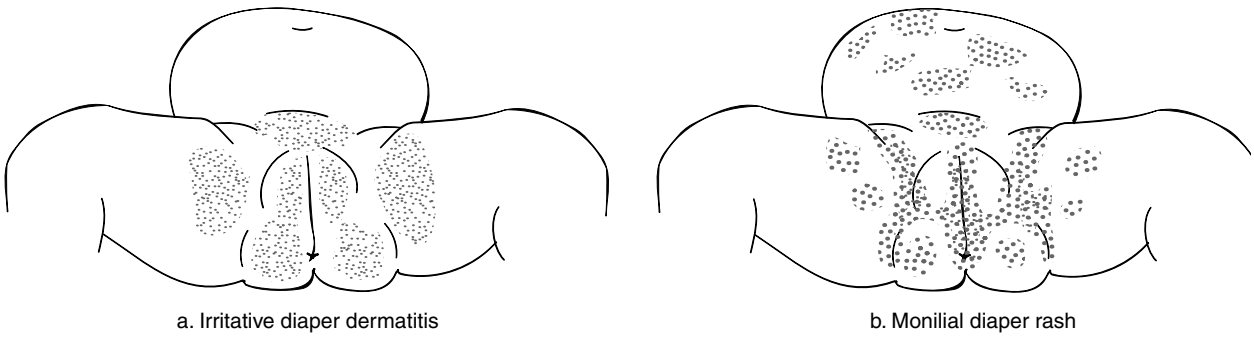


FIGURE 40-6 Diaper dermatitis.

Source: From Liptak, G. Diaper rash. In Hoekelman, R. A., Adam, H. M., Nelson, N. M., et al., *Primary Pediatric Care*, 4th ed. St. Louis, MO: Mosby, 2001, p. 1458. Reproduced by permission.

a simple diaper rash can be secondarily infected with staphylococcus or streptococcus, leading to impetigo. In rare cases, herpes simplex virus or histiocytosis—a seborrhea-like condition—can cause a diaper rash. When infants present with frequent diaper rash, the midwife should try to assess whether the parents are following hygienic practices. Parents on limited incomes may not change diapers often because of the cost of disposable diapers.

Cradle Cap

Some infants collect a seborrheic exudate on their scalp that becomes adherent. This cradle cap is only of cosmetic concern. It can be loosened by a gentle scalp massage with vegetable or olive oil and removed by shampooing and use of a very fine-toothed comb. It usually does not return if shampooing is part of the bath.

Mouth Thrush

Parents who complain that their baby starts to eat but then pulls away from the breast or bottle while crying should be instructed to inspect the infant's mouth. Infant thrush, caused by *Candida albicans*, appears as adherent white plaquelike clumps on the tongue, gums, and hard palate. These infants will need to be treated with an oral antifungal preparation or gentian violet. Occasionally, breastfeeding mothers will get a fungal infection of their nipples from an infected infant. Symptoms will include very itchy nipples. This problem can be treated with an antifungal cream used after breastfeeding.

Noisy, Irregular Breathing

Parents frequently are concerned about noises that infants make while breathing. This concern is usually intertwined with a concern about irregularities in the respiratory pattern. Parents should be advised that the upper airways of infants are narrow and any slight nasal swelling can produce some noise. The common parental practice of frequent suctioning of the nares with a bulb syringe should be discouraged because it produces trauma and swelling, making the situation worse.

If an infant seems to have a crusted nasal discharge, parents can purchase some saline drops and insert one or two drops into the nares to loosen the discharge. Routine use of a home humidifier is controversial because humidifiers are breeding grounds for fungus and molds that are then circulated in the air.

The periodic breathing of the newborn must be distinguished from apnea. Direct observation of the newborn is critical in order to see the pattern of respiratory effort. Periodic breathing occurs most frequently during REM sleep and is defined as pauses in respiratory movement that last for up to 20 seconds alternating with breathing [27]. Pauses more frequent than that need to be evaluated, especially if they are accompanied by other signs of respiratory compromise like tachypnea (>60 breaths per minute), nasal flaring, retractions, color changes, or grunting. Periodic breathing should not be associated with a drop in heart rate.

The Fussy Baby

A frequent cause of parental desperation in the newborn's first 2 months is the fussy, inconsolable baby—often known as "high-need" or colicky babies. The midwife needs to take a careful history of the crying and fussing patterns in order to help devise a plan of care. Parents should be interviewed regarding their expectations of the newborn's sleep/wake patterns and ability to self-comfort. Occasionally, mothers who are depressed will com-

plain about the newborn's behavior while masking their own serious depression. Any discussion of the fussy baby must include questions about the mother's well-being and her recent history.

The reasons that some infants become fussy and cry excessively are not known. A baseline physical examination should be done to rule out infections, milk intolerance, and gastrointestinal blockage. During this visit, a weight check will be done. An organic cause for fussy behavior is rarely pinpointed. One theory regarding these babies is that they have a very low threshold for stimulation and frustration. They appear to get overwhelmed quickly and to rapidly cycle through various behavioral states to full crying.

The approach currently in favor in pediatric circles involves education of the parents to a wide repertoire of calming techniques [28, 29]. Among the suggested ones are the following:

1. Try to feed the baby.
2. Hold the baby; try different holds that provide abdominal support.
3. Swaddle the baby.
4. Give the baby a pacifier.
5. Talk to the baby face-to-face; use low, rhythmic sounds.
6. Reduce sensory stimulation in the room.
7. Walk the baby around the room.
8. Take the baby outside for a walk or a car ride.

Parents are encouraged to go through the repertoire, trying each technique for only 5 minutes until the baby calms. A variety of holding positions can be utilized, including the cradle hold, flexion over the adult shoulder, football hold, or draping over the adult knee. Many of these positions have in common some firm support to the infant's abdomen.

Evaluation of crying is particularly difficult because of the lack of a standardized definition of excessive crying [30]. Parents can be urged to keep a record of their interventions and the time the baby actually spends crying. Modest successes can thus be highlighted and patterns identified. Any parental success should be framed by the midwife as examples of how well the parents are understanding and helping their high-need child. Most importantly, the midwife must urge the parents to discuss their frustration and anger at the situation. A very fussy baby can provoke violent responses from a sleep-deprived parent. Parents should get a clear message to call the midwife if they feel themselves getting out of control. They should also be reassured that most extremely fussy babies settle considerably by the third month of life.

Eating Patterns and Weight Gain

Many parental anxieties are focused on weight gain and eating patterns in the first few weeks of life. Some of this is culturally determined in families who believe that maternal competence is reflected in infant weight gain. When a parent calls with concerns about intake, the midwife must set aside time to take an adequate history.

Among the factors to be considered are history of the birth and immediate postnatal course, birth weight and length, current age, interval illness or problems, method of feeding, primary caregiver, and current family stress level. The parental level of comfort with infants and infant feeding should be assessed. The parents should be asked why they are concerned. Is there a specific reason they feel that the infant's eating patterns are problematic? Most parents will express concerns about vomiting, amount of milk ingested, or the infant's lack of interest in eating.

The midwife presented with this problem during a phone call will need to decide whether the baby should be brought in for an office evaluation. Parents will be most reassured after a weight check; therefore it can be worthwhile to arrange an appointment. On occasion the midwife may be concerned enough by the history that she feels an immediate office visit is critical. The factors listed in Table 40-3 would warrant immediate evaluation.

A midwife who is reassured by the absence of any critical indicators during her phone conversation with the parent can offer some information.

TABLE 40-3 Factors in Feeding History Requiring Immediate Evaluation

Regular projectile vomiting
Bile-stained vomit
No stools since birth
No urination since birth
Poor muscle tone—"spread-eagle posture"
Inability to rouse infant
Inability of infant to suck
Rapid respirations over time (greater than 60 per minute)
Marked color changes during eating
Taut, swollen abdomen
More than six stools per 24 hours
Bloody or excessively watery stools

Healthy term newborns who were of average weight of gestational age can be expected to gain 1 ounce per day in the first 3 months. Breastfed babies may gain slightly less than 1 oz per day. Over the course of the first year, birth weight trebles and birth length doubles [31]. During the first 3 to 5 days of life, newborns may lose from 5 to 10 percent of their birth weight, with breastfed babies experiencing the larger weight loss. This weight should be regained by the tenth day of life. The weight and length of infants born in the United States are evaluated on growth charts. These national norms were recently revised by the CDC and more accurately reflect the diversity of the population and the weight gain patterns of breast-fed infants [32]. Nonetheless, the 2000 CDC charts compare a child to all the children in the United States—a heterogeneous population. It is possible that midwives working exclusively with certain ethnic groups might find slightly differing patterns of growth.

Parents need to distinguish regurgitation from vomiting. Regurgitation ("spitting up") is reflux of stomach contents through the immature lower esophageal sphincter and is normal in newborns. The amount is usually small and the spitting up is rarely forceful. Overfeeding with the bottle contributes to regurgitation. Regurgitation should not interfere with weight gain. Regurgitated milk will not be bile- or blood-stained.

Babies who are being fed adequately will produce both urine and feces in a regular pattern. Anxious parents should be asked to check the diaper prior to a feed for evidence of urine. Superabsorbent disposable diapers may be hard to evaluate, so parents may need to diaper the baby in cloth in order to observe the presence of urination. Six voids a day indicate adequate hydration.

Infant interest in feeding changes with time. During the first 48 hours of life infants may show minimal interest in feeding. Their intake may be only 1 ounce, but they should be offered a chance to feed regularly. Infants are usually hungry every 2 to 3 hours and during the first month feeding should be offered at least every 4 hours. As the first month continues, the infant's stomach will enlarge and feedings of 2 to 4 oz will become the norm.

Physiological Jaundice

Up to 50 percent of newborns become jaundiced to a level that is visible. Visible jaundice indicates a bilirubin level of at least 5 to 7 mg/dL. As discussed earlier, there are many physiological reasons for the development of jaundice during the first week after birth.

Management of jaundice depends on whether the jaundice is determined to be within the norm for physiological jaundice or indicative of a pathophysiological process. The midwife should learn to distinguish these two processes (see Table 40-4) and should encourage infant care practices that enhance clearance of jaundice.

Physiological jaundice is more common in some situations. Asian babies have a high incidence of jaundice and African-American babies a low incidence [33]. Breastfed babies have a higher incidence of physiological jaundice than bottle-fed babies.

The criteria listed in Table 40-4 for possible pathological jaundice do not amount to a firm diagnosis. Other factors need to be considered, including the race and sex of the baby, method of feeding and gestational age. Because most U.S. newborns are discharged from the hospital early, there has been an increasing emphasis on predicting which neonates will experience excessive jaundice. Some hospitals are screening all newborns with serum total bilirubin (STB) levels at one day of age. A level less than 5 mg/dL is very predictive of infants who will not need treatment for subsequent severe jaundice. Higher levels indicate newborns who should be followed closely, even if discharged to home, for STB rising to pathological levels [34, 35].

TABLE 40-4 Types of Jaundice

Physiological Jaundice	Possible Pathological Jaundice
Not visible in first 24 hours	Visible during first 24 hours
Rises slowly and peaks at day 3 or 4 of life	May rise quickly: >5mg/dL/24 hours
Total bilirubin peaks at less than 13 mg/dL	Total bilirubin greater than 13 mg/dL
Lab tests reveal predominance of unconjugated bilirubin	Greater amounts of conjugated bilirubin
Not visible after 10 days	Visible jaundice persists after one week

All parents should be given advice about the high frequency of jaundice in the newborn. They can be advised to feed the infant frequently during the first days of life in order to promote the passage of meconium. As discussed earlier, meconium has a high bilirubin content and delayed passage promotes reabsorption of bilirubin as part of the enterohepatic shunt. Parents can be taught to assess the newborn in a well-lighted room or near a sunny window by blanching the skin to reveal the underlying color. The icterus will start on the head and face and move downward to the trunk and extremities. If a home visit is planned the neonate can be evaluated with an icterometer or transcutaneous jaundice meter [36].

A newborn with pronounced physiological jaundice can be treated with phototherapy. The following symptoms may indicate that the jaundice is not physiological and the newborn needs a more extensive medical evaluation: vomiting, lethargy, poor feeding, hepatosplenomegaly, excessive weight loss, apnea, temperature instability, tachypnea, dark urine or urine positive for bilirubin, light-colored stools, persistent jaundice for more than 3 weeks [37].

Increasingly, phototherapy can be offered in the home and supervised by a pediatric provider. Home phototherapy is contraindicated when the bilirubin level is greater than 18 mg/dL or when pathology is suspected [38]. Many mothers prefer home phototherapy but some are too tired or nervous to accept the extra responsibility for monitoring the newborn [39]. Pathological jaundice is discussed in Chapter 41.

• • • References

1. American College of Nurse-Midwives. *Core Competencies for Basic Midwifery Practice*. Washington, DC: ACNM, 2002.
2. Wallman, C., and Witt, C. L. Newborn Genetic Screening. *Neonatal Network* 17:(3)55–60, 1998.
3. Richardson, L., Selby-Harrington, M., Krowchuk, H. V., et al. Comprehensiveness of well child care for children receiving Medicaid: a pilot study. *J. Pediatr. Health Care* 8(5):212, 1994.
4. American Academy of Pediatrics, Committee on Infectious Disease. Recommended childhood immunization schedule—United States, 2002. *Pediatrics* 109(1):162–164 (January) 2002.
5. Brazelton, T. B. *Neonatal Behavioral Assessment Scale*, 2nd ed. Philadelphia, PA: Lippincott, 1984.
6. Ludington-Hoe, S. M., Cong, X., and Hashemi, F. Infant Crying: Nature, physiologic consequences, and select interventions. *Neonatal Network* 21(2):29–36 (March) 2002.
7. Craig, K. D., and Badali, M. A. On knowing an infant's pain. *Neonatal Intensive Care* 13(2):35–37 (March/April) 2000.
8. Blackburn, S. *Maternal, Fetal and Neonatal Physiology*. Philadelphia, PA: W. B. Saunders, 2003, pp. 577–580.
9. Frankenburg, W. K. Development surveillance and screening of infants and young children. *Pediatrics* 109(1):144–145 (June) 2002.
10. Insel, T. R. Toward a neurobiology of attachment. *Review of General Psychology* 4(2):176–185 (June) 2000.
11. Kennell, J. H., and McGrath, S. Commentary: What babies teach us: the essential link between baby's behavior and mother's biology. *Birth* 28(1):20–21 (March) 2001.
12. Ainsworth, M. Attachments beyond infancy. *Am. Psychol.* 44(4):709–716, 1989.
13. Pressler, J. Promoting attachment. In Craft, M., and Denehy, J. *Nursing Interventions for Infants and Children*. Philadelphia, PA: W. B. Saunders, 1990, p. 9.
14. Bowlby, J. Attachment and loss: retrospect and prospect. *Am. J. Orthopsych.* 52(4):664–667, 1982.
15. Lewis, M. Predicting psychopathology in six year olds from early social relations. *Child Dev.* 55:123, 1984.
16. Leavitt, L. A. Research to practice: emotional development and maternal/infant attachment. *J. Pediatr. Health Care* 13(suppl.):S4–S6 (May/June) 1999.
17. Patterson, D. L. Adolescent mothering: child-grandmother attachment. *J. Pediatr. Nurs.* 12(4):228–235 (August) 1997.
18. American Academy of Pediatrics Task Force on Infant Sleep Position and Sudden Infant Death Syndrome. Changing concepts of sudden infant death syndrome: implications for infant sleeping environment and sleep position. *Pediatrics* 105(3):650–656 (March) 2000.
19. Mitchell, E. A., Tuohy, P. G., Brunt, J. M., et al. Risk factors for sudden infant death syndrome following the prevention campaign in New Zealand: a prospective study. *Pediatrics* 100(5):835–839 (November) 1997.
20. Jantz, J. W., Blosser, C. D., and Fruechting, L. A. A motor milestone change noted with a

change in sleep position. *Arch. Pediatr. Adolesc. Med.* 151(6):565–568 (June) 1997.

21. American Academy of Pediatrics. Report of the task force on circumcision. *Pediatrics* 84(2):388, 1989.

22. American Academy of Pediatrics Task Force on Circumcision. Circumcision policy statement (RE9850). *Pediatrics* 103(3):686–693, 1999.

23. Alkalay, A. L., and Sola, A. Analgesia and local anesthesia for non-ritual circumcision in stable healthy newborns. *Neonatal Intensive Care* 13(2):19–22 (March/April) 2000.

24. Gelbaum, I. Circumcision: to educate, not indoctrinate—a mandate for certified nurse-midwives. *J. Nurse-Midwifery* 37(2):97S, 1992.

25. American Academy of Pediatrics Committee on Nutrition. Iron fortification of infant formulas (RE9865). *Pediatrics* 104(1):119–123 (July) 1999.

26. Liptak, G. Diaper rash. In Hoekelman, R.A., et al., *Primary Pediatric Care*, 4th ed. St. Louis, MO: Mosby, 2001, pp. 1457–1461.

27. Rigato, H. Control of breathing in fetal life and onset and control of breathing in the newborn. In Polin, R. A., and Fox, W. W. (Eds.) *Fetal and Neonatal Physiology*, 2nd ed. Philadelphia, PA: W. B. Saunders, 1998.

28. Taubman, B. A new answer to the old question of colic. *Contemp. Pediatr.* 44:63 (November) 1991.

29. Cervisi, J., Chapman, M., Niklas, B., and Yamaoka, C. Office management of the infant with colic. *J. Pediatr. Health Care* 5:184, 1991.

30. Reijneveld, S. A., Brugman, E., and Hirasing, R. A. Excessive infant crying: the impact of varying definitions. *Pediatrics* 108(4):893–897 (October) 2001.

31. Racine, A. Failure to thrive. In Hoekelman, R. A., et al., *Primary Pediatric Care*, 4th ed. St. Louis, MO: Mosby, 2001, pp. 1072–1078.

32. Ogden, C. L., Kuczmarski, R. J., Flegal, K. M., et al. Centers for Disease Control and Prevention 2000 Growth Chart for the United States: improvements to the 1977 National Center for Health Statistics version. *Pediatrics* 109(1):45–60 (January) 2002.

33. Linn, S., Schoenbaum, S. C., and Monson, R. Epidemiology of neonatal hyperbilirubinemia. *Pediatrics* 75:770, 1985.

34. Gale, R., Seidman, D. S., and Stevenson, D. K. Hyperbilirubinemia and early discharge. *J. Perinatol.* 21:40–43, 2001.

35. Johnson, L., and Bhutani, V. K. Guidelines for management of the jaundiced term and near-term infant. *Clin. Perinatol.* 25(3):555–571 (September) 1998.

36. Respironics. Product case study: Solution for JCAHO recommendation. Testing newborns for neonatal jaundice. *Neonatal Intensive Care* 14(7):66 (November/December) 2001.

37. American Academy of Pediatrics Provisional Committee for Quality Improvement and Subcommittee on Hyperbilirubinemia. Practice guideline: management of hyperbilirubinemia in the healthy term newborn. *Pediatrics* 94(4) (October) 1994.

38. American Academy of Pediatrics, Committee on Fetus and Newborn. Home phototherapy. *Pediatrics* 94(1):558, 1994.

39. Hannon, P., Willis, S., Scrimshaw, S. Persistence of maternal concerns surrounding neonatal jaundice: an exploratory study. *Arch. Pediatr. Adolesc. Med.* 155(12):1357–1363 (December) 2001.

CHAPTER

41

Recognition and Immediate Care of Sick Newborns

MARY KATHLEEN MCHUGH, CNM, MSN

The Midwife's Roles and Responsibilities

Occasionally the midwife is confronted with a newborn who exhibits signs and symptoms that may indicate a deviation from health. The role of the midwife includes recognition of abnormal signs and symptoms, provision of adequate supportive care, and parent education. The midwife's early recognition and referral will be of key importance in the newborn's recovery. The role of the midwife is limited but critical, consisting of either independent management or transfer to pediatric care. Midwives do not co-manage the care of sick newborns. Midwifery management roles are defined in Chapter 2.

In order to be effective in verifying the normality of the newborn and consulting on abnormal findings, the midwife must be willing to accept the inevitable fact that not all newborns are healthy and normal. Faced with signs and symptoms that are abnormal, the midwife follows the steps of the management process related to data collection. The midwife also initiates a consultation with the pediatric team. As discussed in Chapter 38, each midwife establishes a relationship with pediatric providers who provide consultation and accept transfers. On occasion, the midwife may need to start basic supportive care while awaiting a transport team from the pediatric facility.

This chapter is meant to supplement texts on pediatric medicine and will focus on recognition of possible illness and the appropriate midwifery response. It will not provide an exhaustive description of the pathophysiology or treatment of newborn illnesses or deviations.

Frequently the midwife will be in the position of having to explain to worried parents that a certain sign or symptom is abnormal. This chapter will help support those explanations and guide the midwife in educating the parents of a newborn with abnormal signs and symptoms.

This chapter is organized around signs and symptoms that may indicate newborn illness. Symptoms consist of subjective evidence of illness perceived by the patient or, in the case of a newborn, interpreted by the parent. One of the particular challenges in providing care to the newborn is the interpretation and validation of a parent's reports of symptoms—subjective information. Signs of illness include objective evidence perceptible to the midwife during the physical exam of the newborn. Signs and symptoms can be corroborated by additional data gathered by the caregiver, such as laboratory results, vital signs, imaging studies, ultrasounds, etc. Final diagnosis will be based on the signs, symptoms, and additional data and will usually be made by the pediatric team.

The chapter also discusses baseline validating data and describes midwifery management plans for certain newborn situations. It is important to emphasize that the midwife's involvement will continue only until the newborn can be transferred into the care of the pediatric team. Thus, the management plans outlined here will emphasize stabilization and transfer of the newborn.

The Sick Newborn

Overlapping Signs and Symptoms

One of the great challenges facing the midwife caring for newborns is the nonspecificity of certain signs and symptoms in the newborn. It is critically important for the midwife to realize that some of the most common abnormal signs can represent a variety of illnesses or conditions. In particular, respiratory signs can denote many different types of illnesses that are nonrespiratory in nature. Differential diagnoses of common abnormal physical signs are outlined in Table 41-1. Because of the nonspecific nature of some of these signs and symptoms, the midwife must perform a careful history and physical exam (including vital signs) in order to gather the maximum amount of data to report to pediatric caregivers.

Signs of Respiratory Disease

Respiratory signs are the most common abnormal finding in newborns (Table 41-2). The cardinal signs of respiratory compromise include tachypnea (more than 60 respirations per minute), nasal flaring, and retractions of the intercostal muscles located between the ribs. In severe cases of respiratory compromise there will be retraction of the sternum. If the lungs are wet, rales and rhonchi may be heard with auscultation of the lungs. If air is trapped within the lung, audible grunting is heard. The level of cyanosis noted will depend on the degree of hypoxia, although the visibility of cyanosis will be decreased by hypovolemic states.

There are many pulmonary and nonpulmonary causes of respiratory compromise in the newborn (see Figure 41-1). They include sepsis and congenital anomalies that cause upper or lower airway obstruction or pulmonary obstruction. In preterm infants respiratory distress syndrome (RDS) is caused by the absence or deficiency of surfactant. Midwives are most likely to deliver term infants; the most common pulmonary causes of term neonatal respiratory distress are pneumothorax, aspiration of meconium, neonatal pneumonia, and transient tachypnea of the newborn.

TABLE 41-1 Nonspecific Signs of Illness in the Newborn

Abnormal Physical Sign	Possible Etiology
Tachycardia (heart rate greater than 170 beats/min)	Overheating Infection Anemia Shock Cardiac defect
Tachypnea (respirations greater than 60/min after transition)	Overheating Pulmonary disease Metabolic acidosis Cardiac disease Congenital defects of ribs, airway, lungs
Pallor	Cold stress Shock Anemia
Jaundice	Infection (prenatal or postnatal) Hemolytic disease Congenital defects of liver, biliary tract Abdominal obstruction
Abnormal cry	Central nervous system abnormalities Congenital defects of upper airway
Jitteriness	Hypoglycemia Hypocalcemia Drug withdrawal Normal variation
Feeding difficulties	Neuromuscular problems Infection Cardiac disease Respiratory disease Drug withdrawal

TABLE 41-2	Signs of Respiratory Compromise
Visible Signs	**Audible Signs**
More than 60 respirations/min	Rales or rhonchi heard on auscultation
Cyanosis around face and trunk	Stridor heard with inspiration
Nasal flaring	Grunting heard upon expiration
Retractions of the intercostal muscles	
Retractions of the sternum	
Apnea	

A pneumothorax occurs whenever air from the lung is pushed outward from the alveoli into an atypical place, usually the tissue of the interstitial space of the lung. The alveoli rupture as a result of overdistention. Although newborns who are mechanically ventilated are at high risk for pneumothorax, many spontaneous pneumothoraxes occur without an obvious antecedent event. Some pneumothoraxes are so small that there are few if any symptoms. With a larger pneumothorax, the midwife will note the signs of diminished breath sounds on one side, cyanosis, and perhaps overdistention of the chest on the affected side. A large pneumothorax can be a true emergency. The responsibilities of the midwife include emergent referral to a pediatric team and supportive respiratory care.

Meconium aspiration can lead to a serious chain of events in which the chemical inflammation and the obstruction from meconium particles lead to pneumonitis, air trapping, hypoxia, air leaks, persistent fetal circulation, respiratory failure, and persistent pulmonary hypertension. These term newborns will rapidly decompensate in the first hours after birth and may need support from a respirator and occasionally ECMO (extracorporeal membrane oxygenation), a type of heart-lung bypass [1]. Signs of meconium aspiration syndrome include uneven breath sounds, a barrel-chested appearance, rales and rhonchi, and cyanosis.

Pneumonia may be acquired in the intrauterine period or during the passage through the birth canal. Symptoms of pneumonia include the respiratory signs noted above plus hypothermia, color changes, and apnea. Infections can be caused by bacteria, viruses, or other organisms (chlamydia, fungi, and mycoplasma) and may vary in intensity.

A more benign condition is transient tachypnea of the newborn (TTN). In transient tachypnea,

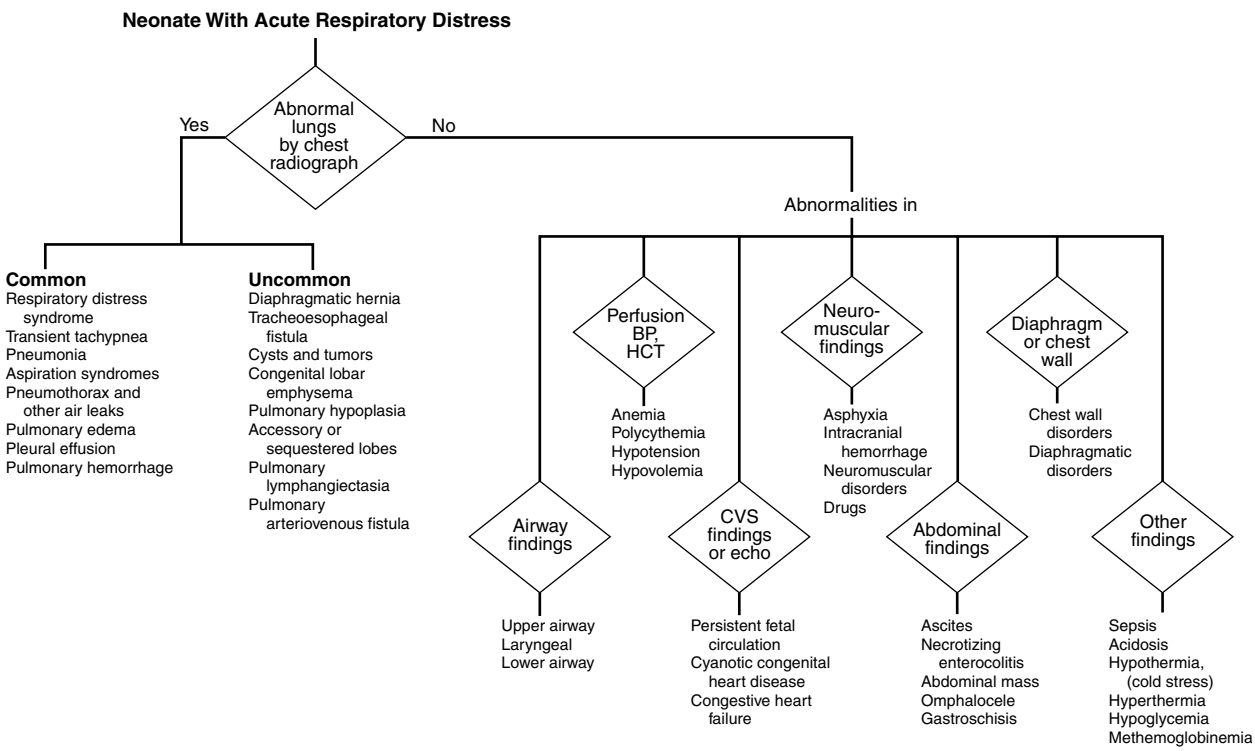


FIGURE 41-1 Neonate with acute respiratory distress.

Source: Reprinted from Kenner, C., Lott, J. W., and Flandermeyer, A. A., *Comprehensive Neonatal Nursing: A Physiologic Perspective*, 2nd ed., 258, © 1998 Elsevier Inc., with permission from Elsevier.

there is inadequate absorption of lung fluid after the birth. Newborns with TTN take longer than most newborns to make a transition from fluid-filled to air-filled lungs. Newborns born by cesarean section, especially elective surgery, are at particular risk for TTN. This is probably because of the lack of lung stimulation from prostaglandins during labor [2]. The principal signs of TTN include tachypnea, rales or rhonchi on auscultation, and sometimes nasal flaring or intercostal retractions. Transient tachypnea lasts only 48 to 72 hours. However, during that period the newborn may need assistance with feedings and extra oxygen.

The Midwife's Involvement The midwife caring for a newborn with signs of respiratory distress provides supportive care while awaiting the pediatric team. Central cyanosis (of the trunk, lips, tongue, and oral mucous membranes) is a sign of serious compromise of the neonate's hemoglobin oxygen saturation. Care includes delivery of oxygen via hood (starting at 40 percent) to relieve cyanosis and to help decrease the work of obtaining oxygen. If cyanosis is not rapidly relieved, the midwife should increase the percentage of oxygen delivered. The midwife should carefully review the mother's prenatal, intrapartum, and postpartum history for evidence of infections.

The newborn should be continuously monitored for heart rate and respiratory rate. If possible, blood pressure is checked. Temperature is monitored and oral feedings are withheld because of the risk of aspiration and the extra oxygen demands of feeding. In a remote site the midwife may be asked to obtain a chest x-ray, CBC with differential, and a blood sugar while awaiting the pediatric team.

The midwife practicing far from a pediatric inpatient facility should become familiar with techniques for starting a peripheral intravenous line in the neonate (see Figure 41-2). If the neonate's condition deteriorates, it will be more difficult to find a vein. Therefore, if there will be any delay in transferring the neonate, the intravenous line should be started.

Oxygen levels can be assessed with capillary blood obtained from a heel stick but this is frequently inaccurate, especially in a poorly perfused neonate. Most hospitals will have equipment available to monitor blood gas tensions noninvasively. There are two primary methods: transcutaneous measurement of partial pressure of oxygen and continuous pulse oximetry. In continuous pulse oxime-

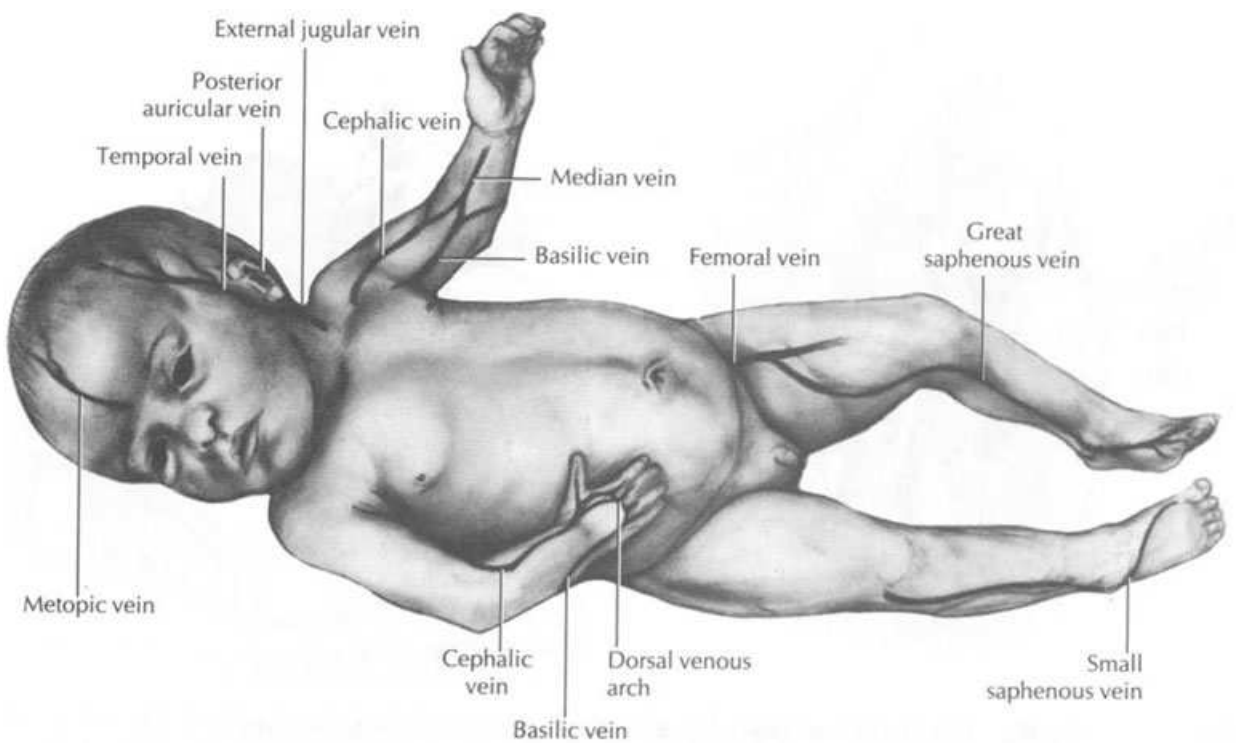


FIGURE 41-2 Techniques for starting a peripheral intravenous line in the neonate.
Source: Hoekelman, R. A., Adam, H. M., Nelson, N. M., et al. *Primary Pediatric Care*, 4th ed. St. Louis, MO: Mosby, 2001, p. 2077.

try a small probe is attached to one of the neonate's fingers or toes. This method computes arterial oxygen saturation (SaO_2), with an acceptable level being 92 to 95 percent [2]. The use of continuous pulse oximetry is growing in popularity because, unlike transcutaneous monitoring of the partial pressure of oxygen, the continuous pulse technology does not need calibration, cannot cause skin damage from heat, does not need frequent position changes, and is accurate even in the presence of edema [3]. The midwife should become familiar with the type of equipment present in the practice environment.

Signs of Possible Infection

Congenital Viral and Parasitic Infections

The newborn who has acquired an intrauterine viral infection will present with signs that may include early jaundice, hepatosplenomegaly, petechiae, and palpable lymph nodes, and be small size for dates. Depending on the virus, there may also be cataracts, limb or cardiac defects, microcephaly, rash, or vesicles. Thrombocytopenia may be present on a complete blood count (CBC). The visible effects of infection will vary according to the severity of infection and the timing of fetal exposure. Newborns who acquire infection during labor will not have the same signs at birth as the fetus infected transplacentally.

Midwifery actions may include the isolation of the newborn from other newborns and pregnant health care workers until the virus is identified. Cord blood should be saved for further testing. The presence of IgM antibodies in the cord blood will help to confirm a suspected viral infection.

Bacterial Infections

Bacterial infections in the newborn are commonly caused by *Group B beta-hemolytic Streptococci* or *E. coli*. Bacteria can be acquired in utero or during the birth process. Other infections are caused by *Staphylococcus aureus* and *Staphylococcus epidermidis* acquired in the hospital. Many infants who are colonized with bacteria from the mother do not become ill. Those who do become ill warrant immediate attention.

If a mother has antenatal or intrapartal risk factors for early onset Group B Streptococcal disease, the currently accepted algorithm is to treat in labor with penicillin: two doses 4 hours apart. Some women will give birth prior to receipt of the two doses. In this situation the Centers for Disease Control recommends the following for newborns of greater than 35 weeks' gestation: CBC with differential, blood culture, and chest x-ray (for any pulmonary symptoms) [4].

Early onset bacterial infection (birth to 6 days) can be severe and life threatening. Respiratory distress is common and signs may include tachypnea, labored breathing (nasal flaring and intercostal retractions), and poor color. There may be apneic episodes. Vital signs may indicate temperature instability (fever or hypothermia) and hypotension. The newborn will often not feed well.

Midwifery actions include immediate consultation and provision of a supportive environment. The newborn is continuously monitored for respiratory rate and heart rate. If possible in the site, check the newborn's blood pressure and conduct noninvasive oxygen monitoring. Warm, humidified oxygen is administered via hood at 40 percent or greater. These newborns should not be fed orally because of the risk of aspiration. In a remote setting, the midwife may be asked to obtain a chest x-ray, CBC, blood sugar, and cultures of the blood and urine. Intravenous access should be established.

Signs of late-onset bacterial infection (7 days to 3 months) will become evident after the newborn has been discharged home. These signs include problems with feeding such as a disinterested suck, lethargy, color changes, occasional apnea, and temperature lability.

The most important action the midwife can take with late onset bacterial infection is to acknowledge that there is a problem. This is a particular challenge if the symptoms are being reported by telephone. Denial or "wish management" may lead the midwife to give false reassurance to the parents with potentially serious sequelae for the untreated newborn. These newborns will need treatment as in-patients.

Acquired Immunodeficiency Syndrome

A newborn can be infected with HIV transplacentally, during the birth process and after the birth. As discussed earlier, all pregnant women should be encouraged to be tested for HIV during pregnancy so aggressive antiretroviral therapy can be started during gestation and continued after birth for a number of weeks. Testing for HIV in the newborn needs to be repeated at least three times, up to 15 months of age. By then maternal antibodies are no longer present.

At birth, the HIV-infected neonate will not have any specific signs of illness. If the mother is found to be HIV positive during her intrapartum stay, the newborn can be treated with postexposure prophylaxis. Newborns of HIV-infected women should not be breastfed. Overall transmission of HIV from infected mother to a breastfed child can be as high as 25 percent, a rate recently confirmed with a multicenter meta-analysis [5].

Signs of Possible Heart Disease

Cardiac problems in newborns result from a variety of causes. They mimic a number of other problems, especially respiratory disease and sepsis. Some newborns will quickly demonstrate signs of an underlying congenital defect. These are usually structural in nature and may affect the heart itself or major vessels leading to and from the heart. The primary signs of heart disease include central cyanosis and/or tachypnea and/or pallor. Depending on the defect, pulses may be bounding or diminished. Pulses can vary in intensity from upper to lower extremities. Depending on the defect, a loud murmur may be present at birth or may not be heard for 1 to 2 weeks after birth. The cyanosis of heart disease is seen over the entire body, and this differentiates it from the peripheral cyanosis of normal newborns.

The most common heart defect in newborns is a ventricular septal defect, accounting for 30 to 50 percent of defects in various populations. If large enough, the defect involves left to right shunting whereby oxygenated blood crosses over the opening in the septum and recirculates through the lungs. Therefore this is not a cyanotic defect. The murmur may not be heard until two or more weeks of age as the compensatory measure of increased pulmonary vascular resistance diminishes and more blood flows from left to right. This is characteristic of a large defect and may be associated with a subtle onset of congestive heart failure evidenced by tachypnea, feeding problems, and failure to thrive. The midwife may elicit troubling symptoms during a postpartum visit with the mother or during calls about breastfeeding problems. In the smaller ventricular septal defects the systolic murmur is heard soon after birth but will not lead to congestive heart failure.

Some newborns will not make the transition from intrauterine to extrauterine circulation. In some infants, the pulmonary resistance remains so high that blood flow through the newborn lungs is decreased. This results in persistent pulmonary hypertension (formerly called persistent fetal circulation). Frequently, these are newborns who experienced significant asphyxia in utero (see Chapter 36). Signs include tachypnea, nasal flaring, and intercostal retractions. Because of the high level of resistance from the lungs, the ductus arteriosus and the foramen ovale may stay open to provide right-to-left shunting. In this case, peripheral pulses will be bounding, the precordium will be active, and a murmur will be heard.

Midwifery management of newborns with acute signs of heart disease includes immediate consultation with the pediatric team and supportive care for the resulting respiratory distress. The newborn is constantly monitored for heart rate and respiratory rate. If possible in the site, the newborn's blood pressure is checked and pulse oximetry is performed. If heart disease is suspected the blood arterial oxygen saturation of an upper extremity can be compared to a lower extremity. In persistent pulmonary hypertension the saturation is lower in the descending aorta [6]. Warm, humidified oxygen is provided via hood at high concentrations. When there is a cardiac problem even high concentrations of oxygen may not yield normal results. If the newborn is tachypneic, oral feedings are withheld. The metabolic demands of respiratory distress will predispose the newborn to hypoglycemia. Peripheral blood samples for glucose are obtained regularly, and an intravenous line should be placed.

Signs of Birth Injuries

Most birth injuries occur during a long, protracted labor or a difficult birth. Birth injuries may occur in situations in which the fetus is large or the fetal presentation or position is abnormal. However, there are cases in which injury occurs in utero.

Cephalhematomas and Skull Fractures

Injuries to the head include cephalhematomas and skull fractures. A cephalhematoma is a collection of blood under the periosteum. Cephalhematomas may be singular or bilateral. The blood does not cross the suture lines of the newborn skull, because the bleeding is under the periosteum. Cephalhematomas may cause tenderness. Some cephalhematomas occur with linear skull fractures, most of which heal well. A clear sign of a skull fracture is a depressed area of fetal skull, particularly over the parietal bones. An

area of skull depression increases the possibility that fragments of skull bone have penetrated through the dura, the covering of the brain. Midwifery care includes careful positioning of the newborn on the side opposite the affected area and consultation with the pediatric team, who will order imaging tests.

Facial Palsy and Brachial Plexus Injuries

Injuries to the face include bruising from forceps or facial palsy caused by either forceps or pressure from the maternal sacrum. The signs of facial palsy include asymmetry of the face. One eye may remain open. Midwifery actions may include consultation for the use of an eye patch and lubricating eye drops. The paralysis is temporary.

Injuries to the brachial plexus may occur prenatally or during a birth when traction is applied to the neck. Such injuries can occur during breech births or births involving shoulder dystocia. The newborn with a brachial plexus injury may be fussy and in pain. The manifestations of the injury will depend on the nerve root that was injured and the degree of the injury. Nerve roots involved can include the cervical roots C5 and C6 (Erb-Duchenne paralysis), roots C8 and T1 (Klumpke's paralysis), or both. The physical signs of Erb-Duchenne paralysis include a generalized loss of movement in the affected arm with an adduction of the lower part of the arm. This leads to the characteristic "waiter's tip" sign involving an internal rotation of the lower portion of the arm with the finger and wrist flexed. The grasp reflex is intact but the Moro reflex is weak on the affected side. In Klumpke's paralysis the grasp reflex is absent and the infant's hand is kept in a clawlike posture.

Midwifery management will include referral for splinting of the affected arm close to the body and consultation with the pediatric team. Parents should be encouraged to handle the affected extremity as little as possible for the first week because of the pain involved. Parents can be reassured that in the vast majority of cases paralysis disappears in 3 to 6 months, with initial improvement evident within a few weeks. Physical therapy is helpful after the first swelling subsides.

Injuries to nerve roots higher in the brachial plexus (C3-C5) can lead to signs of significant respiratory compromise because of paralysis of the phrenic nerve and diaphragmatic compromise. Newborns with this type of nerve injury take very shallow breaths with limited respiratory excursion and need aggressive respiratory support at birth.

Bone Fractures

Pressure and manipulation during the birth process may lead to fractures of bones. Occasionally there are intrauterine fractures. The bones most frequently affected include the clavicles, the arms, and the legs. Signs of bone fracture include swelling, skin discoloration, lack of movement, abnormal positioning, and pain with movement. Crepitus can sometimes be elicited on palpation. The Moro reflex will be asymmetric.

Midwifery management includes splinting of the arm if a clavicular or arm fracture is suspected; obtain pediatric consultation. Parents can be assured that newborn bones heal well and quickly.

Signs of Neurological Disease

The most common sign of neurological compromise in the newborn period is seizure activity. The most frequent reason for seizures in the neonatal period is hypoxic-ischemic encephalopathy (HIE). The newborn who experienced distress in labor may have the cluster of criteria for the diagnosis of perinatal asphyxia: (1) cord blood pH <7.1, (2) Apgar score of 0–3, (3) seizures, and (4) multiple organ system dysfunction in the early neonatal period [7].

Other reasons for neonatal seizures include metabolic disturbances such as hypoglycemia or hypocalcemia, and infection. In the older newborn, seizures can be an indicator of an inborn error of metabolism.

Newborns may evidence various types of seizure activity. The most common is the subtle seizure. Signs of subtle seizures include sucking motions, chewing, bicycling of limbs, drooling, apnea, deviation of the eyes, and eyelid fluttering. These seizures are evidenced as short, repetitive bursts of activity. The midwife will notice these repetitive behavioral patterns during a careful newborn exam.

Other types of seizures (multifocal, focal) are less common in newborns. The signs of these seizures include movement of one limb with progression to other limbs or movement of both limbs on one side of the body.

Because of the risk of apnea, the newborn with possible seizure activity is moved to the nursery for more intensive observation, including monitoring of heart rate and respiratory rate, until the pediatric team arrives. The midwife orders a peripheral glucose sample because of the association between hypoglycemia and seizure activity.

Signs of Surgical Emergencies

There are numerous types of congenital defects that are corrected by surgery on the newborn. The possibilities include both defects that are immediately visible and defects that are hidden from view. These will be discussed separately.

Visible Congenital Defects

Certain types of congenital defects cause quick deterioration in the newborn and may lead to significant morbidity and mortality if not properly managed. Of these, abdominal wall defects and spinal cord defects pose particular challenges. Abdominal wall defects are subdivided into gastroschisis and oomphalocele. Gastroschisis is a condition in which the eviscerated abdominal organs are not covered by a sac. In an oomphalocele, the abdominal organs are external but are covered by a sac. In both cases the potential is great for hypothermia and dehydration because of the large surface area that is exposed. Infection is highly likely.

Midwifery management includes an immediate call for pediatric assistance and transport to a tertiary pediatric hospital. The newborn is placed in a radiant warmer in as sterile an environment as possible. Sterile, warmed saline is applied to the eviscerated abdominal contents via sterile gauze pads [8, 9]. The infant's torso is then wrapped in sterile gauze to keep the saline in place. No feedings are given; a feeding tube is inserted and any stomach contents are aspirated. The neonate has an acute need for intravenous fluids.

Newborns with open spinal cord defects pose similar problems. The two common neural tube defects are meningocele and meningomyelocele. Meningocele is a bony defect of the spinal cord. With meningomyelocele, the vertebra is defective and the spinal cord and spinal roots are externally located in a sac. Meningomyeloceles are commonly found in the lower spine, lumbar, and sacral areas.

The principles for treatment of spinal cord defects are similar to those described for abdominal wall defects: application of a sterile, warm saline dressing with a dry sterile overwrap, thermoregulation, and fluid maintenance. In addition, the infant is positioned prone and fecal contamination is scrupulously avoided [9].

Nonvisible Congenital Defects

Tracheo-esophageal fistula and esophageal atresia are not visible on physical exam. However, signs of excess salivation, respiratory distress, swallowing problems, and abdominal distention will be present. The midwife will be unable to pass a sterile feeding tube more than 10 centimeters.

Midwifery management includes positioning the newborn in a prone position with the head elevated. No oral feedings are given. Aspiration of the esophageal contents by feeding tube attached to a syringe helps to minimize the chance of aspiration into the lungs.

Diaphragmatic hernias are surgical emergencies in the newborn because of the herniation of abdominal contents into the chest cavity. These hernias are usually unilateral on the left. The degree of respiratory distress is directly related to the amount of lung tissue that has been compromised. In some newborns, the herniation is so severe that there has been practically no lung growth on the affected side. The signs of diaphragmatic hernia include decreased left-sided breath sounds, heart sounds on the right, and severe respiratory distress at birth secondary to persistent pulmonary hypertension. Depending on the degree of the defect, the abdominal contents may be in the chest cavity, which causes a concave (scaphoid) abdominal contour.

Midwifery management is emergent and includes endotracheal intubation in the birth room. Use of bag and mask ventilation will only worsen the situation. A feeding tube, preferably attached to low suction, should be passed and taped in place to vent the stomach of air [10]. The pediatric team should be requested immediately.

A variety of congenital defects can lead to intestinal obstruction in the newborn [8, 9]. Among these are malrotation and mid-gut volvulus, meconium plugs, meconium ileus, Hirschsprung's disease, and imperforate anus. With all of these defects, the major diagnostic signs are bile-stained emesis and failure to pass stool. Significant abdominal distention will be present with meconium ileus, meconium plug, and Hirschsprung's disease.

The midwife may receive reports of these symptoms during a home visit or a postpartum phone call. Newborns with these signs should be evaluated immediately by a pediatric caregiver. No oral feedings should be given if there is bile-stained emesis. If neglected, all of these defects can lead to intestinal perforation.

Signs of Drug Exposure in the Newborn

The term drug exposure, when used in reference to a newborn, covers a wide variety of substances and situations, ranging from the most casual exposure to daily, repetitive in-utero exposure. Many at-

tempts have been made to quantify the effects of substance exposure on the fetus and newborn. Most of these studies have had equivocal results or results that were contradicted by other studies.

A large part of the problem in the study of substance exposed fetuses and newborns stems from the reality that few women use only one substance while they are pregnant. Most women are polydrug users, combining various substances in various doses [11]. Also, many substance-using women combine their substance use with other lifestyle patterns that can cause fetal compromise. Factors such as poor nutrition, lack of prenatal care, lack of vitamin supplementation, chronic stress, and environmental exposure to teratogens all affect the fetus.

There are four signs that the newborn may have been significantly exposed to a drug during pregnancy: (1) low term birth weight, (2) dysmorphic physical characteristics, (3) neonatal irritability, and (4) neonatal withdrawal symptoms (see Table 41-3).

TABLE 41-3 Common Symptoms of Withdrawal

Symptoms	**Drugs**						
Physiologic	Heroin	Methadone	Alcohol	Cocaine	Marijuana	PCP	Barbituates
Sneezing	X	X	—	—	—	X	—
Stuffy nose	X	X	—	—	—	—	—
Spitting/drooling	—	X	—	—	—	—	—
Diarrhea	X	X	—	—	—	X	—
Vomiting	X	X	X	—	—	X	—
Poor feeding	X	X	X	X	—	X	—
Sweating	X	X	—	—	—	—	—
Tachycardia	—	—	—	—	—	—	—
Tachypnea	X	X	X	—	—	—	—
Dehydration	X	X	—	—	—	—	—
Mottling	X	X	—	—	—	—	—
Fever	X	X	—	—	—	—	—
Excoriation	X	X	—	—	—	—	—
Neurobehavioral							
Fist sucking	X	X	—	—	—	X	—
Irritability	X	X	X	—	X	—	X
Restlessness	X	X	X	—	—	—	X
Tremor	X	X	X	—	X	—	X
High-pitched cry	X	X	X	—	—	—	—
Seizures	—	X	—	—	—	—	—
Yawning	X	X	—	—	—	—	—
Disturbed sleep	X	X	X	—	X	—	X
Increased crying	—	X	X	—	—	X	X
Convulsions	X	X	—	—	—	—	—
Hypertonicity	X	X	X	—	—	—	X
Drowsiness	—	—	—	X	—	—	—
Increased sleep	—	—	—	X	—	—	—
Hyperactive moro	X	X	—	—	—	—	—
Increased muscle tone	X	X	—	—	—	—	—
Increased wakefulness	X	X	—	—	—	—	—
IVH	X	X	—	—	—	—	—
Uncoordinated and constant suck	X	X	—	—	—	—	—

Source: From D'Apolito, K., and Hepworth, J. T. Prominence of withdrawal symptoms in polydrug-exposed infants. *J. Perinat. Neonatal Nurs.* 14(4):49, 2001. Reprinted by permission.

Neonatal withdrawal covers a wide spectrum of physiological and neurobehavioral symptoms. The most predictable symptoms occur in the neonate exposed to heroin or methadone.

Newborns who have been exposed to nicotine during the fetal period may be of low birth weight. This results from the effects of both carbon monoxide (leading to relative fetal hypoxia) and nicotine (leading to placental vasoconstriction). The effect on the fetus is dose-related and can be reversed if the mother stops smoking during pregnancy.

Newborns born to alcohol-abusing mothers can suffer serious and permanent damage. Because ethanol readily crosses the placenta, the amount of fetal exposure is high. Damage is on a continuum, and two terms are used to describe the damage: fetal alcohol syndrome (FAS) and fetal alcohol effect (FAE). Newborns exhibiting signs of FAS will have both physical and cognitive damage. Physical damage includes dysmorphic features that are congruent with a midline defect, which occurs early in fetal life. The manifestations of FAE are more subtle and will become obvious when the child is older and has trouble with school or socialization.

The dysmorphic features of the newborn with FAS are primarily facial and include narrow forehead, flat midface, low nasal bridge, short nose, thin upper lip with indistinct philtrum (indentation between top lip and nose), epicanthal folds, and micrognathia. Other signs include palmar creases and low birth weight. These newborns may exhibit behavioral signs including irritability, poor feeding, tremors, and hypersensitivity to stimuli.

The signs of FAS may or may not be obvious during the newborn period. Damage varies with timing and dose of exposure. The midwife who notices physical or behavioral signs that are possibly indicative of FAS should discuss the situation with the pediatric team. These newborns need careful follow-up for failure to thrive. Their behavioral characteristics may make them difficult babies and thus vulnerable to abuse by the mother or other caregivers.

Maternal use of cocaine has been suspected as a cause of many fetal problems, most of them related to the intense vasoconstrictive properties of cocaine, which lead to placental and cord accidents. The known effects of cocaine exposure include behavioral problems related to central nervous system irritability [11]. Cocaine-exposed newborns may be irritable, tremulous, and hard to comfort. They may favor a rigid, hyperextended posture. In short, they will be high-strung newborns who may be difficult to mother. The manifestations of cocaine exposure are related to the amount, duration, and timing of fetal exposure. Third trimester use is more likely to result in residual behavioral effects.

The use of heroin in pregnancy is associated with a clear pattern of neonatal withdrawal called neonatal abstinence syndrome. Heroin is a derivative of morphine, which is extracted from the opium poppy. This opiate is very addictive, and the lives of many pregnant heroin users revolve entirely around finding their next high. Thus fetal exposure to heroin tends to be regular and in increasing doses. The fetus becomes addicted in utero and shows evidence of severe intrauterine withdrawal symptoms if the mother stops using the drug during pregnancy. Rather than stopping use during pregnancy, women are urged to join methadone programs that provide uniform, regular doses of methadone and supportive health care services.

At birth, most newborns born to heroin-addicted women exhibit withdrawal symptoms [12]. These start in the first few days after birth and can persist for many weeks. Because heroin use is often intravenous, these newborns are also at high risk of infection with the hepatitis and HIV viruses.

The symptoms of neonatal abstinence syndrome are multiple and involve many neonatal systems. They include central nervous system irritability, tremors, excess hunger and salivation, sweating, yawning, sneezing, fist sucking, and temperature regulation problems. Some infants progress to seizures and profuse vomiting and diarrhea. These newborns need to be managed by the pediatric team during an in-patient stay. Some management considerations include providing a quiet, nonstimulating environment, a possible increased need for calories and fluids, and potential need for pharmacotherapy to control symptoms [12].

The Midwife's Involvement

A midwife who suspects that a neonate has been drug-exposed should order a urine or blood toxicology screen on both newborn and mother. Some laboratories can also do toxicology screens on newborn hair or meconium. Meconium testing is particularly attractive because of the ease of specimen collection from the diaper. If the sample is frozen, the drugs are stable in the meconium for up to 9 months [13]. The results of the screen will help to guide pediatric management. In some states and localities, a positive toxicology screen must be reported to child welfare officials.

The midwife working with a substance-using woman and her newborn faces a particular challenge. The midwife has to sensitize the new mother to the special needs of her substance-exposed new-

born. Yet being labeled as a drug user may cause the mother to avoid further contact with health care providers. The midwife needs to adopt a nonjudgmental approach as she discusses the substance use with the new mother. The following are of particular concern to the midwife:

1. Does the level of substance use impair the mother's ability to care for the baby?
2. What is the pattern of substance use? Daily, or only on weekends? At home or elsewhere?
3. Are there other responsible adults in the extended family who can become involved in care of the newborn?
4. Is the mother receptive to learning about the special needs of her newborn?

The midwife should help the mother understand that the central nervous system irritability of newborns caused by alcohol, cocaine, and heroin will eventually pass. In this situation a visit from a community health nurse after discharge can be very helpful [14]. These newborns need an environment that is not too stimulating. The mother should be taught the swaddling and calming techniques that were outlined in Chapter 40, page 1025. The midwife has a particular obligation to help the mother identify resources she can rely on if the newborn's fussiness starts to wear on her. If she feels her anger building, the mother should be urged to call the midwifery practice, the pediatric practice, or a hotline number before the newborn is abused.

The midwife should discuss with the mother her readiness to accept treatment. If the mother is not ready, the midwife should encourage her to think about change in the future. The mother should be urged to use adequate contraception.

Infants of Diabetic Mothers

Infants of diabetic mothers (IDM) are at risk for birth injuries and for hypoglycemia. The hypoglycemia results from a hyperinsulinemia characterized by accelerated use of exogenous glucose and diminished endogenous glucose production [15]. This disorder is temporary in the newborn and is lessened if the mother had good diabetic control during pregnancy. These infants may be macrosomic or growth restricted, depending on the severity of the diabetes. For women who were diabetic prior to pregnancy, the infants are at increased risk for cardiac and skeletal birth defects.

Many pregnant women are routinely screened for diabetes as part of their prenatal care. Unfortunately, some women receive inadequate prenatal care and their gestational diabetes is undiagnosed when they present in labor. The midwife looks for the following signs that may indicate an IDM: birth weight greater than 4.0 kilograms, tremors, early jaundice, or unexplained respiratory distress. Lab tests may reveal polycythemia (hematocrit greater than 65 percent).

Newborns who may be IDM need to be carefully screened for hypoglycemia. The midwife should screen these newborns hourly until a value of greater than 36 mg/dL (if asymptomatic) and 45 mg/dL if symptomatic has been consistently obtained for a few hours in succession [16]. Any value of 36 mg/dL or lower is immediately verified by drawing a central sample. The midwife will notify the pediatric team if there are any abnormal blood sugar levels. The pediatric team will need to order intravenous fluids containing dextrose.

Signs of Intrauterine Growth Restriction

Newborns whose weight is below the tenth percentile for gestational age are considered small for gestational age (SGA). Although some of these infants have no underlying reason for being SGA, the majority of them have some underlying cause for their intrauterine growth restriction (IUGR).

Term newborns who suffer from IUGR are subdivided into two categories. Some will show signs of symmetric growth restriction, including both reduced birth weight and reduced head circumference. The symmetrically growth-restricted newborn is affected early in gestation. Some common causes for symmetric growth restriction include chromosomal abnormalities, perinatal infections, and exposure to drugs or environmental teratogens.

Other newborns are considered to have asymmetric growth restriction. These newborns suffered compromise late in fetal life, typically in the third trimester. Asymmetric growth restriction can be caused by any condition that causes decreased placental blood flow or decreased oxygenation of the fetus. Their weight is below the tenth percentile but their head circumference is above the tenth percentile.

Besides weight and head circumference changes, newborns affected by IUGR show signs of subcutaneous tissue wasting. The midwife will be able to gather large skin folds, particularly around the shoulders and upper back. The skin is dry and there is frequently meconium present. These newborns have a characteristic overalert appearance.

Their eyes are very prominent, their skulls firm. Laboratory tests might reveal a compensatory polycythemia.

The Midwife's Involvement

A midwife who suspects that a fetus is SGA must monitor the fetus adequately during labor. These fetuses suffer an increased incidence of fetal distress. Many of them have suffered from chronic hypoxia, which can be made catastrophically worse by the normal hypoxia of labor. At birth, supportive care is given for transition to extrauterine life. The midwife should perform a quick physical examination to look for signs of congenital anomalies or active infection and complete a gestational age assessment. The midwife needs to remember that some of the physical characteristics of the Ballard Scale may be inaccurate because of the intrauterine skin changes of the IUGR newborn. The midwife should rely more heavily on the neurological components of the New Ballard Scale.

Because of the prenatal wasting, these newborns are prone to hypoglycemia and hypothermia. Their glycogen stores may be almost exhausted prior to birth. The midwife should emphasize early feedings. The midwife should screen these newborns hourly until a value of greater than 36 mg/dL (if asymptomatic) and 45 mg/dL if symptomatic has been consistently obtained for a few hours in succession [16]. Any value of 36 mg/dL or lower is immediately verified by drawing a central sample. A neutral thermal environment should be created for the newborn. Some IUGR newborns need an exogenous heat source. Others may stabilize with double wrapping in warm blankets and hats. The midwife should order frequent temperature checks.

The placenta should be saved for possible pathology examination. Cord blood should be saved for possible testing for congenital infections.

References

1. Martin, R. J., Sosenko, I., Bancalari, E. Respiratory problems. In Klaus, M., and Fanaroff, A. *Care of the High-Risk Neonate*, 5th ed. Philadelphia, PA: W.B. Saunders, 2001, p. 245.
2. Levine, E. M., Ghai, V., Barton, J. J., and Strom, C. M. Mode of delivery and risk of respiratory diseases in newborns. *Obstet. Gynecol.* 97(3):439–442 (March) 2001.
3. Cifuentes, J., Haywood, J., Ross, M., and Carlo, W. Assessment and management of respiratory dysfunction. In Kenner, C., Lott, J., and Flandermeyer, A. *Comprehensive Neonatal Nursing: A physiologic perspective*, 2nd ed. Philadelphia, PA: W.B. Saunders, 1998, p. 266.
4. Centers for Disease Control and Prevention. Prevention of perinatal Group B Streptococcal disease: a public health perspective. *MMWR* 45:1, 1996.
5. Keller, J., Lee, J., and Anderson, J. Women's health issues: news from the Fourteenth International AIDS Conference in Barcelona. *The Hopkins HIV Report*, November 2002, p. 10.
6. Brook, M., Heymann, M., and Teitel, D. The heart. In Klaus, M., and Fanaroff, A. *Care of the High-Risk Neonate*, 5th ed. Philadelphia, PA: W.B. Saunders, 2001, p. 408.
7. Flavin, N. E. Perinatal asphyxia: a clinical review, including research with brain hypothermia. *Neonatal Network* 20(3):31–40 (April) 2001.
8. Richey, D. Transporting the infant with an abdominal wall defect. *Neonatal Network* 9(2):53, 1990.
9. Shaw, N. Common surgical problems in the newborn. *J. Perinat. Neonatal Nurs.* 3(3):50–65, 1990.
10. Braby, J. Current and Emerging Treatment for Congenital Diaphragmatic Hernia. *Neonatal Network* 20(2):5–15 (March) 2001.
11. D'Apolito, K., and Hepworth, J. T. Prominence of withdrawal symptoms in polydrug-exposed infants. *J. Perinat. Neonatal Nurs.* 14(4):46–60, 2001.
12. Kandall, S. Treatment strategies for drug-exposed neonates. *Clin. Perinatol.* 26(1):231–241, 1999.
13. Ostrea, E. M. Understanding drug testing in the neonate and the role of meconium analysis. *J. Perinatol. Neonatal Nurs.* 14(4):61–82, 2001.
14. Mahony, D. L., and Murphy, J. M. Neonatal drug exposure: assessing a specific population and services provided by visiting nurses. *Pediatr. Nurs.* 25(1):27–34 (January/February) 1999.
15. Kliegman, R. Problems in metabolic adaptation: glucose, calcium and magnesium. In Klaus, M., and Fanaroff, A. *Care of the High-Risk Neonate*, 5th ed. Philadelphia, PA: W.B. Saunders, 2001, p. 305.
16. Kalhan, S., and Peter-Wohl, S. Hypoglycemia: what is it for the neonate? *Am. J. Perinatol.* 17(1):11–17, 2000.

PART

VII

Postpartal Care

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CHAPTER

42

The Normal Puerperium

The postpartal period is the time from the delivery of the placenta and membranes (marking the end of the intrapartal period) until the return of the woman's reproductive tract to its nonpregnant condition. Note that this change is to the nonpregnant condition—not the prepregnant condition, as is often said. The prepregnant condition of the organs is gone forever—most strikingly so after the first pregnancy and childbirth experience but also with each subsequent pregnancy.

This period also is called the puerperium, and the woman progressing through the puerperium is called a puerpera. The period of postpartum recovery lasts approximately six weeks.

Database for the Puerperium

The components of the database for determining the well-being of the postpartal woman are as follows:

1. Continuing evaluation of any significant findings or developments during the antepartal and intrapartal periods
2. Evaluation of the physiological and anatomical changes of the puerperium
3. Evaluation of the woman's vital signs and other physical signs, symptoms, and changes
4. Evaluation of the mother's and father's response to their baby and their preparation for caretaking
5. Evaluation of the woman's behavioral changes and psychological responses to childbearing
6. Continued screening for signs and symptoms of obstetric or medical complications (see Chapters 24 and 29 for the database necessary for this screening)

In order to evaluate any of the components of the database you must know how to recognize the normal parameters and expected changes in each of these aspects of the woman's life.

Physiological and Anatomical Changes of the Puerperium

Although the term *involution* has been used to refer to the retrogressive changes taking place in all of the organs and structures of the reproductive tract, it refers more specifically to the retrogressive changes in the uterus that lead to its reduction in size. For the sake of clarity, the definition of *puerperal involution* will be limited to the uterus, and what happens to other organs and structures simply will be referred to as *puerperal changes*.

Uterus Involution of the uterus involves the reorganization and shedding of the decidua/endometrium and the exfoliation of the placental site as evidenced by the decrease in size and weight and change in location of the uterus and by the color and amount of the lochia. The amount of lochia and the speed of involution are not affected by the administration of a series of ergot preparations (Ergotrate, Methergine), which have only short-term effect. However, breastfeeding will speed the process of involution. The decidua remaining inside the uterus after separation and expulsion of the placenta and the membranes consist of the zona basalis layer and a portion of the zona spongiosa layer of the decidua basalis (at the placental site) and the decidua parietalis (lining the remainder of the uterus). This remaining decidua reorganizes into two layers as the result of invasion by leukocytes: a degenerating, necrotic, superficial layer, which will be cast off as part of the lochial dis-

charge, and a healthy, functional, deep layer next to the myometrium. The latter layer consists of the remnants of the basilar endometrial glands in the zona basalis layer. The endometrium will be regenerated by proliferation of the epithelium of these glands. Regeneration of the endometrium is completed by the middle or end of the third postpartal week except at the placental site.

Complete regeneration of the endometrium at the placental site takes approximately six weeks. The epithelium grows in from the sides of the site and from the surrounding uterine lining, and up from beneath the placental site. This growth of the endometrium in effect undermines the thrombosed blood vessels at the site, causing them to slough and be cast off in the lochial discharge.

The uterus, immediately after delivery of the baby, placenta, and membranes, weighs approximately 1000 g. The uterus decreases in weight to approximately 500 g by the end of the first postpartal week, and to its usual nonpregnant weight of 70 g by the eighth week postpartum.

This rapid decrease in size is reflected in the changing location of the uterus as it descends out of the abdomen and again returns to being a pelvic organ. Immediately after delivery, the top of the fundus is approximately two-thirds to three-fourths of the way up between the symphysis pubis and the umbilicus. It then rises to the level of the umbilicus within a few hours. It remains at approximately the level of (or one finger-breadth below) the umbilicus for a day or two and then gradually descends into the pelvis, being nonpalpable above the symphysis pubis after the tenth day. Although there is individual variation of the location of the umbilicus in relation to the symphysis pubis and individual variation in the breadth of the fingers from examiner to examiner, thereby creating a range of normal in the descent and daily location of the fundal height, there is enough similarity to allow the generalization of uterine descent illustrated in Figure 42-1.

Any time the top of the fundus is above the umbilicus, the following problems should be considered: blood or blood clots distending the uterus in the early postpartal hours, or displacement of the uterus by a distended bladder at any time postpartally (especially if the uterus is also displaced to the right upper quadrant). The reduction in the size of the uterus does not decrease the number of muscle cells. Instead, each cell dramatically decreases in size as it rids itself of excess cellular material.

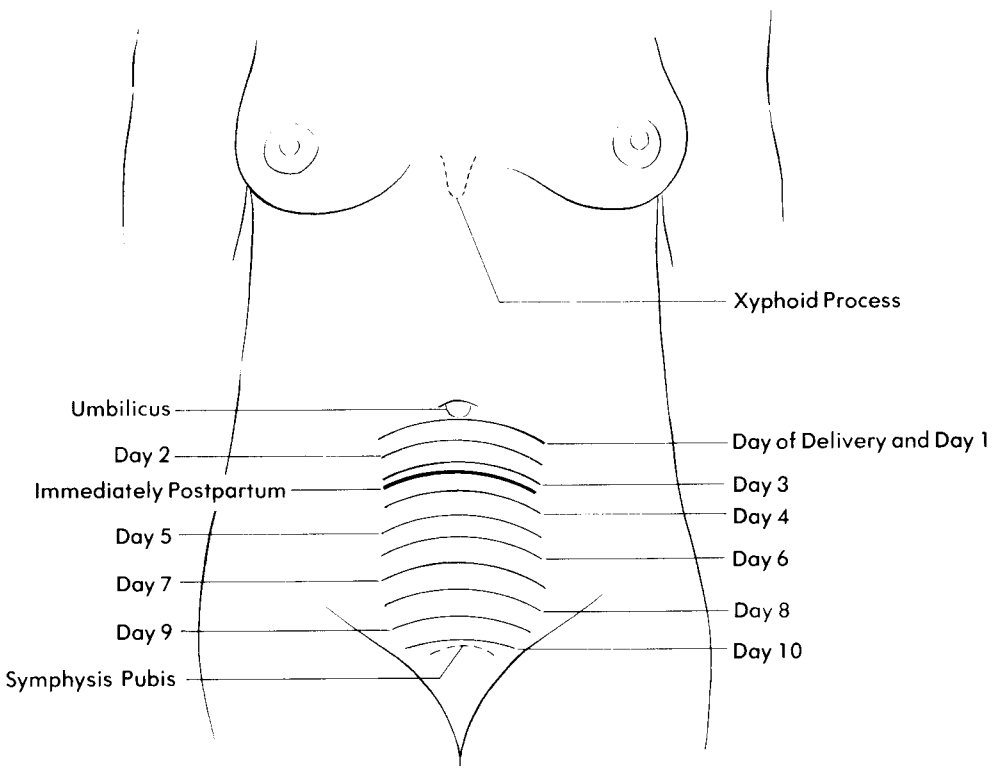

FIGURE 42-1 Fundal height and uterine involution.

The large uterine blood vessels that nourished the growing uterus and the placenta are no longer needed; the nonpregnant uterus does not have a large area that requires such a rich blood supply. These blood vessels degenerate and become obliterated. They are thought to be replaced by new blood vessels with smaller lumina.

Immediately after delivery, the cervix is extremely soft, flabby, and floppy. It may be bruised and edematous, especially anteriorly if there was an anterior lip in labor. It looks congested, reflecting its great vascularity. It assumes a loose form and readily admits two to three fingers. It regains some of its form within the first day and becomes less soft. The cervix continues to admit two fingers for about a week but thereafter admits one finger with difficulty, and even that is stopped now at the internal os. The external os has assumed its nonpregnant form by the fourth postpartal week. This form is determined by parity and the presence of lacerations.

The broad and round ligaments, which stretched to accommodate the uterus during its increase in size, are now lax. This accounts for the easy displacement of the postpartal uterus by the bladder. By the end of the puerperium, the ligaments have regained their nonpregnant length and tension.

Lochia Lochia is the name given to the uterine discharge that escapes vaginally during the puerperium. As it changes color, its descriptive name changes; lochia is rubra, serosa, or alba. Lochia rubra is red because it contains blood. It is the first lochia that starts immediately after delivery and continues for the first two to three days postpartum. Lochia rubra contains primarily blood and decidual tissue.

Lochia serosa starts as a paler version of lochia rubra, serous and pink. It ends approximately seven to eight days later as a pink, yellow, or white color as it makes the transition into becoming lochia alba. Lochia serosa contains primarily serous fluid, decidual tissue, leukocytes, and erythrocytes.

Lochia alba starts about the tenth postpartum day and resolves over a period of two to four weeks. In some women it will still be present at the time of the postpartum examination. It is creamy white and consists primarily of leukocytes and decidual cells.

Lochia has a characteristic odor not unlike that of the menstrual flow. This odor is strongest in the lochia serosa. It is stronger if mixed with perspiration and must be carefully differentiated from a foul odor indicative of infection.

Lochia begins as a heavy discharge in the early postpartum hours. Subsequently it decreases to a moderate amount as lochia rubra, a small amount as lochia serosa, and a scant amount as lochia alba. It is common for a woman to have a small amount of lochia while lying down and to bleed more heavily or to pass small clots when she gets out of bed. This is the result of pooling in the upper vaginal vault when the woman is in the recumbent position. Pooling is associated with clotting, particularly on the first days after the birth. The average total amount of lochial discharge is approximately 8 to 9 oz (240 to 270 mL). Variation in duration of lochial flow is not uncommon. However, the daily trend should be to a lighter flow, which is changing from bright to dark red, to brown, to pink. The sudden recurrence of bright red vaginal bleeding is not a normal finding and requires evaluation. Causes include excessive physical activity, retained placental or membranous products, and uterine atony.

Vagina and Perineum Immediately post delivery the vagina remains stretched open, may have some degree of edema and bruising, and gapes at the introitus. Over the first one to two days postpartum, it regains enough tone that it does not gape so widely and is no longer edematous. It is now smooth-walled, larger than usual, and generally lax. Its size decreases with return of the vaginal rugae by about the third postpartal week. The vaginal space will always be a little larger than it was prior to the first childbirth. However, perineal muscle tightening exercises will restore its tone and enable the woman to deliberately tighten her vagina. This can be accomplished by the end of the puerperium with daily practice.

Abrasions and lacerations of the vulva and perineum heal readily, including those needing repair (see Chapter 79).

Breasts Lactation is initiated in all women by the hormonal changes of childbirth. Whether a woman chooses to breastfeed or not, she may experience engorgement over the first few postpartum days as her body prepares to nourish the infant it just bore. Women who breastfeed respond to the stimuli of the nursing infant with further hormonal release and stimulation of the milk producing alveoli. For women who choose to formula feed, involution of the breast tissue occurs with avoidance of stimulation. Chapter 43 discusses the breast changes asso-

ciated with breastfeeding and the options for infant feeding in detail.

Assessment of the breast in the early postpartum period includes appearance and integrity of the nipples, bruising or irritation of breast tissue from the infant's position at breast, presence of colostrum, whether the breasts are filling with milk, and any evidence of clogged ducts, engorgement, and signs of potential mastitis.

Vital Signs and Other Physical Signs, Symptoms, and Changes

Blood Pressure Immediately following delivery, many women experience a transient rise in both systolic and diastolic blood pressure, which resolves spontaneously to the prepregnancy baseline over several days. The midwife is responsible for assessing the risk of postpartum preeclampsia, a relatively rare but serious complication, when the blood pressure elevation is significant.

Temperature The maternal temperature returns to normal from its slight elevation during the intrapartal period and stabilizes within the first 24 hours postpartum.

Pulse The pulse rate, elevated during late labor, resolves over the first few hours postpartum to its normal level. Hemorrhage, fever during labor, and acute or persistent pain may affect this process. Any pulse rate above 100 during the puerperium is abnormal and may be indicative of infection or delayed postpartal hemorrhage (see Chapter 44).

Respiration Respiratory function resolves to the woman's normal range during the first hours postpartum. Shortness of breath, rapid respirations, or other changes warrant evaluation for conditions ranging from fluid overload, to an asthma exacerbation, to pulmonary embolus.

Renal System Changes The renal pelves and ureters, which were stretched and dilated during pregnancy, return to normal by the end of the fourth postpartal week.

Immediately postpartum the bladder is edematous, congested, and hypotonic, which may result in overdistention, incomplete emptying, and excessive urine residual unless care is taken to ensure periodic voiding. Rarely is the urethra obstructed, but it may be insensitive as a result of prolonged labor with the fetal head in the pelvis. Unless the woman develops a urinary tract infection, the effects of labor on the bladder and urethra diminish within the first 24 postpartal hours.

Approximately 40 percent of postpartal women have nonpathological proteinuria from immediately postdelivery up to the second day postpartum. The specimen must be obtained as a clean-catch or from catheterization, as lochial contamination will also produce proteinuria. Benign proteinuria can be assumed only in the absence of signs and symptoms of a urinary tract infection or preeclampsia.

Diuresis begins shortly after delivery and lasts up to the fifth day postpartum. The urine output may be more than 3000 mL per day. Diuresis is the body's primary route for discarding excess interstitial fluid and excess blood volume. This is also the explanation for a rather profuse perspiration that may occur during the early postpartum days.

Weight Loss Women lose an average of 12 lb at the time of delivery. This loss represents the accumulated weight of the baby, placenta, and amniotic fluid. Another 5 lb may be lost during the first postpartal week as a result of fluid loss. One study has found that the majority of women approach their prepregnancy weight by 6 months postpartum. The single greatest determinant of postpartum weight loss was pregnancy weight gain, with those who gained the most losing the most. However breastfeeding, commonly reported to influence weight loss after childbirth, did not have a significant effect in this study. On average, multiparous women lost less weight [1].

Gastrointestinal Changes Women may be hungry and ready for a meal an hour or two after delivery. Barring complications of delivery, there is no reason to delay feeding healthy postpartum women longer than it takes to make an initial assessment.

Constipation may be a problem in the early puerperium due to a lack of solid foods during labor and self-restraint in defecation. The woman may practice self-restraint because her perineum is sore or because she lacks knowledge and is afraid she will rip open or tear out her stitches if she has a bowel movement.

Abdominal Wall The abdominal striae are never eradicated completely but they do change to fine, silvery-white lines over a period of several months.

The abdominal walls are flabby after delivery because of their stretching during pregnancy. All puerperal women have some degree of diastasis recti—the separation of the rectus muscles of the ab-

domen. How severe this diastasis is depends on a number of factors, including the woman's general condition and muscle tone; whether the woman exercises to regain her abdominal muscle tone and close the diastasis after each pregnancy; her parity (regaining complete muscle tone becomes increasingly difficult with increasing parity); the spacing of her pregnancies (whether she had time to regain her muscle tone before another pregnancy); and whether her pregnancies have overdistended her abdomen (e.g., multiple gestation). These factors also determine how long it will take her to regain her muscle tone. It takes longer to regain muscle tone from a diastasis that is five fingerbreadths wide than it does from a diastasis that is two fingerbreadths wide. In the latter instance, it is possible to have closed the diastasis by the end of the puerperium. (See "Postpartal Abdominal Examination" in Chapter 53, for a discussion of evaluating and measuring diastasis recti and how to motivate a woman to exercise.) If abdominal wall muscle tone is not regained, the space between the rectus muscles fills in with peritoneum, fascia, and fat. The woman then does not have good muscle support in subsequent pregnancies, which accounts for the pendulous abdomen often seen in a multipara. This condition may lead to extreme back pain for the woman and difficulties with engagement of the fetal presenting part at the time of labor and delivery in the next pregnancy.

Hematological Changes Leukocytosis, which elevated the white blood cell count to 15,000 or above during labor, continues with an elevated WBC for the first two days postpartum. The white blood cell count may further increase to 25,000 or 30,000 without being pathological if the woman had a prolonged labor. However, infections should be ruled out in the presence of significantly elevated WBC.

The hemoglobin, hematocrit, and erythrocyte count vary widely in the early puerperium as a result of vacillating blood volume, plasma volume, and red cell volume levels. These levels are affected by the woman's current state of hydration, the volume of fluids she had during labor, and her normal reduction in total blood volume from its elevated state during pregnancy. These factors render the hematocrit less effective as a measure of blood loss for at least two to four days postpartum. However, if the hematocrit in the first day or two postpartum is lower by two or more percentage points than the hematocrit done upon entry into labor, there has been a significant blood loss. Two percentage points is roughly the equivalent of a unit (500 mL) of blood loss. There is a reduction of approximately 1500 mL in total blood volume during delivery and the puerperium. Not all of this is blood loss; there is a reduction in volume as the accumulated fluid load of pregnancy is lost through diuresis, increased perspiration, and a return to the normal nonpregnant function of the renal system. Of the total, approximately 200 to 500 mL of blood may be lost during delivery, another 500 to 800 mL of volume during the first postpartal week, and the last 500 mL over the remainder of the puerperium. Lochia itself makes up less than a quarter of the total loss.

Normal nonpregnant levels for all the constituents of the blood are reached by the end of the puerperium.

The Mother and Father's Response to Their Baby and Preparation for Caretaking

The response of each mother and father to their baby and to their experience in childbearing is different and covers the entire spectrum of reactions and emotions, from the heights of boundless joy to the depths of despair and grief. The scenarios are endless and reflect individual circumstances in life. The midwife enters into the joy in situations that meet expectations or are happy or quietly satisfying. When the response is not joyful, the midwife needs to understand what is occurring and to facilitate a healthy process of working through the response for the well-being of each parent, baby, and family. It helps to keep a few basic thoughts in mind:

1. Attachment does not begin at birth. The mother nurtures her baby throughout pregnancy. Both the mother and the father fantasize about their baby during (and often before) pregnancy.
2. Birth is a moment in the continuum of the mother's bond with her baby.
3. The relationship between a mother and her baby is symbiotic; each needs the other.

Early Attachment and Bonding It has long been known that animals demonstrate a pattern of behavior in accepting their newborn and that certain intervening variables alter this pattern and end in rejection of the newborn. The description of this behavior as species-specific reflects the fact that the pattern of attachment behavior differs from species to species.

How a human mother and father behave toward their newborn is influenced in part by internal factors, which they bring into the situation, and in part by external factors, which occur at the time. The internal factors include how the individuals were cared for by their own parents; their genetic endowments; internalized cultural practices, mores,

and values; relationships with each other, families, and significant others; previous pregnancy and bonding experiences; the identification work done during this pregnancy (identifying themselves as parents, identifying the baby as theirs, fantasizing parenthood, etc.); and the effect of the course of the pregnancy on this work. The external factors include the care received during labor, delivery, and postpartum; the attitudes and behaviors of attendants; the responsiveness of the infant; the newborn's condition; the practices of the attendants and institutions; and whether the parents are separated from the baby during the first hours or days of life.

There are basically three sequential time periods during which attachment and bonding between parents and baby develop and take place, each encompassing a series of events: (1) the prenatal period; (2) the time of birth and immediately following birth; and (3) the postpartal and early caretaking period. Delineating these three time periods does not negate the influence of the prepregnancy period, both in shaping parental attitudes and role anticipation from birth to present parenthood and in the formation of the thoughts and dreams that go into planning a pregnancy; nor does it negate the continuing reciprocal responses, strengthening of bonds, and changing roles occurring throughout life after the postpartal period.

The Prenatal Period It is during the prenatal period that the woman accepts the fact of pregnancy, delineates her mothering identity as separate from that of her own mother's, verifies the pregnancy and identifies the baby as an individual separate from herself, dreams and fantasizes about the baby, and makes preparations for the baby. These psychological processes and events are discussed in Chapter 21. The father experiences a similar sequence of events.

The Time of Birth and Immediately Following Birth This period starts with labor because what happens during labor directly affects the attachment process at birth. The most obvious factor from labor that can affect attachment and bonding during this period is medication. Attachment processes are thwarted if both mother and baby are "sleepy" from medication. The mother's active participation and involvement during labor sets the stage for taking-in and reception of the baby at birth (Figure 42-2). The bonding between the mother and father that results from the power of the shared labor experience strengthens and facilitates postbirth family bonding.

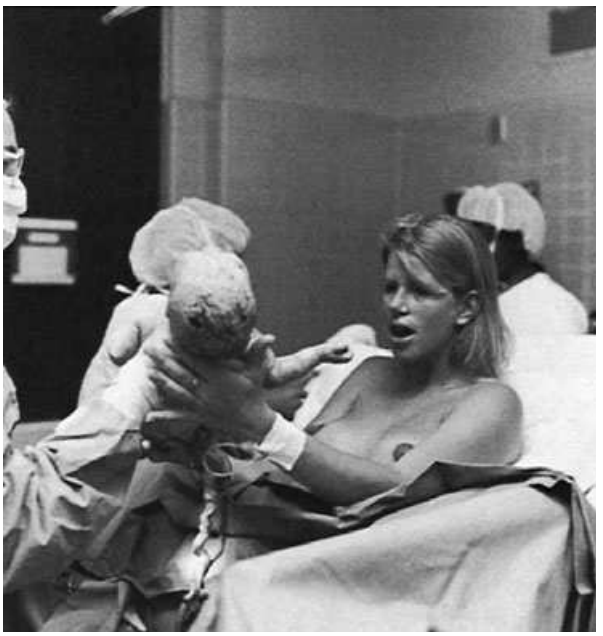

Figure 42-2 Mother receiving her baby at birth.

The actual taking-in and touching of her baby may begin with the mother's touching her baby's head at the introitus shortly before birth. Even when the baby is placed in a skin-to-skin total body contact position on the mother's abdomen immediately after birth or when the mother has reached out for her baby, there is a definite sequence in her touching of the baby. The speed of this sequence may vary. The basic direction is from peripheral actions and position inward to central actions and position. This touching sequence starts with the mother's fingertips touching the baby's extremities in an exploratory, questioning manner; progresses as she places the palms of her hands on the baby's trunk and then encircles the baby's trunk with both hands; and ends when she encloses and encompasses the entire baby within her arms.

Other attachment and bonding behaviors in the immediate postbirth period include establishing mutual eye contact and spending time in the *en face* position, talking to the baby in a high-pitched voice, comparing the baby to the baby fantasized and dreamed of during pregnancy (this comparison usually starts with the sex of the baby), and using the baby's name.

These behaviors mesh with the unmedicated newborn's capabilities. This meshing enables a responsiveness that establishes a reciprocal and rein-

forcing two-way interaction between parent and child. The capabilities of the newborn are facilitated because the baby is in a quiet-alert state during the first hour after birth. This makes the baby receptive to stimuli and constitutes a sensitive time for the baby corresponding to a sensitive time for the mother during the first hour postpartum. The baby can see at birth and is able to follow a moving object visually at an optimal distance of 10 to 12 in. This corresponds to the distance the baby is usually held in the *en face* position and results in reciprocal eye contact and mutual gazing. The high-pitched voice the mother uses corresponds to the baby's ability to hear especially well in the high-frequency range.

The attachment behaviors of the father also follow an orderly progression. Unlike the mother, who may be in constant intimate contact with her baby, the father is peripheral to the central interaction between mother and baby. This is evidenced in the series of behaviors that bring him to the same touching sequence described for the mother and into his own central interaction and bonding with the baby. This series of behaviors starts with a hovering posture over the baby. In this position he visually latches on to the baby with an intensity that is only briefly and infrequently diverted during the first few minutes immediately after birth. The father's hands and fingers may be positioned in readiness toward the baby and he gets as close as possible to a face-to-face position with the baby who is in an *en face* position with the mother. He establishes fingertip contact with the baby, leading to palm contact. When he holds the baby he positions himself *en face* for eye contact and mutual gazing (see Figure 37-2).

The Postpartal and Early Caretaking Period A relationship develops over time and depends on the participation of both parents in the relationship. Reciprocity and reinforcement from circular communication lead to learning what to expect from each other and to the development of trust. Caretaking ability resulting in a healthy, responsive baby inspires fulfillment, confidence, and feelings of competence and success within the caretaker. The satisfied, loved baby learns the feeling of self-worth and gains the confidence to learn and to adapt. Early learning has a direct relationship to early caretaking.

The mother and father go through a process in making the transition into parenthood. The process starts before pregnancy with the anticipation of someday being a parent and visualizing themselves in this role. This anticipation intensifies during pregnancy as they start to make decisions that will affect their baby and their childbirth experience—for example, choosing a health care provider and locale of birth; attending preparation for childbirth and parenthood classes; the woman's second trimester evolution from a care receiver from her mother to a caregiver, preparatory to being a mother; and seeking role models for how to mother or father.

A study of participants in childbirth classes found that many parents-to-be expressed concern over their ability to parent, or their partner's ability to parent, or how they would cope with parenting [2]. Women were more likely to report concern about postpartum physical appearance, while the fathers expressed concern about the infant's effect on work and personal time. Men also were concerned about whether the women would be "bored or lonely" while at home with a newborn. While these results cannot be generalized to all pregnant couples, they suggest that prenatal interventions that support bonding and preparation for the realities of parenting may support the transition.

The observational work of Kennell and Klaus has emphasized the importance of a labor support person to healthy newborn interactions [3, 4]. While human mothers do not have a set window of time for bonding with their infants, early receptiveness is certainly a way to facilitate the sort of relationship in which stressors such as establishing breastfeeding can be better tolerated. Peterson and Mehl surveyed new mothers and reported that the length of mother-infant separation, birth experience, length of labor, and prenatal expectations all affected how quickly mothers became attached to their children [5].

When the baby is born, parents undergo a period of learning the behaviors of and cues from their baby. For first-time parents, it also is a time of awkwardness and insecurity in the skills of caretaking as well as beginning to grasp, and cope with, the responsibilities and functions of the parental role. Caretaking behaviors are largely under the influence of others and, especially for the mother, may be determined by how others want her to function. This period may last several weeks until the parents have learned appropriate responses to their baby's cues and have begun to develop their own style of parenting, individually and as a team. Klaus and Kennell cite the work of Winnicott to describe what he termed "primary maternal preoccupation," a pe-

riod of heightened maternal awareness of the newborn's needs, lasting for several weeks [6]. The need for nurturing, protective behaviors from those around the mother to allow her this time of awareness was emphasized.

The end point is attainment of the parental role, the time at which the role is accepted and internalized and the parents are comfortable both with the role and with their own style of parenting, which may not occur until four to six months following the birth.

Behavioral Changes and Psychological Response to Childbearing The mother experiences extensive physical and physiological changes: she has made enormous adjustments of both her body and her psyche, has undergone extraordinary stimulation and excitement, is in the process of exploration and assimilation of the reality of her baby, is under pressure to absorb quickly the learning necessary for her to get to know and care for her baby, and feels the awesome responsibility she has assumed now made real and the demands placed on her to "mother." Small wonder that she may have a few behavioral changes and at times feel a bit overwhelmed by it all. It is a time of vulnerability and being open to guidance and learning; at the same time the new mother may be frustrated by not feeling competent and in control. All women experience these changes, but their intensity and how well a particular woman copes with them may vary depending on her locale when they are taking place. In the home, a woman learns and makes adjustments in the security and comfort of her own environment where she can exert control. In the hospital, these supports are lacking, and the feelings of frustration and vulnerability may develop into what has become known as the postpartum blues.

Grief is the other end of the continuum of the intense emotions possible in childbearing. The most intense grief comes with death of the baby, no matter when in the pregnancy. Fetal death is sudden and unexpected. A midwife must understand a mother and father's psychological response in order to help them grieve in a healthy way.

Postpartum Blues (Baby Blues) The phenomenon of early postpartum or baby blues is a common sequela of childbirth, occurring in up to 70 percent of all women [7]. Various causes have been proposed, including an unsupportive birth environment, rapid hormonal changes, or insecurity in a new role. None of these has been demonstrated to be a consistent underlying cause. It is possible that all of these, plus the inevitable sleep deprivation experienced by new mothers, play a role in this process.

In any event, postpartum blues typically begin a few days after birth and resolve by 10 to 14 days. Characteristics include weepiness, feeling let down by the experience of birth, agitation or restlessness, mood swings, distancing, and negative reactions to their child or family. Because birth is portrayed as a "peak" experience, the new mother may perceive herself as inadequate or as not having been properly cared for, if her imagined birth does not match her experience. She may also feel ignored if her family suddenly focuses attention on the new baby.

The key to supporting a woman through this period is consistent support from family and caregivers, reassurance that she is not "going crazy," and opportunities for increased rest. Additionally, positive reinforcement of her successes in parenting the newborn can help restore her confidence in her abilities.

Among the purposes of early postpartum telephone contact by the midwife or early clinical visits is the assessment of maternal mood. Baby blues, by definition, are self-limiting. Persistent depressed mood past the first few weeks postpartum requires assessment for postpartum depression.

Grief Grief is a psychological response to loss. The grief process consists of the identified stages or phases of this response. Grief work, a term coined by Lindemann [8], refers to the task of moving through the stages of the grief process to a resolution of the grief in the formation of new significant relationships. Grief is normal, and grief work is essential to keeping grief normal. Failure to do grief work, usually because of a desire to avoid the intense pain and distress of grief and its full emotional expression, often leads to a morbid, or pathological, grief reaction.

Grief varies considerably, depending on what the loss is and the individual's perception of and involvement with whatever is lost. "Loss" may run the gamut from the cancellation of a planned-for event (for example, a picnic, trip, or party) to the death of a loved one. How severe a loss is depends on the perception of the individual who has suffered the loss. The degree of loss to the individual is reflected in the response to the loss. For example, a death may induce a small or large grief response, depending on an individual's relation and involvement with the person who has died.

Maternity losses include those experienced by women with infertility problems (women who are unable to become pregnant or unable to maintain a pregnancy); those that involve losing the baby

(through abortion, miscarriage, stillbirth, giving the baby up for adoption); those that have a viable baby but have a loss of expectations (because of prematurity, congenital deformities/abnormalities); and the losses discussed as causative factors of postpartum blues (loss of internal intimacy with the baby, loss of attention). Another important loss (which is sometimes overlooked) accompanies the change from the exclusive relationship between the father and mother to a threesome involving mother-father-child.

The manifestations and feelings of grief in adults are quite uniform and the process follows a definite pattern. There is, however, considerable movement between the stages of grief, with the intensity of the first and second stages diminishing as a person does grief work and moves toward resolution. The time line for movement through the stages of grief varies for each individual based on the nature of the relationship and the intensity of the loss.

The first stage of grief is shock, which is the individual's initial response to the loss (Figure 42-3). Behavioral manifestations and feelings include denial, disbelief, despair, anger, fear, anxiety, guilt, emptiness, aloneness, loneliness, sadness, isolation, numbness, crying, introversion, irrationality, hostility, hatred, bitterness, acute awareness, lack of initiative, mechanical actions, alienation, betrayal, abandonment, frustration, rebellion, and lack of concentration. Physical manifestations include waves of somatic distress lasting 20 to 60 minutes, sighing, weight loss, anorexia, fitful sleep, fatigue, restlessness, haggard and drawn appearance, tightness in the throat, choking, shortness of breath, nagging and tormenting chest pain, internal quivering, generalized weakness, and specific weakness in the legs.

The second stage of grief is suffering, the phase of reality (Figure 42-4). Acceptance of the fact of the loss and adjustment to the realities this imposes

For Our Emily

Sweet Emily
in eager dreams,
in giddy accord
we wished for you.

In delicious tenderness,
in fiery loving
we made you.

In blossoming roundness,
in serene closeness
we grew you.

In joyous preparation,
in gladsome anticipation
we awaited you.

In unbelieving shock,
in agony of grief
we lost you.

And now, in wrenching sorrow,
in aching emptiness
we must part from you and learn to live
without you.

Lois Lake Church, mother
April 7

So much anticipation and so much joy
so much hard work and concentration
so great an effort.
Such breathing energy
such loving unity
such caring teamwork
breathing
inhale
exhale
in and out
then urgent, necessary pushing,
thrusting forth, stretching,
straining till no straw might be added.
A beautifiul and magnificent effort
finally ends; through!
Triumphant!
And lovely,
O, so lovely
but absolutely silent
and terrible.

Allan Southworth Church, father
April

FIGURE 42-3 Poems written by parents demonstrate initial response to loss. Emily was stillborn. (Used by permission of Lois Lake Church and Allan Southworth Church.)

Not Mine

Powdery scent, apricot-soft skin
of someone else's infant;
toddler-round cheeks and sturdy legs,
damp hair clinging in curls
to nape of neck—
child of another woman's body.
Father swooping his girl aloft,
voices bubbling, blending in glee—
not my husband, nor my child.
Babydoll sprawled on car's seat
—not my daughter's,
nor tiny dress of calico,
painstakingly smocked, lovingly pressed.
Not of my family, the long hair to braid and beribbon,
the child of my gender
to nurture to womanhood.
Mine only, the big-belly memories,
mine the not-to-be-fulfilled dreams.

Lois Lake Church, mother
July 15

FIGURE 42-4 Poem by the mother of a recent stillborn demonstrates reality and suffering. (Used by permission of Lois Lake Church.)

occur during this period—for example, the grieving person adjusts to the environment without the presence of the loved one or accepts the fact of a deformity and makes necessary adjustments in living and plans because of it. During this time there is preoccupation with and idealization of the lost object. The events leading to and surrounding the loss are relived again and again. The why, what if, and how questions are asked repeatedly and arouse feelings of anger, guilt, and fear, respectively. The pain of loss is felt in its totality, in prolonged reality, and in the memories each day, date, and event evoke. Full expression of emotion is essential to a healthy resolution. Crying is a common form of release. The pain of suffering comes in waves—frequently or less frequently, anticipated or unexpectedly—the intensity of the pain relinquishing with agonizing slowness. During this time, the grieving person's life goes on. As the individual continues to do grief work, preoccupation with the loss gradually changes to anxiety about the future.

The third stage of grief is resolution, the phase of establishing new significant relationships. During this period, the grieving person accepts the loss, adjustment is completed, and the individual is again fully functional. This progress results from the person's reinvesting emotions in other significant relationships. Reinvestment of emotions does not mean that the lost object has been replaced. Rather, it means that the individual is once more capable of investing in and forming other significant relationships. With resolution, the person's behavior becomes again a matter of free choice, whereas during suffering behavior was determined either by social convention or by internal restlessness.

Behavioral manifestations of a morbid or pathological grief reaction include avoidance and distortion of normal emotional expression of grief, agitated depression, psychosomatic conditions, acquisition of the symptoms of the last illness of the deceased, activities that are detrimental to the individual's social or economic existence, lasting loss of acceptable patterns of social interaction, morbid attachment to the possessions of the deceased, and persistent loss of self-esteem.

When the maternity loss is the death of the baby, it is essential that the parents experience the reality of the baby's existence in order for them to be able to accept the reality of the baby's death. Otherwise, the entire pregnancy-life-death sequence becomes the subject of fantasy, imagination, and a dream-mirage type of illusion, which is difficult to grasp and even more difficult to accept and resolve. Women periodically fantasize about pregnancy, birthing, and parenting (regardless of whether they actually desire to experience them) throughout life, including long before actual conception and childbearing. Conception and recognition of the fact of pregnancy (wanted or unwanted) reawaken, activate, or accentuate these fantasies. Quickening intensifies the fantasies, as a living presence makes itself known. The fantasies now begin to include specific physical and personality characteristics of the child, dreams of parent-child interactions, and projections of the child's growth, maturity, and life. Often the family and environment are reorganized in preparation for the expected baby. Then death strikes—and there is no solace for the grief over the now-empty womb. The loss is not only the actual baby but also the loss of all the dreams and fantasies extending far into the future (Figure 42-5). There is also a real sense of loss of part of one's self, which enhances the feeling of worthlessness to which all who grieve are vulnerable. Actions that help parents experience the reality of their baby's existence and thus facilitate healthy grieving include

O Emily, we wanted to show you
the world's wonders,
but now your sweet blue eyes
will never see
the glories of the sunset,
the miracle of spring's first flowers,
your papa's loving face.

We wanted to help you know
the sounds we love,
but now your tiny ears
will never hear
a lacy fugue of Bach,
the morning song of birds,
your brother's laughter.

We wanted you to taste
all of life's flavors,
but now your rosebud mouth
will never know
the sweet milk I have for you,
a plump juicy raspberry,
the tang of ocean waves.

We wanted you to touch and try
all textures and tasks,
but now your graceful hands
will never play a note of music,
stroke a cat's fur,
slip trustingly into mine.

Our Emily, we wanted to teach you
how to love,
but you already know
the love that created you,
the joy that nurtured you,
the strength that birthed you,
And these will be yours forever.

In love and sorrow,
your mama,
Lois Lake Church
April 17

FIGURE 42-5 Untitled poem by the mother of a recent stillborn demonstrates the loss of dreams and fantasies. (Used by permission of Lois Lake Church.)

having them see, touch, and hold the dead baby; encouraging them to name the baby; giving them a set of footprints, photographs, a lock of hair; and encouraging them to have some form of funeral and burial service.

When the maternity loss is a loss of the parents' expectations of a perfect child because of deformities or abnormalities, it is essential that the parents grieve the loss of their perfect child and all the fantasies and dreams they had about their baby's appearance and potential. This grieving is essential if the parents are to be free to accept and bond themselves to their imperfect child. This is a long, painful process that takes place over time. Parents of a child with anomalies also suffer loss of self-esteem during their grief process resulting from their perception that their child's imperfection reflects negatively on them. Resolution includes acceptance of each family member's individual characteristics, development, and potential as separate from one's own.

A midwife can help the parents grieve and thus facilitate their attachment to the imperfect child by providing a safe, patient, listening, facilitative environment for ventilation of their negative feelings and hostility toward, and rejection of, their baby as well as anger toward the hospital, health care professionals, God, themselves, and others. It is important also to accept the other behavioral manifestations of grief, such as parents' need to repeatedly relive and retell their experience and feelings, and their need for full and accurate information about the causes and implications of their child's anomalies. Other actions include the health professional's acceptance of the baby, recognition of the baby's individuality and other characteristics, and genuine caring for the imperfect baby. Midwives should take cues from the parents as to their readiness to care for their infant and then ensure that their initial caretaking experiences are as positive as possible. It is important to encourage and facilitate the sharing of grief, caretaking, and open communication between the parents, and to provide information and assistance that will allow parents and siblings to cope realistically. Midwives can also help the couple identify and make good use of family and community sources of support. The parents should be referred for genetic counseling if indicated.

Siblings in the home should be told the truth about the loss so they have an honest explanation of their parent's behavior. Otherwise, they may fantasize that they are the cause of a horrible, unknown problem. Siblings need to be reassured that whatever has happened is not their fault and that they are still important, loved, and cared for.

The midwife's first major responsibility in the event of a loss is to share this information with the parents. Families may sense instantly when something is not right at birth; there is a stillness in the

room, an unnatural quietness and sadness in those attending the woman. In the event of death, there are no baby sounds. The mother has a right to as much information as we have—then, not later. Truth and reality are far more compassionate than false reassurance or concealment.

The midwife should also encourage and create a safe environment for emotional expression of grief. This means arranging privacy and taking the time to stay with the parents, to share in their grief, to cry with them, and to listen. This is a continuing commitment to the parents, and the midwife should plan additional visits to listen as they relive their experience, to provide information about the grief process and the facts pertaining to their loss, and to assess that their grieving is healthy and without manifestations of a pathological reaction.

When the loss occurs at an early stage of pregnancy, the midwife may still be called on to participate in care. Because the rituals of birth and death are less evenly offered with miscarriage, and because many otherwise supportive persons do not recognize the depth of parental loss, families may find themselves without their usual support. Grief often appears more intense, with increased sensations of guilt. There may be resurgences of grieving with future pregnancies, or around the time of the anticipated birth [9]. Additionally, when families make the decision to end a pregnancy early because of fetal abnormalities, their grief closely resembles those of women who have a spontaneous loss, and they may require assessment for postpartum depression [10]. Offering families telephone contact and the opportunity for counseling in the office during the weeks following an early loss can contribute to the healing process. Following an initial visit at the time of the loss with an opportunity to talk with one of the few people able to validate the reality of the lost child may help speed the grieving process [11].

It is always difficult for midwives who have been at a birth with a poor outcome, such as a fetal or newborn loss, or who have assisted families through the their own grief, not to question their own skills. This is a normal response, and the trust relationship that the midwife has built during a pregnancy may magnify his or her own grief. Nonetheless, the midwife must be part of the support system for the family; to avoid them at this time is to foster their fears and doubts. Reviewing care provided to be sure that it meets the standards of care is only one part of addressing one's own feelings after such an event. The midwife herself may need collegial support as she deals with her own emotions.

Although all health care providers are cautioned about not discussing the care provided when there has been an "adverse" outcome—the language used to describe a dead or injured newborn—protected mechanisms exist for review of clinical cases as well as resources for counseling.

Management Plan for the Puerperium

Management of care during the puerperium includes management of care during the early puerperium, guidance for the remainder of the puerperium, conducting or arranging for home visits as indicated, conducting the two-week postpartum visit, and conducting the four- to six-week postpartum examination. Specifically the midwife has responsibility for the following:

1. Continuing evaluation and management of care of the woman's well-being
2. Providing relief from physical discomforts
3. Providing assistance with breastfeeding
4. Facilitation of parenting
5. Assessment of the baby during a home visit, if these are offered in your practice
6. Providing anticipatory guidance and instruction
7. Continuing screening for complications of the puerperium (Chapter 44)

Management of care of the first hour postpartum was discussed in connection with the fourth stage of labor in Chapter 33. Management of the early puerperium involves the management of care of the woman while she is in the hospital after the birth and for a minimum of 1 to 2 days postpartum if she is at home.

Continuing Evaluation and Management of the Woman's Well-Being

Evaluation of the Early Puerperium During the early puerperium the midwife should see the woman at least once daily. Each visit includes the following aspects:

Chart Review Before the midwife begins a visit, she will review any part of the antepartum and birth care with which she is unfamiliar, so that she can speak with knowledge to the new mother. This includes being aware of any complications in the new-

born's health status. Reviewing the chart entries since the birth also familiarizes the midwife with the record of the mother's vital signs, laboratory results, medication use, and any comments from the nurses. Previous orders and progress notes are reviewed as well. Time elapsed since birth, in hours or days, is ascertained to identify expected physical findings.

History As the midwife begins her visit, the first topic is often the birth itself. When the woman shares her experience, she is offering information that can be validated or corrected, and providing cues for which topics are of greatest concern to her. Additional information can be requested to assess both physical recovery and the mother's progress with learning to parent her newborn.

Interval assessments for each postpartum visit include maternal nutrition, bladder and bowel function, amount of lochial flow, activity level, and pain or discomfort. If the mother is breastfeeding, this is also assessed. Whether or not the midwife is the primary caregiver for the infant, infant feeding method, information about infant behavior, and sleep-wake cycles should be collected.

If at all possible, the midwife should arrange her visit to coincide with those times when the baby will be awake and with the mother. This enables the midwife to evaluate the mother-baby interaction for normality (screening out maternal rejection) and for the mother's skill and comfort in handling her baby, which may indicate areas of learning needs.

Physical Examination The examination during the early postpartum period includes the following:

1. Assessment of vital signs, including the trend over the period since the birth
2. Breast examination (see Chapter 52), including demonstrating the presence of colostrum and management of the nipples for breastfeeding women
3. Auscultation of heart and lungs, as indicated by maternal complaints, or observed changes in appearance or vital signs
4. Abdominal evaluation for uterine involution, diastasis, bladder (see Chapter 53)
5. Evaluation for costo-vertebral angle (CVA) tenderness if indicated by maternal complaints or clinical signs (see Chapter 54, method C)
6. Perineal assessment for bruising, edema, hematoma, healing of any repair, inflammation, suppuration
7. Lochia for type, quantity, and odor,
8. Anus for hemorrhoids
9. Extremities for varicosities, edema, calf tenderness or heat, presence of Homan's sign, reflexes

Examination of the perineum requires good visualization (i.e., exposure and light). The woman should be positioned with the bottoms of her feet together, knees bent, and legs apart. Let her ease into this position. Pain while she does so is informative. A penlight is invaluable in checking the perineum and should be an indispensable item of equipment for making a postpartum visit. Another helpful item is a large mirror, which can be positioned so the woman can see her own perineum if she so desires. Part of the postpartum perineal examination is educating the woman about what to expect when she sees or touches her vaginal area, including the normal changes as well as the appearance of any trauma.

For examining the posterior end of a repair (especially a lengthy one) and the anal area for external hemorrhoids, you may be able to see best (especially if the woman is obese) if the woman turns on whichever side is more comfortable for her. Gentle separation of the buttocks then gives good exposure for visualization of the area.

Evaluation of the extremities includes checking for Homan's sign. Homan's sign is elicited by placing one hand on the mother's knee, and applying gentle pressure in order to keep the leg straight. Dorsiflex that foot. If there is calf pain with this action, the sign is positive.

Management of the Early Puerperium The midwife develops a management plan for the early puerperium that reflects both the setting in which birth has occurred and the nature of the woman's birth experience. How different the plans may be for the experienced mother resting in her own bed at home after an easy birth and the exhausted woman who has worked through a painful back labor and had a large laceration repaired. In many institutional settings, routine or standing orders for the first postpartum days may exist. It is imperative for you to consider whether these orders are the appropriate ones for the new mother and to make adjustments as indicated (for example by modifying pain management routines or planning a lactation consult). Equally, it is essential to understand which are required for the efficient management of care and should be implemented without concern (such as deleting labor orders or entering an order to discontinue IV fluids). The midwife should be certain the following issues are addressed if written orders are

prepared, or that they are included in the instructions for mothers delivering outside the hospital setting:

1. Hydration, including when and whether any IV access should be discontinued
2. Nutrition
3. Activity level
4. Any medications (such as vitamins and iron, stool softeners or laxatives, pain relievers, sleep medications)
5. Perineal care, including relief of postpartum discomfort
6. Management for inability to void
7. Breast care and support for chosen feeding method
8. Laboratory tests as needed
9. Rh screening for Rh immune globulin administration in Rh negative mothers
10. Rubella vaccine for nonimmune women
11. Contraception if being initiated prior to the first postpartum visit

Patient Teaching in the Immediate Postpartum Period

During the first few days after birth, the new mother's ability to actively absorb formal teaching is limited by her intense focus on her newborn. Rubin's classic work on the developmental stages through which new mothers proceed suggested that her time was essentially focused on the infant and her behavior was dependent (taking in) for several days, before she began to take hold, or function more autonomously [12]. A small study published in 1990 suggested that the pace of this transition had accelerated; however, the brief hospital stays now common for healthy women still limit the mother's ability to function independently with her new infant before she is on her own at home [13]. An Israeli study found transient loss of cognitive ability in the immediate postpartum period [14]. All this suggests not only that initial teaching should be focused on essentials but that follow-up contact will support the mother in learning to care for her new child.

Teaching must target essentials of self-care, including handwashing, hygiene, relief of common discomforts, and recognition of warning signs such as fever, pain, excessive bleeding, dizziness or faintness, sudden-onset headache, visual changes, or epigastric pain. Initiation of breastfeeding, including access to continuing resources or how to judge infant satisfaction if the mother is formula feeding, is included. The basics of infant care deserve particular attention, especially for first-time mothers who may have little or no experience with newborns.

Education for perineal care may seem self-evident, but handwashing, the use of a warm water rinse with voiding, wiping front to rear, patting any incision area rather than scrubbing at it, and an explanation of the various comfort measures available can make a huge difference to the new mother.

The immediate postpartum visit is also a good time to begin to encourage a return to Kegel's exercises. The originator of the exercise reported that 20 to 40 hours of progressive resistance exercise, over two months time, was necessary to completely restore tone [15].

Common Medications Prescribed in the Postpartum Period

Analgesics Most midwives have their preferred pain relief regimens for the early postpartum period. Ibuprofen 800 mg (Motrin) is generally available. The midwife may wish to write a prescription for the woman to take home, or recommend that she purchase the ibuprofen 200 mg tablets over the counter, take them initially at 800 mg doses, and titrate her dose down as postpartum discomforts resolve. Acetaminophen with codeine 30 mg (Tylenol 3) is another commonly prescribed pain reliever, as is oxycodone/APAP (Percocet). Women who have had a normal childbirth should not require anything stronger than ibuprofen by the second postpartum day. Significant pain that persists warrants an examination to identify its cause.

Laxatives Those women have who labored for many hours without eating or have experienced lacerations that penetrate the rectal sphincter may have concerns regarding either pain or the integrity of the repair that decrease their willingness to move their bowels. The prescription of a mild stool softener such as docusate sodium (Colace) 50 to 100 mg daily or twice daily will help to maintain normal function. Reassurance, education about any repair and its healing, and encouragement to increase fluid intake and eat a high fiber diet will also promote normal function.

Rh Immune Globulin (RhoGAM, BayRho-D) Rh immune globulin is a fractionated plasma product developed to prevent alloimmunization of Rh-positive infants of an Rh-negative mother. They are specific to the D antibody; thus only women who are Rh D negative, Du (weak D) negative need be treated. Although Rh immune globulin is a blood product and carries warnings about risk of transmission of viruses such as HIV and hepatitis as well as Creutzfeldt-Jakob disease, this is a highly fractionated plasma derivative. The risk of disease transmission associated with drug administration is theoretical, and the risk asso-

ciated with alloimmunization significant both for the mother and for future children. Nonetheless, women should be told that this is a blood product before it is administered [16].

As many as 75 percent of all pregnant women experience a fetal-maternal transplacental hemorrhage (TPH) during pregnancy or birth. The amount of fetal blood in the maternal circulation is less than 0.1 mL in 60 percent of these cases and less than 5 mL in over 99 percent [17, p. 738]. The risk of TPH increases with chorionic villus sampling, spontaneous or therapeutic abortion, amniocentesis, preeclampsia, external version, hemorrhage from placenta previa or abruptio placentae, cesarean section, and manual removal of the placenta. Minimal TPH may produce antibody response in some women, and the risk of the mother developing antibodies following the birth of an Rh positive infant is approximately 16 percent [18].

The action of RhoGAM is to suppress the mother's production of antibodies in response to receipt of the Rh-positive antigen. Passive immunity transmitted through immunization prevents the development of maternal antibody. The rationale for suppression of antibody production in the woman is that it is the presence of D antibodies in the mother that causes hemolytic disease of the newborn (erythroblastosis fetalis) in subsequent pregnancies. Administration of Rh immune globulin in the prescribed manner postpartum reduces risk to 1 to 2 percent, which is the risk of antepartum exposure to fetal cells.

Regardless of whether she has received Rh immune globulin during pregnancy, any postpartal woman who meets the following criteria should receive Rh immune globulin:

1. She is Rh D/Du negative.
2. She is not sensitized to Rh D antibodies based on a current screen. (The exception is that a woman who has received a 28 week injection of Rh immune globulin may have a persistent low positive value at term. She still receives the postpartum injection.)
3. The infant is Rh D positive.
4. The infant has a negative direct antiagglutination test (Coombs' test).

The standard 300 μg dose of Rh immune globulin is sufficient to treat a fetal-maternal bleed containing 15 mL of red blood cells or 30 mL of whole blood. If there is suspicion of a greater exposure, a Kleihauer-Betke test should be performed to determine the correct dose. Rh immune globulin is administered within 72 hours of birth, before antibody production begins and the woman becomes sensitized. Once the mother has become sensitized to the Rh factor, the process cannot be reversed.

If cord blood results are delayed and administration of Rh immune globulin is deferred for 72 hours, Rh immune globulin should be administered at that time. About one-third of the time, the infant will be Rh negative; however, no harm is done to the mother by administering the dose unnecessarily, and this outcome is preferable to not treating a mother at risk of Rh sensitization. In addition, prophylaxis has been demonstrated to be at least partially protective for up to fourteen days after the birth [17, p. 760].

Rh immune globulin is not administered to the newborn infant, to previously sensitized Rh negative mothers, or to Rh negative mothers whose infant is Rh negative. It is never given to Rh D positive or Du positive women.

Rubella Vaccine 0.5 mL Subcutaneous Rubella vaccine is given postpartum to women who had a rubella titer of less than 1:10 or who tested nonimmune or indeterminate for rubella immunity during the antepartal period.

Methergine Methergine 0.2 mg by mouth, every four hours for six doses, is prescribed when the mother has had significant uterine atony after giving birth, to decrease the risk of a delayed postpartum hemorrhage. It may also be prescribed based on multiparity, overdistention of the uterus as with a macrosomic infant or polyhydramnios, persistent relaxation of the uterus in the early postpartum period, or a concern about retained membranes or placental fragments.

Postpartum Follow-Up: Telephone Calls, Home Visits, and Two-Week Postpartum Visit

A midwife can use a variety of methods to stay in contact with the mother and baby between the immediate postpartum period and the four- to six-week examination. Some midwives make telephone calls, some do home visits, and some have the mother and baby return for a two-week visit. Some midwives may work with nurses or train birth assistants to make the telephone calls or do the home visits. Some midwives do a combination of these, depending on the needs of the mother, baby, and family. These activities have a number of purposes:

1. To evaluate the postpartum course and well-being of the mother
2. To evaluate the well-being of the baby
3. To evaluate progress and comfort in caretaking ability and assumption of the parental role

4. To review with the mother her labor and birth experience
5. To be accessible for questions and concerns and to establish a contact for the mother to feel comfortable calling when she has questions or concerns
6. To provide needed teaching and counseling

While there is some evidence that physical outcomes are not improved by early postpartum visits [19], many of the problems that arise postpartum may be better addressed by early intervention. For example, breastfeeding support may enable a mother to continue, rather than wean her infant to formula. Or the early onset of postpartum depression may be recognized and help sought.

Telephone calls are usually made the day after the delivery or the day after the mother goes home from the birth center or hospital and again a few days later. They are often combined with a two-week visit in the office or clinic. During the telephone call the midwife screens for problems by asking about both maternal and infant well-being.

For the mother, evaluation includes the following:

1. Her perception of labor and birth, her current coping ability, and how she is responding to the new baby.
2. Condition of the breasts, including engorgement, whether or not the mother is breastfeeding, what comfort measures she is using to reduce discomfort. In addition, if the mother is breastfeeding, questioning should include pain or discomfort with feeding, appearance of the nipples and areolae, whether colostrum or milk is present, and an assessment of the breastfeeding process.
3. Food and fluid intake, assessing for both quality and quantity.
4. Abdominal pain, cramping, bowel function.
5. Any difficulty or discomfort with urination, and whether she is diuresing.
6. The amount, color, and odor associated with lochial bleeding.
7. Perineal pain, swelling, redness, and, if there was a repair, whether the repair is visibly intact. The mother may need to find a mirror and examine herself, or have her partner check for her, if she reports any of the first symptoms.
8. Presence of hemorrhoids, and any comfort measures being used.
9. Lower extremity edema, pain, and redness.
10. Whether the mother is having enough rest, both during the day and at night.
11. Who is present to assist the new mother with household management, and how the help is perceived (i.e., useful or intrusive).
12. Current level of physical activity, in terms of newborn care, household chores, and exercise, and whether she has begun performing Kegel's exercises and abdominal tightening exercises.
13. How the family is adjusting to having the new baby at home.
14. Her current level of confidence in her ability to care for the infant.

Whether or not the midwife is responsible for the infant's care, the mother should be asked about the baby during this visit or call, including information about the following:

1. What feeding method the mother is using now. If she has switched methods, does she need any assistance with her new choice? Breastfeeding mothers are asked about difficulty with nursing, milk supply, nursing time, infant satisfaction, and sleep-wake cycles. Formula-feeding mothers should also be asked about any difficulties their infant is having with feeding, frequency, and amount taken.
2. Bladder and bowel patterns, including frequency. The shift in frequency and appearance of stools should be validated.
3. Infant color—i.e., presence of jaundice, and any circumoral cyanosis while feeding.
4. Whether the umbilical cord has come off, whether the site is clean and dry, what, if anything, the mother is applying to the site.
5. For male infants who are circumcised, the appearance of the incision site.
6. How the new infant is reacting to life. This includes whether the infant is sleeping well, appears fussy or unsatisfied after eating, is crying frequently, is alert when awake, etc.

Using a telephone call to assess the mother-baby pair's well-being, particularly if the birth has occurred in a setting where the family will be alone with their infant shortly after birth, allows the midwife to triage in a timely fashion for emergent problems that might require a trip to the office (or the pediatric nurse practitioner or physician's office), or even a visit to the emergency room. It also verifies the mother's understanding of her ability to cope with the challenges of being a new mother.

A home visit involves the same set of questions as for the telephone call but also allows the midwife to observe the following:

1. The mother's responses to the baby's needs and cues
2. The mother-baby interaction
3. The place of the baby in the home's social environment

4. The resources in the home (e.g., plumbing, water supply, refrigeration, air conditioning/heat, window screens, supplies for baby care)

A home visit may also include a brief physical examination of the mother and baby. A brief physical examination of the mother might include the following:

1. Blood pressure
2. Temperature
3. Breast evaluation
4. Abdominal assessment
5. Perineum check, including assessment of the lochia

A brief physical examination of the baby might include the following:

1. Temperature, pulse, and respiration rate
2. Check for dehydration (skin turgor, sunken fontanels)
3. Auscultation of heart and lungs
4. Cord check
5. Circumcision check (if applicable)
6. Screening for jaundice
7. Observation of responsiveness/alertness
8. Assessment of physical well-being and adequacy of caretaking

The two-week visit also involves the same set of questions as the telephone call, adjusted for expected physical, physiological, and psychological changes by two weeks postpartum. Particular attention should be paid to how well the woman is coping with these changes and her new parental responsibilities. The midwife may or may not conduct an abbreviated physical examination of the mother or the baby or both.

The two-week visit should be a mother-baby visit so the midwife can observe the mother's interaction with her baby and her responsiveness to her baby's needs and cues. Every contact with the mother is an opportunity to share with her the developmental capabilities of her baby and to discuss safety, infant stimulation, and parenting skills. This is also a good time to check that the baby either has already seen or has an appointment to see a pediatric health care professional and to discuss the need for these visits and for immunizations.

For breastfeeding mothers, the two-week visit can also be used as a time to encourage effective breastfeeding and to work on any nursing problems.

Finally, if mothers have not elected a contraceptive method during the immediate postpartum visit, the two-week visit is an excellent opportunity to review available options. Many couples will choose to begin sexual intercourse shortly after the mother's lochia resolves, if not before, and mothers who are formula-feeding may well ovulate before a routine postpartum physical is performed at six weeks.

Four- to Six-Week Postpartum Examination

Although the puerperium lasts approximately six weeks, marking the length of time it takes for the woman's reproductive tract to return to its nonpregnant condition, most experts believe it is possible to evaluate the normality and conclusion of the puerperium at four weeks postpartum. The midwife should choose the interval most appropriate to the community served, and the woman's needs, including the need for contraception.

Lydon-Rochelle and colleagues reported on a review of births in which they compared general health status of primiparous women based on mode of delivery [20]. Women with operative vaginal deliveries and those who gave birth by cesarean section were less likely to be in good general health at the end of the puerperium, indicating a potential need for careful evaluation of their ability to return to their usual activities or employment. Specific issues of concern included physical ability, and increased likelihood of postpartum blues or depression. In addition, women with forceps or vacuum births were more likely to report difficulty with bowel or bladder function and delayed resumption of sexual activity. While this is not entirely new data, the assessment of women's health during postpartum visits should take the slower recovery of this group of women into consideration, both for teaching and clinical management.

The four- to six-week postpartum examination often consists of a complete history, physical, and pelvic examination, as outlined in Chapter 2. Any available records of this pregnancy (antepartal, intrapartal, postpartal) should be reviewed. In addition, the visit includes (1) screening for contraindications to any of the methods of family planning if this has not already been done, (2) additional history regarding the period of time since the woman was last seen, and (3) additional specific physical and pelvic evaluations that relate to the return of the reproductive tract and body to its nonpregnant state. In addition to the assessment given above for use in a telephone call or at a two-week visit, this additional history includes the following:

1. Resumption of sexual intercourse—number of times, contraception used (if so, which method), dyspareunia, woman's and partner's enjoyment and satisfaction, problems

2. Family-planning method desired; previous family-planning methods used—satisfaction, side effects, length of time used, why discontinued
3. Calls to the midwife or the physician, visits to the hospital emergency room, or admission or readmission to the hospital—why, when, diagnosis, treatment, duration, and present status of problem
4. Any symptoms of fever, chills, cold, flu
5. Breasts: history of engorgement, feeding method and satisfaction, any current problems with nipples, breast care, or symptoms of mastitis
6. Bladder function, including any incontinence, any symptoms of urinary tract infection, performance of Kegel's exercises
7. Abdominal tone, persistence of a diastasis, whether the mother has begun exercising
8. Bowel function including constipation, incontinence of stool or flatus, whether the woman has used laxatives or enemas to improve bowel function
9. The resolution of lochia, including any episodes of excessive bleeding, and when or whether the menses have resumed
10. Leg cramps or pain, especially with exercise, the development or persistence of varicose veins, and signs of thrombophlebitis
11. Coping with infant needs by both the mother and the family, whether the child has been to well-child visits, growth and well-being of the child

The physical examination for a postpartum woman may be done as a complete physical evaluation, or may be limited in some settings. If only a limited examination is performed, it should include the following:

1. Thyroid
2. Lymphatics: cervical, axillary, inguinal
3. Breasts, including an assessment related to breastfeeding when appropriate as follows:
   a. Whether the breasts are adequately supported by the mother's undergarments
   b. Presence of milk
   c. Breast symmetry
   d. Nipple injury such as cracking or blisters
4. Abdominal examination, including assessment of diastasis recti
5. Perineum, including healing of any laceration or episiotomy repair, and resolution of hematomas
6. Bimanual examination, including
   a. Assessment of vaginal tone by having the mother contract her muscles around your examining finger
   b. Assessment of residual pain by applying pressure to the posterior vaginal wall at the level of the hymen
   c. Assessment for cystocele or rectocele development
   d. Assessment for estrogen depletion with decreased rugation and atrophy of vaginal tissue
   e. Uterine sizing: it may be slightly larger than the nonpregnant uterus but should be a pelvic organ. Larger than expected size for the number of weeks postpartum, boggy tone, or continued lochial oozing may be indicative of subinvolution (see Chapter 44)
7. Assessment of any residual hemorrhoids
8. Examination of the legs for varicosities, persistent edema

In addition to the history and physical examination, assessment of the postpartum woman may include laboratory assessment with CBC if severe anemia was noted at birth or following a postpartum hemorrhage, screens for sexually transmitted diseases as appropriate, and a Pap smear when indicated or part of the institutional protocol. Currently, the Pap smear is often deferred to the next annual examination, dating from the time of the initial assessment for pregnancy, or from the last annual if that Pap smear was accepted as part of the new obstetric visit assessment.

Relief from Common Discomforts

There are a number of discomforts of the puerperium. Although they are considered normal, they may cause significant physical distress. Discomforts specific to breastfeeding mothers (nipple tenderness and cracked nipples) will be discussed in the chapter on infant feeding (Chapter 43).

Afterbirth Pains Afterbirth pains are caused by the continuing sequential contraction and relaxation of the uterus. They are much more common with increasing parity and in women who breastfeed. The reason for more severe afterpains with increasing parity is a concomitant decrease in uterine muscle tone, producing intermittent relaxation. This is in contrast to the primipara, whose uterine muscle tone is good and whose uterus stays essentially contracted without intermittent relaxation. In breastfeeding women, the suckling of the baby stimulates the production of oxytocin by the posterior pituitary. The release of oxytocin not only triggers the let-down reflex in the breasts but also causes the uterus to contract.

Afterbirth pains will be relieved if the uterus remains well contracted, which requires that the bladder be empty. The new mother should be reminded that the frequent filling of her bladder as her body begins to shed excess fluid following the birth will lead to a need for frequent urination. A full bladder will displace the uterus upward leading to uterine relaxation and more painful contractions. When the bladder is empty, some women will find sufficient relief of pain by repositioning themselves to lie prone, with a pillow or blanket roll positioned under the lower abdomen. Constant uterine compression in this position can provide significant relief from cramping.

Effective analgesia for most women whose contractions are severe can be achieved with either acetaminophen (Tylenol) or ibuprofen (Motrin). Although aspirin-containing products are not recommended for breastfeeding mothers, due to the risk of decreased platelet counts and an association with Reye's syndrome, ibuprofen and acetaminophen have been shown to be safe [21, pp. 27–28, 62–63, 368–369]. In many cases, the anti-inflammatory properties of ibuprofen will make it a superior product for this purpose. Women whose pain is severe enough to require the use of narcotic analgesics following a vaginal birth should be evaluated for causes of pain other than uterine contractions.

Excessive Perspiration Postpartal woman experience excessive perspiration because the body uses this route as well as diuresis to rid itself of the excess interstitial fluid that resulted from the normal increase in extracellular water during pregnancy. Relief is simply to keep clean and dry. Care must also be taken to ensure that the woman is hydrated. Drinking a glass of water during each hour she is awake will accomplish this.

Breast Engorgement It is thought that engorgement of the breasts is due to a combination of milk accumulation and stasis and increased vascularity and congestion. This combination results in further congestion by virtue of lymphatic and venous stasis. It occurs as the milk supply increases, on approximately the third postpartal day in both breastfeeding and nonbreastfeeding mothers, and lasts approximately 24 to 48 hours.

As the milk supply comes in, engorgement is preceded by a sense of heaviness as the breasts begin to fill. The breasts become distended, tense, and tender to the touch. The skin is warm to the touch, with visible veins, and is taut across the breasts. The nipples are firmer and may become difficult for the infant to grasp. For some women, the breast tenderness becomes painful, particularly if the infant is having difficulty with nursing, or if she does not have a supportive brassiere. Although engorgement is not an inflammatory process, the increased metabolism associated with milk production may cause a mildly elevated temperature. Fever greater than 100.4° F suggests the presence of mastitis or another infection.

Relief measures depend on whether the woman is breastfeeding. For a woman who is not breastfeeding, such measures are geared toward relief of discomfort and cessation of lactation. Although in the past a variety of medications were used to attempt to suppress milk production in formula-feeding women, none was found to be without risk to the woman, nor were any completely effective. Since the Food and Drug Administration removed the indication for lactation suppression for bromocriptine (Parlodel) in 1989, no medication is approved for this use in the United States [21, pp. 87–88].

Women who choose to formula feed need to understand that they will develop a milk supply, which will cause engorgement. They need to be taught to use a bra or breast binder to firmly support the breasts, lifting rather than squeezing toward the chest wall. Women with pendulous breasts may need to add a roll underneath the breasts. A simple breast binder can be constructed using linens or a thin towel, pinned into place to provide support.

The application of ice to the breasts, using either purchased chemical ice packs or a rolled plastic bag filled with water and frozen, restricts blood flow and inhibits milk production. If the mother chooses to make her own ice packs, she should be reminded to wrap them in a layer of cloth for comfort and to reduce the risk of accidental freezing injury. The ice packs should be shifted to various parts of the breast, rather than remaining in a single location.

No attempt should be made to express milk from the breasts, either manually or by using heat (e.g., standing in a warm shower and letting the water run over the breasts), as this will only promote milk production. The application of heat dilates the blood vessels and indirectly stimulates milk production and letdown.

The use of analgesics, as described above in the section on afterbirth pains, can relieve any accompanying discomfort.

Finally, mothers should be reminded that this is a short-lived problem. Engorgement will recede as soon as the woman's body realizes that the milk is not being used and decreases production. However, the new mother can expect that her milk supply will not vanish immediately, but it will resolve over several weeks.

Breastfeeding mothers, in contrast, should be advised that the application of heat, frequent feeding, and use of mild analgesics can relieve the discomfort of engorgement. If the areolae and nipples are too firm or tense for the infant to grasp, expressing a little milk prior to placing the baby at breast can facilitate attempts to latch on (see Chapter 62). Mothers who begin breastfeeding immediately after the birth, nurse frequently on both breasts, and avoid the use of supplements or pumping to express milk for bottle feeding are less likely to engorge painfully (Figure 42-6).

Perineal Pain A number of perineal comfort measures can alleviate discomfort or pain resulting from a laceration or episiotomy and subsequent repair. Before any measures are instituted, it is essential to examine the perineum to rule out complications such as hematoma. It may also indicate which of the following measures might be most effective.

FIGURE 42-6 Breastfeeding.

Many women will also have a personal preference as to one or another of these techniques. It is often worth the time and effort to describe several different methods and allow her to choose which is working best for her.

Ice Pack or Bag as Needed. If chemical ice packs are not available, an ice bag can be made by filling an unpowdered rubber glove with crushed ice or ice chips and tying off the glove at the cuff with a rubber band. All ice bags or packs should be wrapped in a soft covering, absorbent side out, for the sake of cleanliness, and protection against an ice burn.

Ice bags or packs are applied as needed. They are most useful for reducing swelling and numbing the perineum in the immediate postpartal period. Ice should always be applied in the event of a third- or fourth-degree laceration, and when significant perineal edema is present. Optimum benefit is achieved with 30-minute applications of cold [22].

Topical Anesthetic as Needed. Examples of topical anesthetics are Dermoplast spray, Nupercaine ointment, Americaine spray or ointment, and Surfacaine ointment. If an ointment is to be used, the woman should be instructed to wash her hands before applying it. These are applied during the first few postpartum days during the period of acute healing either from a repair or if hemorrhoids are present. Women who need to continue using these after a few days should be seen to determine if another problem is present.

Sitz Bath Two to Three Times Daily. The advent of the disposable, fit-in-the-toilet sitz bath made this a simple, convenient, and comfortable procedure that the woman can use in her home. Some women will prefer to use cold water, rather than the warm—not hot—water generally prescribed.

A modification of the same idea is to pour warm water over the perineum. This can be a part of routine perineal care after both voiding and defecation. A small pitcher or container or peri-bottle facilitates this method.

The warmth of the water for either the sitz bath or for pouring should first be tested on another sensitive but nontraumatized portion of the body, such as the inside of the wrist. The warmth of the water increases circulation and promotes healing.

Ice sitz baths have also been proposed by Droegmueller [23]. It is clear that cold is the preferred therapy for the initial treatment of soft tissue injuries and inflammatory conditions in

athletics. Postpartum pain relief with the use of cold sitz baths includes the decreased response at the nerve ending as well as local vasoconstriction, which reduces swelling and muscle spasm. To administer an ice sitz bath, begin with water at room temperature and add ice until the proper temperature is reached.

Witch hazel compresses both reduce edema and are analgesic. They are concocted by pouring witch hazel over some 4 × 4 gauze squares in a small cup or basin, squeezing them out to a wet but not drippy state, folding them once, and placing them on the perineum. It is important that the hands of the person who prepares the compresses be thoroughly washed first. Tucks pads, a commercial variation of this comfort measure saturated with a mixture of witch hazel, glycerin, and water, may also be used.

Rubber Ring. Use of a rubber ring has been criticized because of its possible interference with circulation. However, properly used, it can bring safe relief when there is considerable positional pressure on the perineal area. The rubber ring should be inflated only enough to relieve this pressure. It should be a large rubber ring and positioned so that there are no pressure points in the pelvic area.

Perineal Tightening. Doing perineal tightening or Kegel's exercises increases circulation to the area and thus promotes healing. It also begins to restore muscle tone to the pelvic musculature. It is one of the most useful perineal comfort measures and often yields dramatic results in facilitating ease of movement and making the woman more comfortable.

As a comfort measure, perineal tightening is geared toward alleviation of the discomfort and pain a woman has when sitting or getting in and out of bed. In both of these instances her perineal area is subjected to direct pressure and, particularly when getting in and out of bed, her stitch area also can be scraped. Perineal tightening draws the affected area up and in, so that it does not receive direct pressure or scraping; the gluteal muscles receive these effects. The woman should tighten her perineum, drawing it up and in and maintaining this contracted state before moving in bed or lowering herself onto a chair.

Perineal tightening can have the opposite effect if the woman had a mediolateral episiotomy. Tightening the perineum in this instance pulls on the posterior end of the stitch line since the incision cuts diagonally across the muscles, and can be quite painful.

Constipation Fears may inhibit bowel function if a woman is afraid of tearing out stitches or of pain associated with the remembered bowel pressure in labor. In addition, constipation may be further aggravated by laxness of the abdominal walls and by the discomfort of a third- or fourth-degree repair.

Dietary changes to increase fiber and additional fluid intake may relieve the problem. When women have had a third- or fourth-degree laceration, the use of stool softeners and laxatives can help prevent straining. In most cases, the long-term use of a mild stool softener or laxative should be limited to women who do not resolve their problem with reassurance and diet changes, to avoid the development of dependence.

Hemorrhoids If the woman has hemorrhoids, they may be quite painful for a few days. If they developed during pregnancy, they were traumatized and became more edematous during the pushing of the second stage of labor and with pressure of the baby and distention at birth. The first three relief measures below help reduce the size of the hemorrhoids and are good for the initial 24- to 48-hours of treatment. Relief measures may be used in combination (except cold and warm during the same time span) and include the following:

1. Ice bags or packs
2. Ice sitz baths
3. Witch hazel compresses or Tucks
4. Preparation H ointment
5. Analgesic or anesthetic spray or ointment
6. Warm water compresses
7. Warm sitz baths
8. Stool softener
9. Anusol suppositories
10. Replacement of external hemorrhoids inside the rectum. A lubricated finger cot is used and the hemorrhoids are gently pushed into the rectum. Using Preparation H for the lubricant gives a double effect. After the hemorrhoids are inserted, the woman tightens her rectal sphincter both to give them support and to contain them within her rectum.

Rooming-In

The best possible structure in the hospital for facilitating mother-infant attachment, bonding, parenting, and the family unit is rooming-in (see Figure 42-7). Rooming-in is not a new concept but one that disappeared from maternity care in the United States when childbirth moved inside the hospital

FIGURE 42-7 Family in rooming-in.

and separated the mother and baby from the family and, by and large, from each other. In the mid-1940s a movement began to reverse this separation within the hospital. Opponents' fears that rooming-in would lead to increased infection have been proven unfounded. In fact, the danger is less. The most comprehensive definition of rooming-in was developed at that time at Yale University:

> The term rooming-in refers to a hospital arrangement for maternity patients wherein a mother and her newborn are cared for together in the same room. However, its meaning reaches beyond physical facilities and signifies an attitude in maternal and infant care and a general plan of supportive parental education which are based on the recognition and understanding of the needs of each mother, infant, and family. It is a plan to maintain natural mother-infant relationships, to reinforce the potentialities of each mother and infant, and to encourage the family unit. From this broad point of view, then, rooming-in is not to be viewed merely as a specific plan for space arrangement or as a particular kind of equipment or organization, but rather as an integrated, interdepartmental program of professional assistance that helps parents achieve happy family unity and warm parent-child relationships. [24]

Rooming-in does not mean that the baby has to be with the mother every minute of her hospital stay, nor does it mean that the mother assumes sole responsibility for the care of the baby. In rooming-in the nursing staff remains responsible for the nursing care of both the mother and the baby. The mother assumes care of her baby as she desires and as she demonstrates the ability to do so. The setting is ideal for a new, inexperienced mother not only to learn how to care for her baby but also to get to know her baby and how it communicates with her through body movement and vocal noises. The experienced mother also benefits from rooming-in and learning the individuality and communication style of this baby. The mother in rooming-in can rest comfortably having her baby with her, yet knowing that either she or a nurse can care for the baby, whichever she desires, so she can obtain needed rest and prevent exhaustion.

Rooming-in also is the ideal setting for breastfeeding (because the mother can respond when the baby is hungry and nurse frequently to stimulate lactation), to involve the father, and to begin parenting. The baby needs the security that comes from prompt attention to its demands and from holding, cuddling, fondling, and nuzzling. These needs must be satisfied if the baby is to be healthy and happy. An inexperienced mother and father may find it difficult both to recognize these needs and to know how to satisfy them. Baby care is a learned skill and art. It can be a shock to a new, inexperienced mother to be home suddenly with a baby she has no idea how to care for. Rooming-in makes the transition from hospital to home a gradual and natural one instead of a shock.

The importance of recognizing the baby's needs and individual behavior lies in the potential for growth when the needs are satisfied and the parents collaborate with the baby's growth and development pattern. An impersonal hospital regimen encourages a mother to believe, falsely, that her baby's behavior is automatic. Inflexible and mechanical policies condition a mother to follow rules instead of being guided by the needs of her baby. A hospital regimen does not allow her to learn that a satisfied baby cries relatively little and will settle into a fairly regular schedule of its own in two to three weeks. Growth and development are fostered when the baby is secure in the warmth and contact that comes from being held and cuddled and is free to eat, sleep, and eliminate according to internal rhythms rather than with a rigid and arbitrary regimen. Parenting begins in respect for and in response to the individuality of the baby.

Anticipatory Guidance and Instruction

This portion of the chapter provides an outline of the topics included in anticipatory guidance and instruction of the postpartal mother during the early puerperium. This is not to say that all women need instruction in all areas. It does mean that each woman should be apprised of these topics and then given instruction in those in which she feels a need. You cannot assume that because a woman is a first-time mother she doesn't know anything about these topics. She may have baby care experience through caring for a sibling or other infant relatives. By the same token, you cannot assume that because a woman is a multipara she knows all you have to offer. She may need a refresher depending on how many years it has been since her last baby. Also, most professionals who have become mothers do not like to have to rely on themselves; they want to be treated like any other new mother and be taught, if they wish, without being made to feel like they should already know everything.

The following material is presented in outline form. For the beginning midwife who is unfamiliar with infant care, a number of good resources, including those written for the lay community, are readily available. Some of these are included in the bibliography at the end of this chapter.

Mother

1. Perineal care
2. Breast care for the breastfeeding mother
3. Care of the breasts during breast engorgement
4. Abdominal tightening exercises
5. Perineal exercises
6. Activity/exercise (see Chapter 9 for information on items 4–6)
7. Nutrition
8. Rest
9. Hygiene, including tub bath or shower as preferred
10. Normality of baby blues
11. Warning signs, including
    a. Fever or chills
    b. Excessive bleeding
    c. Abdominal pain
    d. Severely painful or lumpy breast
    e. Calf pain or heat, with or without leg edema
    f. Depression
12. How to contact the midwife and other resources
13. When to return for postpartum evaluation, or when a home visit/telephone contact will be made

Baby

1. See Chapter 43 for information regarding educational needs of breastfeeding mothers.
2. If being bottle-fed:
    a. The preparation and storage of formula
    b. The care and preparation of bottles and nipples
    c. How to hold the baby during feeding
    d. How to hold the bottle during feeding
3. Burping (Figure 42-8)
4. Baby bathing, including shampooing
5. Dressing
    a. How to dress (manipulation of clothes and baby)
    b. How much clothing in relation to environmental and body temperature
6. Cleaning and care of penis of the baby, including circumcision care where applicable
7. Care of female perineum
8. Cord care
9. How to lift, hold, and carry a baby
10. Diapers—how to change them, what to do with them
11. Prevention and treatment of diaper rash

FIGURE 42-8 Teaching and learning about burping.

12. How to take the baby's temperature and how to read a thermometer
13. Pacifiers versus allowing the baby to suck on thumb or fist
14. The meaning of crying
    a. Hunger
    b. Need for a diaper change
    c. Need to be burped
    d. Need to change from an uncomfortable position
    e. Pain, for example, illness or stuck by a safety pin
    f. Need for loving—wants to be held and cuddled
    g. Clothes or blanket too tightly wrapped

    The parents should be assured that it is not possible for them to spoil their baby at this time. The first thing an infant learns is whether the world is a safe place, and whether the world responds to his or her needs.
15. Call the person providing pediatric care for any of the following:
    a. Fever
    b. Diarrhea
    c. Respiratory congestion
    d. Poor feeding
    e. Persistent restless crying
    f. Jaundice
    g. Listless behavior, not alert when awake
16. Importance of checkups and immunizations

Mother in Relation to Others

1. Sibling rivalry
2. Partner's needs and fears
3. Transitional family relationships
4. Family planning
5. Resumption of sexual intercourse
    a. Time of resumption determined by desire and comfort
    b. Alternative methods of satisfying sexual needs in the puerperium
    c. Problems of privacy, interruptions, and the letdown reflex if the woman is breastfeeding
    d. Alternative positions for sexual intercourse
    e. Use of a lubricant or hormone preparation for discomfort
6. Need for time together with partner and separate from the baby

References

1. Schauberger, C. W., Rooney, B. L., and Brimer, L. M. Factors that influence weight loss in the puerperium. *Obstet. Gynecol.* 79(3):424–429 (March) 1992.
2. Mathey, S., Morgan, M., Healey, L., Barnett, B., Kavanaugh, D. J., and Howie, P. Postpartum issues for expectant mothers and fathers. *JOGNN* 31(4):428–435 (July/August) 2002.
3. Kennell, J. H., and Klaus, M. H. Bonding: Recent observations that alter perinatal care. *Pediatrics Rev.* 19(1):4–12 (January) 1998.
4. Sosa, R., Kennell, J., Klaus, M., Robertson, S., and Urrutia, J. The effect of a supportive companion on perinatal problems, length of labor, and mother-infant interaction. *N. Engl. J. Med.* 303(11):597–600 (September 11) 1980.
5. Peterson, G. H., and Mehl, L. E. Some determinants of maternal attachment. *Am. J. Psychiatry* 135(10):1168–1173 (October) 1978.
6. Winnicott, D. W. *Babies and Their Mothers*. Reading, MA: Addison-Wesley, 1987. Cited in Kennell, J. H., and Klaus, M. H. Bonding: Recent observations that alter perinatal care. *Pediatrics in Review* 19(1):4–12 (January) 1998.
7. Yalom, I. D., Lunde, D. T., Moos, R. H., and Hamburg, D. A. "Postpartum blues" syndrome. A description and related variables. *Arch. Gen. Psychiatry* 18(1):16–27 (January) 1968.
8. Lindemann, E. Symptomatology and management of acute grief. *Am. J. Psych.* 101:141–148, 1944.
9. Kay, J., Roman, B., and Schulte, H. M. Pregnancy loss and the grief process. In Woods, J. R., Jr., and Woods J. L. E. (Eds.) *Loss during Pregnancy or in the Newborn Period*. Pittman, NJ: Janetti Publications, 1997, ch. 1.
10. Leppert, P. C., and Pahlka, B. S. Grieving characteristics after spontaneous abortion: a management approach. *Obstet. Gynecol.* 64(1):119–122 (July) 1984.
11. Zeanah, C. H., Dailey, J. V., Rosenblatt, M.-J., and Saller, D. N., Jr. Do women grieve after terminating pregnancies because of fetal anomalies? A controlled investigation. *Obstet. Gynecol.* 82(2):270–275 (August) 1993.
12. Rubin, R. Puerperal change. *Nurs. Outlook* 9(12):743–755 (December) 1961.

13. Ament, L. Maternal tasks of the puerperium reidentified. *JOGNN* 19(4):330–335 (July/August) 1990.

14. Eidelman, A. I., Hoffman, N. W., and Kaitz, M. Cognitive deficits in women after childbirth. *Obstet. Gynecol.* 81(5, pt1):764–767 (May) 1993.

15. Kegel, A. H. Progressive resistance exercise in the functional restoration of the perineal muscles. *Am. J. Obstet. Gynecol.* 56(2):238–248 (August) 1948.

16. *Physicians Desk Reference*. RhoGAM (Ortho-Clinical). Accessed at www.healthandage.com/html/res/pdr/html/ on October 7, 2002.

17. Bowman, J. M. Hemolytic disease (erythroblastosis fetalis). In Creasy, R. K., and Resnik, R. *Maternal-Fetal Medicine*, 4th ed. Philadelphia: W. B. Saunders, 1999.

18. Bowman, J. M. The management of Rh-isoimmunization. *Obstet. Gynecol* 52(1):1–16 (July) 1978.

19. Gagnon, A. J., Edgar, L., and Kramer, M. S. A randomized trial of a program of early postpartum discharge with nurse visitation. *Am. J. Obstet. Gynecol.* 176(1, pt1):205–211 (January) 1997.

20. Lydon-Rochelle, M. T., Holt, V. L., and Martin, D. P. Delivery method and self-reported general health status among primiparous women. *Paediatric Perinat. Epidemiol.* 15(3):232–240 (July) 2001.

21. Hale, T. W. *Medications and Mother's Milk*, 10th ed. Amarillo. TX: Pharmasoft Publishing, 2002.

22. Rhode, M. A., and Barger, M. K. Perineal care: then and now. *J. Nurse-Midwifery* 35(4):220–230 (July/August) 1990.

23. Droegmueller, W. Cold sitz baths for relief of postpartum perineal pain. *Clin. Obstet. Gynecol.* 23:1039, 1980.

24. Jackson, E. B. The development of rooming-in at Yale. *Yale J. Biolog. Med.* 25:484, 1952.

• • • Additional References

Anonymous. Bereavement: who counsels the counselor? *J. Nurse-Midwifery* 36(3):151–152 (May/June) 1991.

Blackburn, S. T. *Maternal, Fetal, and Neonatal Physiology: A Clinical Perspective*, 2nd ed. Philadelphia: W. B. Saunders, 2002.

Brazelton, T. B. *Touchpoints: Your Child's Emotional and Behavioral Development*. Cambridge, MA: Perseus Publishing, 1994.

Enkin, M., Keirse, M. J., Neilson, J., et al. *A Guide to Effective Care in Pregnancy and Childbirth*. 3rd ed. Oxford, England: Oxford University Press, 2000.

Sears, W., and Sears, M. *The Baby Book: Everything You Need to Know from Birth to Age Two* (rev. ed.). Boston: Little Brown, 2003.

Temkin, E. Rooming-in: redesigning hospitals and motherhood in cold war America. *Bulletin of the History of Medicine*. 76(2):27–298 (Summer) 2002.

Woods, J. R., Jr., and Woods, J. L. E. (Eds.) *Loss During Pregnancy or in the Newborn Period*. Pittman, NJ: Janetti Publications, 1997.

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CHAPTER

43

Infant Feeding

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Breastfeeding—Optimal Infant Nourishment

Breastfeeding is the optimal way to nourish and nurture infants, and with the addition of complementary foods in the second half of the first year, continues to be of nutritional, immunological, and psychological significance well into the second year and beyond. Statements in support of breastfeeding have been issued by professional associations in the United States including the American Academy of Pediatrics (AAP) [1], Association of Women's Health, Obstetrical, and Neonatal Nurses (AWHONN) [2], American Dietetic Association (ADA) [3], and American College of Nurse-Midwives (ACNM) [4]. In their position statement, the ACNM:

1. Encourages efforts to inform and educate the public, health care providers and clients about breastfeeding as a normal process and as the preferred method of infant feeding.
2. Encourages health care providers to offer or arrange for a system of ongoing counseling and support for breastfeeding.
3. Promotes adoption of international, national, state, local and institutional policies that clearly support breastfeeding.
4. Encourages identification and removal of barriers to breastfeeding and opposes practices that discourage breastfeeding, and
5. Encourages the support of breastfeeding in the workplace and at school, and encourages institutions to provide optimal conditions to facilitate breastfeeding. [4]

During the last half of the twentieth century, appreciation of the uniqueness of human milk and the value of breastfeeding as a natural resource inspired government and private sector public health initiatives to promote, protect, and support breastfeeding. Priority goals and activities designed to increase breastfeeding initiation and duration are presented in documents such as those issued by the U.S. Breastfeeding Committee (USBC) [5] (Table 43-1) and the U.S Department of Health and Human Services [6] (Table 43-2).

Efforts designed to improve breastfeeding outcomes should include three features: breastfeeding promotion, protection, and support [7]. Breastfeeding promotion efforts focus on the advantages of breastfeeding to the individual baby and mother. Also included as promotion efforts are the dissemination of the advantages of breastfeeding in regard to the global ecology in decreased waste from bottles and the manufacturing process. Breastfeeding protection involves the legislated rights of women and children

TABLE 43-1 Goals of the U.S. Breastfeeding Committee

- Ensure access to comprehensive, current, and culturally appropriate lactation care and services for all women, children, and families.
- Ensure that breastfeeding is recognized as the normal and preferred method of feeding infants and young children.
- Ensure that all federal, state, and local laws relating to child welfare and family law recognize and support the importance and practice of breastfeeding.
- Increase protection, promotion, and support for breastfeeding mothers in the workforce.

Source: United States Breastfeeding Committee, Breastfeeding in the United States: A national agenda. Rockville, MD: DHHS, HRSA, MCHB, 2001.

TABLE 43-2 HHS Blueprint for Action on Breastfeeding

- Train health care professionals who provide maternal and child care on the basics of lactation, breastfeeding counseling, and lactation management during coursework, clinical and in-service training, and continuing education.
- Ensure that breastfeeding mothers have access to comprehensive, up-to-date, and culturally tailored lactation services provided by trained physicians, nurses, lactation consultants, and nutritionists/dietitians.
- Establish hospital and maternity center practices that promote breastfeeding, such as the *Ten Steps to Successful Breastfeeding*
- Develop breastfeeding education for women, their partners, and other significant family members during the prenatal and postnatal visits.

Source: U.S. Department of Health and Human Services, Office on Women's Health. Washington, DC, 2000.

that enable breastfeeding. These include adequate maternity leaves and appropriate child care facilities as well as the position that discreet breastfeeding in public places is not indecent exposure. Protection of breastfeeding also involves prohibiting certain marketing practices of companies manufacturing breast milk substitutes. *Support* of breastfeeding is accomplished through evidence-based hospital policies, health worker practices, and community programs that increase breastfeeding initiation and duration.

The in-hospital breastfeeding rate for the United States in 1998 was 64 percent, a rate substantially lower than the 75 percent initiation goal of the year 2000 Healthy People Goals (Figure 43-1) [6]. The five- to six-month breastfeeding rate data were released according to three racial and ethnic groups (Figure 43-2). For women identified as "Black," the rate was reported at 19 percent; for women identified as "Hispanic," the rate was 28 percent; and for women identified as "White," the rate was 31 percent. The combined six-month duration rate was estimated to be under 29 percent—less than half of the goal of 50 percent. The 2010 breastfeeding goals include an objective for breastfeeding at 12 months of 25 percent of women continuing to breastfeed. As Figure 43-3 illustrates, at

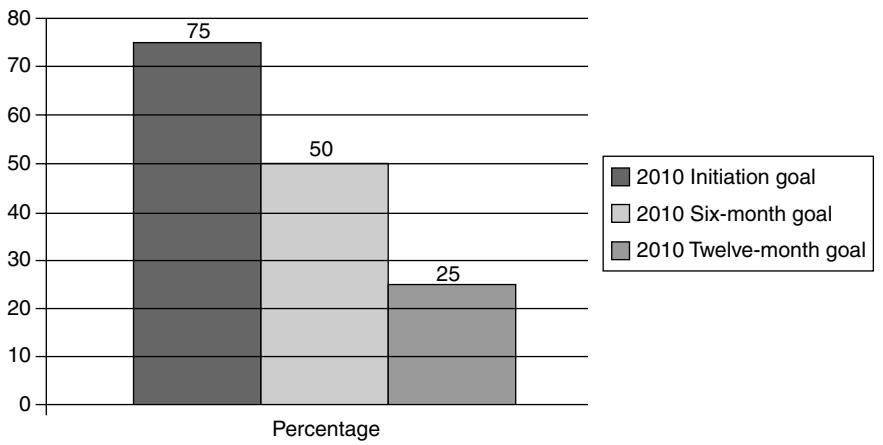

FIGURE 43-1 Healthy People Goals for Breastfeeding by 2010. *Source:* U.S. Department of Health and Human Services, Office on Women's Health, *HHS Blueprint for Action on Breastfeeding*, 2000.

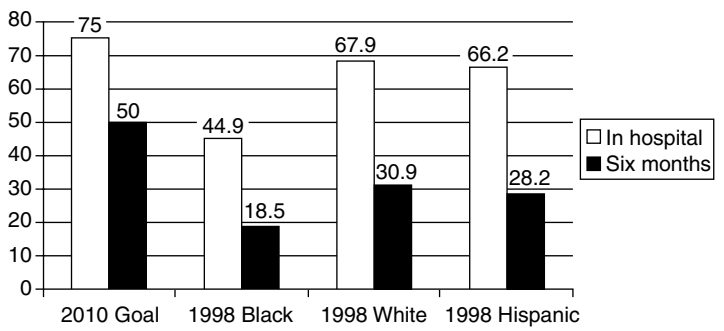

FIGURE 43-2 Percentages of infants in the United States reported as breastfeeding at hospital discharge and at six months.
Source: Ross Products Division, Abbott Laboratories, Ross Mothers' Survey.

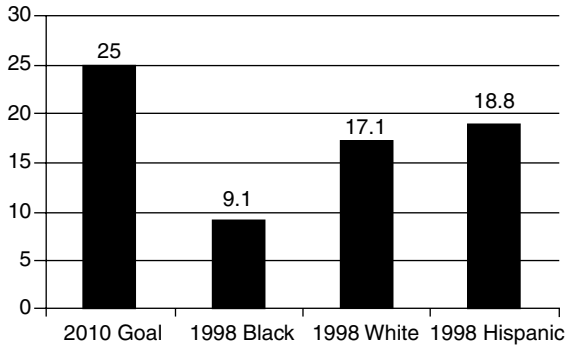

FIGURE 43-3 Percentages of infants in the United States reported as breastfeeding at one year.
Source: Ross Products Division, Abbott Laboratories, Ross Mothers' Survey.

12 months the disparity is pronounced, with only 9 percent of Black women, 19 percent of Hispanic women, and 17 percent of White women continuing to breastfeed (compared to the national goal of 25 percent of women continuing to breastfeed to one year). According to a report from USDA [8], meeting the Healthy People breastfeeding goals would save a minimum of $3.6 billion on only three diagnoses (otitis media, gastroenteritis, and necrotizing enterocolitis).

Maternal health advantages of having breastfed include the decreased risk of breast cancer [9] and increased bone density after weaning [10]. Breast cancer studies continue to indicate that accumulated duration of breastfeeding is a significant factor in reducing risk [11].

It is unclear whether the positive health outcomes attributed to individuals who have been breastfed are a result of the unique species-specific properties of human milk, the absence of exposure to potentially harmful formula components, or a combination of these factors. It is clear, however, that *not being* breastfed accrues recognized health risks to the baby. Exclusivity of breastfeeding and duration of breastfeeding also play a part in optimizing health outcomes. Babies should be fed breast milk exclusively (without formula or other foods) for about the first six months, adding appropriate complementary foods in the second half of the first year. Breastfeeding should continue to one year and then beyond as desired by the mother and baby [1, 12, 13].

The Baby-Friendly Hospital Initiative

The Baby-Friendly Hospital Initiative is an international effort developed by the World Health Organization (WHO) and UNICEF in 1991 to promote, protect, and support breastfeeding in hospitals and birth centers worldwide by encouraging the implementation of evidence-based best practices. Baby-Friendly USA was founded in 1997 as the responsible agency for the Baby-Friendly Hospital Initiative in the United States. In the United States, "Baby-Friendly" is a trademark of the U.S. Fund for UNICEF. The program has been built both nationally and internationally, around a list of ten research-supported practices, the Ten Steps to Successful Breastfeeding, that were developed for maternity facilities (Table 43-3) [14]. The change in three child health outcomes as a consequence of the

TABLE 43-3 Ten Steps to Successful Breastfeeding

Every facility providing maternity services and care for newborn infants should

1. Have a written breastfeeding policy that is routinely communicated to all health care staff.
2. Train all health care staff in skills necessary to implement this policy.
3. Inform all pregnant women about the benefits and management of breastfeeding.
4. Help all mothers initiate breastfeeding within one hour of birth.
5. Show mothers how to breastfeed and how to maintain lactation even if they should be separated from their infants.
6. Give newborn infants no food or drink other than breast milk, unless *medically* indicated.
7. Practice rooming-in in order to allow mothers and infants to remain together 24 hours a day.
8. Encourage breastfeeding on demand.
9. Give no artificial teats or pacifiers.
10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

Source: World Health Organization/UNICEF, 1989.

implementation of these ten steps has been studied in the large-scale PROBIT trial in Belarus [15]. Sixteen hospitals and polyclinics were randomly chosen to change policy and practice regarding breastfeeding using the Ten Steps to Successful Breastfeeding of the WHO/UNICEF BFHI, and 15 hospitals and polyclinics (the control group) did not. There was a significant difference in the duration and exclusivity of breastfeeding among infants born in the intervention sites. These changes were found to be significantly correlated to decreased risk of gastrointestinal tract infection and atopic eczema in the first year of life.

The International Code of Marketing of Breast-milk Substitutes

The World Health Assembly (WHA) adopted the International Code of Marketing of Breast-milk Substitutes in May 1981. All governments were enjoined to regulate marketing practices that promote artificial feeding (formula and other breast-milk substitutes) as well as the use of artificial feeding devices such as bottles and "rubber" nipples in an effort to protect breastfeeding.

One of the four operational targets of the Innocenti Declaration [16] to which the United States is a signatory is that by 1995 all governments would have "taken action to give effect to the principles and aim of all of the *Articles of the International Code of Marketing of Breast-milk Substitutes* and subsequent relevant World Health Assembly resolutions in their entirety" [17]. By 2002, no substantive action had been taken to implement the International Code of Marketing of Breast-milk Substitutes in the United States although evidence continues to accumulate that supports the Code. For example, the consequence of health care providers distributing formula company "gifts" (in the form of discharge bags as well as those designed to be given to antepartum mothers) has been studied and found to have a significant negative impact on breastfeeding outcomes, yet the practice continues. Howard and colleagues tested the effect of prenatal "gifts" from a formula company distributed to mothers via an obstetrical practice as compared with a noncommercial educational pack [18]. The study found that exposure to formula materials significantly increased the risk of weaning within the first two weeks. Among women with uncertain feeding intentions or short-duration goals, receipt of formula promotion materials significantly reduced rates of exclusive breastfeeding as well as duration. The authors conclude: "Educational materials about infant feeding should support unequivocally breastfeeding as optimal nutrition for infants; formula promotion products should be eliminated from prenatal settings" [18].

Distribution of formula company "gift" bags from the maternity unit at discharge has also been found to negatively impact breastfeeding outcomes [19] and the ethics of health care providers who participate in the marketing of formula has been questioned as well [20].

Anatomy and Physiology of Lactation

The breasts, or human mammary glands, begin their development in the fifth week of embryonic life from the milk lines, a line of glandular tissue. Occasionally, residual tissue from the milk line remains and accessory mammary tissue can develop anywhere along this line (Figure 43-4). The mammary gland is the only organ that is not fully developed in fetal life with continuing development through puberty to the duct end-bud stage and further growth in pregnancy and lactation.

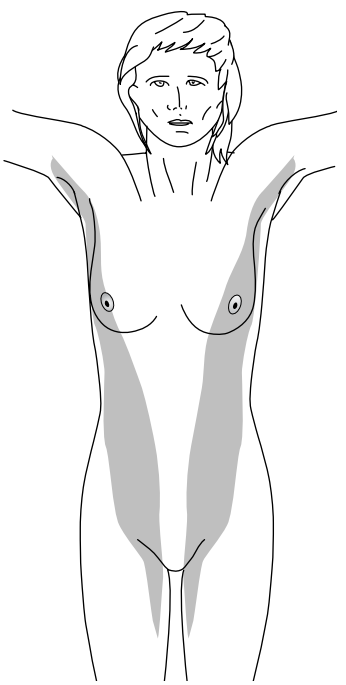

FIGURE 43-4 Possible locations of accessory breast and/or nipple tissue.

Source: Cadwell, K., Turner-Maffei, C., O'Connor, B., and Blair, A. *Maternal and Infant Assessment for Breastfeeding and Human Lactation: A Guide for the Practitioner*. Sudbury, MA: Jones and Bartlett Publishers, Inc., 2002.

The breast tissue includes two major divisions: the parenchyma and the stroma. The parenchyma includes the orderly, treelike lactiferous ducts that open onto the surface of the nipple and the lobular-alveolar structure. The stroma includes the connective tissue, fat (adipose) tissue, blood vessels, and lymphatics (Figure 43-5).

The functional unit of milk making is the alveolar cell, which produces milk and excretes it into the lumen of the alveolar sack. Ductules and ducts carry milk from the alveolus to the nipple pore.

The skin of the breast includes the nipple, located slightly below the midpoint of the breast, and the areola, which surrounds the nipple. The nipple end has 15 to 25 small openings that are the endings of ducts that connect back to the lobular-alveoli system. The elastic nipple contains smooth muscle fibers and is enervated with both sensory and autonomic nerve endings; it is a system that causes the nipple to become smaller and firmer in response to cold, touch, and sexual stimulation. Surrounding the nipple, the areola is a circular area, also elastic and usually more darkly pigmented than the general skin of the breast. The size of the areola varies from woman to woman and enlarges and darkens during pregnancy and lactation. It has been suggested that the darker color of the areola may serve as a visual signal to the newborn and aid in orienting the infant to the breast for feeding.

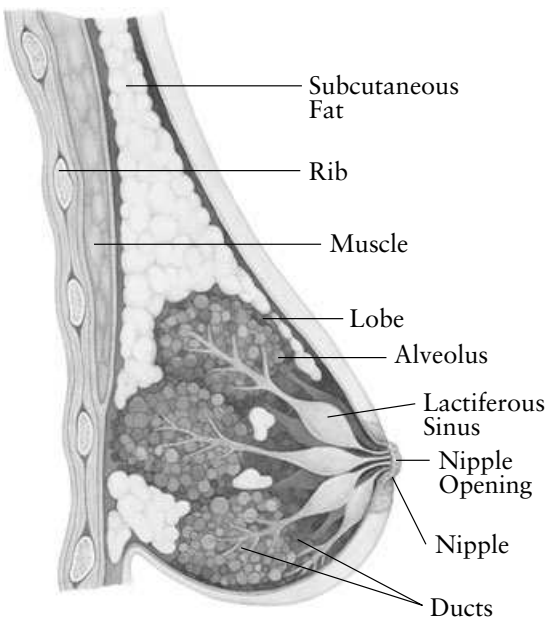

FIGURE 43-5 Side view of lactating breast.

Source: Walker, M. L. *Core Curriculum for Lactation Consultant Practice*. Sudbury, MA: Jones and Bartlett Publishers, Inc., 2002.

Montgomery's tubercles look like small pimples on the areola during pregnancy and lactation. They secrete a substance that is both lubricating and antimicrobial, protecting the nipples and areolae during pregnancy and lactation.

The breast is enervated by the fourth, fifth and sixth intercostal nerves.

During pregnancy, the size of the breast increases and the weight also increases from approximately 200 g to 400–600 g. In the first trimester of pregnancy, the woman's breasts respond to the changing levels of circulating hormones with rapid ductular-lobular-alveolar growth. During the third month of pregnancy, a secretory material known as colostrum begins to appear under the influence of prolactin, and in the last trimester the alveoli are filled with colostrum. By the sixteenth week of pregnancy, the breast is fully prepared for lactation, the physiologic completion of the reproductive cycle.

In lactation, the functioning mammary gland responds to complex nervous system and endocrine system signals in order to produce and deliver milk. The lactating breast weighs from 600 to 800 g. The mammary gland involutes, or regresses, during and after weaning but does not return to its prepregnancy state. During involution, the alveoli gradually collapse, any remaining secretion is absorbed, and adipose tissue increases within the breast.

Luteal and placental hormones influence the breast development of the pregnant woman, resulting in increased duct sprouting, branching, and lobular formation. Placental lactogen, prolactin, and chorionic gonadotropin are responsible for the continued and accelerated growth, with estrogen and progesterone also playing a role. Prolactin is the essential hormone for lobular-alveolar completion in pregnancy and initiates milk secretion via receptors on the alveolar cell walls. The prolactin-inhibiting factor (PIF) from the hypothalamus negatively controls prolactin, which is secreted by the pituitary. Although prolactin levels increase as much as tenfold to twentyfold during pregnancy, milk is not produced because of the elevated levels of progesterone. With the delivery of the placenta, estrogen and progesterone drop; high prolactin levels are maintained through the effect of suckling, and copious milk secretion begins and is noted clinically two to three days postpartum. Without nipple stimulation, prolactin levels drop to those of nonpregnant, nonlactating women within two weeks. Suckling via nipple stimulation provides the stimulus for prolactin release.

Within the breast, there are also local mechanisms of control of milk production. For example, milk removal stimulates milk synthesis and when milk is not removed secretion ceases over a period of days. The rate of milk synthesis and the amount of milk produced may vary from one breast to the other according to the frequency of suckling and the amount of milk removed.

During pregnancy the breast becomes increasingly sensitive to tactile stimulation as it prepares for the stimulation of breastfeeding and the task of ejecting milk. During suckling, oxytocin is released as the nipple is stimulated and stretched and also through sensory pathways when the mother sees, feels, touches, or hears stimuli that remind her of the baby and breastfeeding. Oxytocin causes the myoepithelium to contract, ejecting the milk from the alveoli and lobules. At 15, 30, and 45 minutes after the baby is born, significant elevations of oxytocin occur if the baby is placed skin-to-skin. If the baby does not suckle, the levels of oxytocin return to baseline [21]. Oxytocin is the hormone that promotes mother-infant bonding as well as other maternal behaviors.

Lactogenesis begins approximately 12 weeks before parturition as lactogenesis I and is initiated in the postpartum by the rapid fall in progesterone after the delivery of the placenta (lactogenesis II). Stage II is marked by copious secretion of milk two to three days postpartum. Galactopoiesis (stage III lactogenesis) is the ongoing production of mature milk. Weaning results in breast involution, which is characterized by two distinct physiological processes: the secretory cells undergo apoptosis (programmed cell death) and the mammary gland's basement membrane undergoes proteolytic degradation [22]. During breast involution, most mammary epithelium is reabsorbed.

Antepartum Preparation for Breastfeeding

Midwifery assessment of the pregnant woman for breastfeeding should include a physical assessment and evaluation of the breasts as well as the taking of a careful history.

History

In taking a history, the midwife should ask for the woman's age at onset of menses, whether there has been any chest or breast surgery, injury or trauma, any family history of breast cancer, or any history of discharge from the nipple(s). The midwife should also ask the woman if her breasts have been sore at any time during her menstrual cycle and if she has noticed breast changes during this pregnancy, such as tenderness or increase in breast size. Who among her family and friends has breastfed? Who will support her in breastfeeding? The midwife should ask a multipara if she has breastfed before, and if so how was that experience? What medications or herbs does she take on a regular or an intermittent basis? In addition, a discussion of infant feeding plans with an opportunity for the parents to ask questions should be part of the care plan.

Physical Assessment

The breast is divided into four quadrants for reference purposes: (1) the upper outer quadrant, (2) the lower outer quadrant, (3) the lower inner quadrant, and (4) the upper inner quadrant. The size of the breast varies from woman to woman and is not related to the ability to produce sufficient milk for the infant. The size and shape of the two breasts should be similar to each other. Markedly discrepant breasts may indicate diminished functional tissue, so close follow-up—including frequent weight checks of the breastfed baby—is imperative if the mother presents with this condition [23].

Increase in the size of the breast and the Montgomery glands along with the appearance of visible veins with an overall pattern on the breast indicate that the breasts are preparing for milk secretion. By the end of pregnancy, most women have noted breast changes. An occasional woman may experience most of the breast changes associated with pregnancy in the early days postpartum. Further evaluation of the breasts, the mother's hormones, and breastfeeding is indicated if breast changes are absent. Gigantomastia (extreme breast overgrowth) of pregnancy has been reported and is considered incompatible with breastfeeding. Underdeveloped breasts (micromastia) may indicate lack of glandular tissue or hormonal imbalance. Additional breast tissue and nipples (polymastia) may occur along the "milk line" that extends from the axilla to the groin (see Figure 43-4). This tissue is rarely fully functional although filling and involution may be experienced. The mother may need help with comfort techniques (warm or cold compresses, whatever feels best) during involution; breastfeeding proceeds normally in the two functioning breasts.

Because trauma to the chest could seriously impact the potential of the breast to produce and de-

liver milk, examination of the breasts and axilla should include questions related to any history of injury or surgery (including biopsy, reduction, and augmentation), and the midwife should consider the impact of the trauma on the ducts and nerves in the assessment. Signs of current inflammation, infection, or abscess should also be noted and treated.

An enervated nipple with patent ducts is necessary to continued production of milk. Lack of everted or enervated nipple tissue will not affect lactogenesis II (the copious production of milk "coming in") but will compromise the continuing production of milk (lactogenesis III). Congenital inverted nipples (nipples that retract toward the chest wall rather than protruding from the breast) have been studied in randomized controlled trials to determine the best method of correction. Neither the wearing of hard plastic shells designed for this purpose nor the performance of nipple exercises are more effective than natural softening effects of the hormones of pregnancy in everting previously inverted nipples [24]. Inverted nipples have been classified into three grades [25]:

1. Grade 1 inverted nipples are easily pulled out (by using a breast pump or by the infant nursing well, for example).
2. Grade 2 inverted nipples can be pulled out but do not maintain their projection (most inverted nipples fall into this category).
3. Grade 3 inverted nipples are difficult or impossible to pull out.

Experimental studies of postpartum nipple eversion techniques have not been published. If the nipple does not evert inside of the infant's mouth during nursing, the nipple may not be stimulated adequately and the milk supply will diminish over time. Inverted nipples in the mother are closely correlated with malnutrition and dehydration in studies of readmission of breastfed infants.

Engorgement or fullness of the breast may also temporarily invert nipples. This may make it difficult for the infant to latch on and for the nipple to stretch well back into the baby's mouth. Fullness may be relieved by hand expressing, soaking the breasts in a basin of lukewarm water, or gentle pumping.

Unusually shaped or sized nipples are usually congenital, although trauma may also be the cause. The functionality of the nipple must be assessed. The midwife should consider the patency of the nipple pores as well as the ability of the baby to stretch and suckle the nipple. Close follow-up may be needed to ensure adequate milk transfer.

Cancer of the breast may cause distortion of the nipple and the breast. Prompt referral is required if this or any other signs of breast cancer are detected.

Discussion of Infant Feeding Plans

The midwife can begin the discussion of infant feeding plans with an open-ended question such as "What have people told you about breastfeeding?" rather than asking, "Do you plan to breastfeed?" Pregnancy is the optimal time to deal with misconceptions and to explore information gaps. "What do you think breastfeeding will be like for you?" is another question that opens discussions. The midwife should listen for indications of self-doubt and/or misinformation—for example, comments such as "no one in my family makes good enough milk," "my breasts are too big (or too small)," or "I tried before and the baby never latched on"—and provide support to the pregnant woman by clarifying and teaching. Document the mother's understanding of breastfeeding in order to reinforce your teaching at a later time and continue to aid the mother in the development of her feeding plans.

Previous breastfeeding experiences (if any) should be discussed as well. Ask about how breastfeeding worked out before? What would the mother change for this time? How can the midwife help? This discussion is especially important if the woman stopped breastfeeding before she had intended. What problems did she have and how does she explain their etiology? What did she do to seek help?

A referral for a prenatal consultation with a lactation specialist may be appropriate for the pregnant woman who has had a prior lactation failure. An in-depth evaluation of the physical and psychosocial factors that played a part in her previous breastfeeding experience and discussion with a specialist may provide the education and reassurance needed to enable successful breastfeeding.

Ask the pregnant women what she is doing to prepare for breastfeeding. Discourage prenatal nipple preparation, vigorous nipple scrubbing with loofah sponges or rough washcloths, and any other potentially harmful activities. Nipple stimulation is known to cause uterine contractions [26] and is to be avoided during pregnancy in order to not risk initiating preterm labor. The use of hard plastic shells worn inside the bra during the last trimester of pregnancy with the intention of everting a flat or inverted nipple has not been shown to be effective in a randomized control trial [27]. Instead, the control group, which received no treatment, had the

greatest sustained improvement. In addition, the women who received the shells to correct their nipple inversion initiated breastfeeding at the lowest rate and stopped breastfeeding before six weeks at a significantly higher rate than the women who had been randomly assigned to groups that did not receive the shells.

Later prenatal discussions should also include the advantages of breastfeeding the baby soon after birth, rooming-in, and nursing on cue.

The Effect of Birth Practices on Breastfeeding

During pregnancy, the majority of women interviewed will indicate that they plan to "try" breastfeeding. However, in many areas, breastfeeding *intention* rates are much higher than *initiation* rates. A Canadian report found that while approximately 80 percent of mothers intended prenatally to breastfeed, only 30 percent breastfed for at least six months [28].

Similar discrepancies between breastfeeding intention and practice are found in the United States. The WIC Infant Feeding Practices study examined the experience of a sample of participants of this federal nutrition program for women, infants, and children from low-income to moderate-income families [29]. While 56 percent of mothers in this study initiated breastfeeding, only 46 percent were still breastfeeding (30 percent exclusively and 15 percent mixed feeding) at discharge. Participants had a number of experiences during the peripartum period that were detrimental to breastfeeding, including late initiation of breastfeeding after birth, extended separation from infant, supplementation with formula, limited or no help with breastfeeding problems, and receipt of gift packages including formula. Maternal race and ethnicity were found to be significantly associated with experience of detrimental practices. African American infants were among those most likely to receive formula supplements and to spend a night in the hospital nursery.

Other potentially detrimental experiences in childbirth and the postpartum period include receipt of anesthesia and analgesia during labor, delayed maternal-infant contact, delayed initiation of breastfeeding, maternal/infant separation, unnecessary supplementation of breastfed infants, and limited or no breastfeeding teaching and support.

A correlation between use of anesthesia and analgesia and disturbances in infant neurobehavioral functioning and suckling has been noted by several sources [30, 31, 32, 33]. Others have suggested that these effects are confounded by multiple factors including the variety of pain relief medications and protocols used as well as the impact of different childbirth and postpartum practices [34, 35].

Continuous support during labor and birth has also been linked with enhanced breastfeeding initiation and exclusivity [36]. A large trial in Mexico found that the frequency of exclusive breastfeeding was significantly higher among women who received psychosocial support during labor. These findings support the hypothesis that women who are nurtured throughout the childbearing process may be better able to nurture and nourish their babies. The midwife is in a unique position to offer support during labor and birth to women she has come to know in pregnancy and whom she will also care for in the postpartum period. This enhanced and long-term relationship makes the midwife's support and nurturing of these women even more powerful.

Successful Breastfeeding

The Ten Steps to Successful Breastfeeding and the Baby-Friendly Hospital Initiative

Research demonstrates that the management of the mother and baby in pregnancy, delivery, and the postpartum period influences the outcome of breastfeeding. In recognition of the importance of childbirth practices, UNICEF and the World Health Organization (WHO) created the Baby-Friendly Hospital Initiative (BFHI) to recognize maternity facilities that have worked to create a facility-wide environment that promotes, protects, and supports breastfeeding. This international initiative is constructed around *Ten Steps to Successful Breastfeeding* (see Table 43-3), a list of practices that are well supported by scientific evidence [37].

Step 1 calls for establishment of a facility-wide breastfeeding policy to guide practice. Step 2 indicates that all staff need to be oriented to the facility's breastfeeding policy and be knowledgeable of its content. Staff who interact with breastfeeding mothers and babies need sufficient training to implement the policy. A minimum of 18 hours of breastfeeding training is required of the maternity staff of a Baby-Friendly birth facility. Step 3 identi-

fies the importance of integration of parental education about breastfeeding during prenatal care and childbirth education.

Early mother-infant contact and early initiation of breastfeeding are the focus of Step 4. Righard and Alade have demonstrated that unrestricted skin-to-skin contact in the first hour postpartum is beneficial to breastfeeding [33]. After an hour of uninterrupted skin contact with their mothers, infants of nonmedicated births demonstrated an ability to crawl to the breast, root, attach, and begin to suckle. Swedish midwife-researchers discovered that infants who touched or licked the nipple or areola during the first 30 minutes after birth appear to elicit more interaction with their mother: their mothers were less likely to send the infant to the nursery and were more likely to talk to their infant during feedings [38]. Here again the midwife is in a unique position that allows her to support and facilitate early and prolonged contact between mother and baby and to assist in initiating an early first feeding. She can assist and observe this first feeding and another feeding later on when she does her postpartum rounds.

Step 5 indicates the importance of positive and frequent breastfeeding teaching interactions between staff members and mothers. Breastfeeding is a learned behavior, not an instinctive one. Mothers want and need the support of their caregivers during the critical early period. Gill has identified a gap between mother's expectations and the care they receive, finding that mothers want much more contact with their caregivers, more encouragement, more practical information and more consistency in the information they received from their health care team [39]. Mothers particularly wanted a midwife or nurse to stay with them throughout an entire feeding.

Step 6 discourages unnecessary supplementation of breastfed infants. The Baby-Friendly Hospital Initiative has identified a list of medical indications for supplementation (Table 43-4). Supplementation that is not medically necessary puts the exclusivity and duration of breastfeeding at risk. Research has indicated that receiving formula may delay the onset of lactation [40]. This step also links with the International Code of Marketing of Breast-milk Substitutes, which indicates that maternity facilities should not give breastfeeding women any literature, gift items, or samples from infant food manufacturers.

Step 7 calls on hospitals to practice rooming-in, keeping mothers and babies together throughout their stay, except when separation is medically necessary (see Chapter 42). Close contact assists the parents in learning their baby's feeding cues and increases the available feeding opportunities. Klaus has suggested that the effect of the hormone oxytocin, which is increased through physical contact and nipple stretching, may enhance the maternal-infant bond and decrease the risk of abandonment [41].

TABLE 43-4 Acceptable Medical Reasons for Supplementation

- Infants with very low birth weight (less than 1500 g) or those born before 32 weeks gestational age
- Infants with severe dysmaturity with potentially severe hypoglycemia, or who require therapy for hypoglycemia, and who do not improve through increased breastfeeding or by being given breast milk
- Infants whose mothers have severe maternal illness (e.g., psychosis, eclampsia, or shock)
- Infants with inborn errors of metabolism (e.g., galactosemia, phenylketonuria, maple syrup urine disease)
- Infants with acute water loss—for example, during phototherapy for jaundice, whenever increased breastfeeding or use of expressed breast milk cannot provide adequate hydration
- Infants whose mothers require medication that is contraindicated when breastfeeding (e.g., cytotoxic drugs and radioactive drugs)

Source: From U.S. Committee for UNICEF and Wellstart International

Step 8 clarifies the importance of offering the breast according to infant feeding cues, rather than clock timing. A Cochrane review of the data regarding unrestricted versus restricted breastfeeding concluded that restricted breastfeeding was associated with an increase in the incidence of sore nipples, engorgement, and the need to give supplemental formula. In contrast, demand feeding was associated with fewer breastfeeding problems and a longer overall duration of breastfeeding [42].

Step 9 indicates that the use of pacifiers and bottle nipples should be avoided unless medically indicated. Time spent sucking on pacifiers or bottle nipples is sensation lost to the breast and endocrine system. Early use of pacifiers and nipples is associated with decreased duration and exclusivity of breastfeeding [43]. Howard and colleagues suggest that these decreases in breastfeeding may be due to less frequent feeding, and thus less stimulus to the milk-making cells [43]. Pacifier use has also been linked with recurrent ear infection [44].

Step 10 clarifies the responsibility of the maternity facility to assist mothers in finding postpartum

support. Breastfeeding women need proactive community services and resources. The maternity facility should take an active role in fostering the growth of culturally appropriate community resources, ranging from professional lactation services to peer counseling to mother-to-mother support. The facility should assist mothers in connecting with appropriate support services. Research indicates that community support can not only increase breastfeeding success, but also demonstrate measurable improvements in infant health: Pugh and colleagues found that support provided by a nurse/peer counselor team increased the duration of breastfeeding, and decreased the infant's number of sick visits and medications [45].

Evaluation of the implementation of these ten steps has identified a synergistic effect of the steps: the more beneficial practices women experienced, the less likely they were to stop breastfeeding early [46]. Late initiation of breastfeeding and supplementation of the breastfed infant were the strongest risk factors for early termination of breastfeeding in this study.

Newborn Behaviors

Healthy, full-term infants display a sequence of behaviors after birth that culminate in feeding at or around the end of the first hour of life [47]. Using the senses of touch, smell, sight, and hearing, and reflexes including stepping/crawling and rooting, newborn infants can locate and attach to the breast without assistance. The first hours of life are considered a sensitive period for breastfeeding. Optimal mother-infant contact during this period has been associated with better breastfeeding outcomes. When skin contact does not or cannot occur during the early sensitive period, and after use of pain relief during delivery, research suggests that prolonged skin-to-skin contact may revitalize the infant's quest to the breast [48, 49].

Infant behavior has been categorized into six states: (1) deep sleep, (2) light sleep (or active sleep), (3) drowsy, (4) quiet alert, (5) active alert, and (6) crying [50]. After the first hour, the infant signals its feeding readiness by eliciting cues, including making mewing sounds, yawning, stretching, movements of mouth (including smacking, salivating, searching with lips and tongue), moving hand to mouth or face, rooting, and head bobbing. These activities are characteristic of drowsy, quiet-alert, and active alert states. Crying is a late hunger cue. Crying infants are disorganized and are not able to move directly from crying into feeding. Nonetheless, crying is widely accepted as a feeding cue in American culture. Mothers should be supported in discerning and responding to their infant's early feeding cues. Feeding on demand would be better described as feeding on cue.

Positioning and Latch

Comfortable positioning for breastfeeding is imperative. Nipple and breast soreness are not normal sequelae of breastfeeding; rather, the most common cause of soreness is incorrect positioning and attachment at the breast.

Mothers should be adequately supported by their chair or bed. There is no one right position for breastfeeding. The Madonna, cross-cradle, and football positions are often helpful for new mothers. However, there is no need to adjust positioning if mother and infant are comfortable, and adequate milk transfer is occurring.

In the Madonna (or "cradle") position (Figure 43-6), the infant lies on its side, facing the mother. The infant's head, neck, and upper back rest on the forearm of the lateral breast. The mother uses her opposite hand to support the breast as needed.

FIGURE 43-6 Madonna position.

Source: Walker, M. L. *Core Curriculum for Lactation Consultant Practice*. Sudbury, MA: Jones and Bartlett Publishers, Inc., 2002.

In the cross-cradle position (Figure 43-7), the infant lies on its side, facing the mother. The infant's head, neck, and upper back rest in the mother's contralateral palm and along her forearm. The mother uses her other hand to support the breast as needed.

In the football (or "clutch") position (Figure 43-8), the infant lies on its side or back curled between the mother's arm and the side of her chest. The mother's forearm and hand support the infant, and she uses her other hand to support the breast as needed.

FIGURE 43-7 Football position.

Source: Walker, M. L. *Core Curriculum for Lactation Consultant Practice*. Sudbury, MA: Jones and Bartlett Publishers, Inc., 2002.

FIGURE 43-8 Cross-cradle position.

Source: Walker, M. L. *Core Curriculum for Lactation Consultant Practice*. Sudbury, MA: Jones and Bartlett Publishers, Inc., 2002.

FIGURE 43-9 Sidelying position.

Source: Walker, M. L. *Core Curriculum for Lactation Consultant Practice*. Sudbury, MA: Jones and Bartlett Publishers, Inc., 2002.

In the sidelying position (Figure 43-9), mother and infant lie on their sides facing each other. This position is often the most comfortable for mothers recovering from surgical birth.

In order to feed well, infants must utilize a wide-open mouth latch, as shown in Figure 43-10 [51]. In order to achieve a wide gape, the infant's nose is aligned with mother's nipple. The mother provides gentle support to the infant's head and neck by resting her hand on the infant's occipital bones, and allows the infant's head to move back in a pose, as if sniffing a flower. As the infant's lower jaw gapes, the mother gently moves the infant in toward the breast, aiming the infant's bottom lip toward the outer edge of the areola. This results in an asymmetrical rather than centered latch. The infant's mouth should be completely full of breast tissue. The infant uses its lips, tongue, oral cavity, jaw, facial muscles, and buccal fat pads to generate both

FIGURE 43-10 Wide-open latch.

Source: Used with permission © Health Education Associates.

negative and positive pressure, drawing forward the milk. The mother's hormonal response to nipple stretching and stimulation increase oxytocin circulation, which causes the myoepithelial cells to eject milk into the baby's mouth.

Breastfeeding has a visible and audible rhythm. The infant suckles in a burst of short, rapid, pistonlike motions of the jaw at the beginning of the feeding, followed by a slower, deeper rocking motion as the jaw indents the breast, drawing out milk. The ratio of sucks to swallows is high in the initial pistonlike phase, and reduces to 1:1 or 2:1 as the milk flows rapidly in the slower rocking phase.

Optimal Feeding Management

Optimal feeding frequency ranges between 8 and 12 feeds daily [1]. Although it is easy to divide a 24-hour day by 8 to 12 feedings, and come up with projected schedule, this is not how most infants feed. Most infants cluster several feedings within a stretch of a few hours, sleep for several hours, and awaken to cluster feed again. Mothers should be encouraged to feed in response to infant feeding cues, and stop feeding when the infant reaches satiety. (Satiety cues include full body relaxation, falling asleep at the breast, releasing the nipple, etc.) It is not necessary for the infant to feed from both breasts during each feeding. The mother should allow the infant to nurse on the first breast until satiety cues are seen. She may then offer the second breast, and allow the infant to determine how long to nurse on that side (if at all). If one breast is not nursed during a feeding, it should be offered first at the next feeding.

Timing the frequency and duration of feeds is unnecessary and may be detrimental to infant growth and maternal milk supply.

The best indicator of milk sufficiency is the infant's output and weight gain. It is expected that the newborn will (1) have a minimum of three to four bowel movements each 24 hours, that stools should be about 1 tablespoon or larger, and that after the third day, stools will be yellow in color; (2) wet a minimum of one to two diapers the first day, and six or so diapers daily after the third day; (3) gain more than 15 to 30 grams daily after the mature milk has come in; (4) be at or above birth weight by 10 days of age [52].

Breastfeeding should be comfortable for mother and infant. A mother should be encouraged to report any discomfort to her midwife or breastfeeding counselor as soon as possible. It is much easier to correct technique in the early days than to remedy problems later. Research suggests that clinical indicators of breastfeeding problems can usually be seen prior to discharge from the maternity unit [53]. Women report that a health care worker's observation and assistance throughout at least one complete feeding in the hospital or community is key to their breastfeeding success [54].

Finding Support

Midwives and other health care providers are important sources of breastfeeding support in the postpartum period, as well as friends, family, breastfeeding peer counselors, lactation care providers, and informal and formal support networks including the La Leche League and the Nursing Mothers Counsel. Mothers often require assistance in locating appropriate resources. Information about how to find breastfeeding support should be a routine part of discharge teaching. Proactive support services that reach out to mothers rather than waiting for the mother to call for help are among the most powerful strategies. Meeting the community support person before a new mother leaves the hospital usually makes her more likely to call for help as soon as a problem surfaces. Breastfeeding peer counseling has been shown to be effective in increasing the initiation, duration, and exclusivity of breastfeeding [55, 56, 57, 58, 59]. A message resounds throughout the body of knowledge about breastfeeding support. Ertem and colleagues state that "interventions aimed at prolonging the duration of breastfeeding . . . will need to shift focus from increasing knowledge and managing problems of lactation to enhancing mother's confidence regarding breastfeeding"[60]. This study found that the problems a woman experienced during lactation were not associated with early weaning. Rather it was the degree of a mother's confidence in her ability to overcome hurdles that was significantly associated with early weaning. Breastfeeding has been called a "confidence game." Midwives should focus breastfeeding support in a manner that nurtures the growth of women's confidence.

Problem Prevention and Management

As discussed above, breastfeeding problems are best prevented by optimizing antepartum care, childbirth routines, and breastfeeding management and

by providing proactive maternal support. Maternal and infant comfort level and infant's growth and output are important hallmarks of feeding. Common challenges to the breastfeeding dyad include nipple and breast discomfort, infant digestion and sleep, medical concerns, and lifestyle issues.

Nipple Discomfort

Nipple soreness is one of the most common reasons women give for early weaning. Researchers report that between 11 to 96 percent of mothers experience nipple soreness [61]. Rather than an expected sequela of breastfeeding, clinical impressions indicate that early onset nipple discomfort is caused by poor positioning and attachment of the newborn. Pain and soreness may be immediately relieved by improvements to the infant's positioning and attachment. In cases where fissuring and abrasion of the nipple and areola have occurred, pain should be greatly reduced with improvements to positioning and attachment. However, resolution of pain may not occur until damaged skin is completely healed. Nipple pain that is not resolved by improvements to positioning and attachment may be complicated by the following:

1. Inflammation due to reaction to topical creams, detergents, soaps, etc.
2. Infection with *Candida albicans* [62], *Staphlococcus aureus* [63], or rarely other infectious agents.
3. Damage from equipment or clothing (poor fitting bras, damp bra pads or bra cups, nipple shields, breast shells, and misused pumps and other gadgets).
4. Eczema or psoriasis of the nipple and areola.
5. Raynaud's phenomenon, vasospasm of the nipple that results in a color change of the nipple in response to exposure to cold air (as occurs at the end of a feeding) [64].
6. Rarely itching, burning, and eczema-like changes to the nipple and areola may be caused by Paget's disease of the breast, a cancerous condition [65].

Research regarding various suggested soothing topical treatments has demonstrated that there is no clear superiority of any treatment other than corrected positioning and, in one study, the application of warm compresses [66, 67].

Treatment protocols for *Candida* infection include treatment of the nipple with topical nystatin, miconazole, or clotrimazole [68].

Breast Discomfort

Discomfort in the lactating breast may be related to engorgement, plugged ducts, mastitis, abscess, and other processes.

Engorgement is the condition of excessive fullness in the breast. The engorged breast is likely to be hot and painful with tight, shiny skin. In the early postpartum period, the engorged breast is not necessarily only full of milk; it also contains extra blood and lymph drawn there by the hormonal changes precipitating the production of mature milk. Restricted feeding schedules are thought to be the main determinant of engorgement [69]. In order to prevent engorgement, and to relieve it when it has occurred, mothers should be encouraged to feed their infant based on cue, and with comfortable positioning. Research examining comfort modalities for the treatment of engorgement has found that the greatest relief for the engorged breast comes from breastfeeding [69, 70]. Milk must be drained in order for mother to experience relief. If the baby is unable to attach to the very swollen breast, warm soaks, cool packs, and/or gentle hand expression of milk (see Chapter 62) should be utilized until milk begins to flow and the breast softens a bit.

Plugged ducts—also referred to as clogged or caked breasts—are a fairly common occurrence in the early weeks of breastfeeding. Plugged ducts are thought to result from restriction of milk flow due to internal or external pressure (e.g., engorgement, tight bras, and clothing). Mothers should be encouraged to feed frequently, preferentially offering the affected breast first, when the infant is hungriest, to attempt to drain the plugged areas. Many clinicians suggest changing the orientation of the infant's position so that the infant's chin points to the plugged segment of the breast. This is thought to focus the massaging action of the tongue on the plugged area. Untreated plugged breasts may progress into mastitis; it is important to assist mothers in determining the factors that contribute to this problem, and in improving the milk flow during feedings.

In approaching this and other breastfeeding problems, it may be helpful to think like a detective. Look at the breast for signs of bra tracks, bruises, and other trauma; watch the mother and baby closely throughout a feeding. Is the mother compressing her breast? Is the baby too high or too low in her arms? Most problems are multifactoral, and require a bit of detective work to solve. Plugs that

do not respond to treatment may be unrelated to breastfeeding. When plugs do not resolve within 24 to 48 hours, mothers should be referred for further evaluation including ultrasound or stereotactic imaging. Breast cancer has been detected in the lactating breast. Milk retention cysts, or galactoceles, are thought to be rare products of plugged ducts and may be visualized by ultrasound or other imaging techniques. Upon aspiration, these cysts are found to contain milk. They will typically refill with milk after aspiration. Galactoceles are not a contraindication to breastfeeding [71].

Mastitis refers to an inflammation in which one or more segments of the breast will appear to be hot, red, and inflamed (see also Chapter 44). Mothers experience elevated temperatures and a feeling of malaise. Inflammation may be infective or noninfective. Noninfective mastitis may result from plugged ducts, resulting in reabsorption of milk from the duct into the interstitial spaces in the breast tissue and subsequent inflammatory response. Infective mastitis is associated with nipple fissure, or other trauma creating an entryway to the breast. The common infective agent is *Staphylococcus aureus*, although *Candida albicans*, *Escherichia coli*, *Enterobacteriaceae*, and rarely *Mycobacterium tuberculosis* have been cultured from infected breasts [71]. Simultaneous bilateral mastitis rarely occurs and is associated with *Streptococcus* infection. Because it is difficult to distinguish between infective and noninfective mastitis, typical treatment in the United States includes a 10 to 14 day course of the antibiotic dicloxacillin or cloxacillin in dosages of 500 mg four times daily. Hale and Berens note that clinicians should "review sensitivities of staph organisms for their individual regions" [68]. It is essential to encourage completion of the full course of antibiotic treatment, as mastitis has been noted to reoccur with incomplete treatment. Ensuring adequate drainage of the affected breast is crucial to the resolution of this condition and is accomplished through continued breastfeeding. Assist mothers to improve latch and attachment. Mothers may need to suspend other activities for a few days to focus on breastfeeding, rest, and care for themselves. Anti-inflammatory medications such as ibuprofen (Motrin, Advil, etc.) may also be beneficial [68]. Fetherston has identified several predictive factors for mastitis, including blocked ducts (caused by engorgement, hurried feedings, use of nipple shield, etc.), problems with positioning and attachment, tight bras, and nipple pain [72]. Clinicians have noted that mastitis tends to occur in anemic women, perhaps due to a reduced immune response. A sudden change in feeding frequency such as a delay or a skipped feeding with subsequent milk "back up" is enough to trigger mastitis in some women.

An abscess is a localized collection of pus in the breast, formed by disintegrated cells and surrounded by an inflamed area. Unresolved mastitis can result in the formation of one or several abscesses within the breast. Most abscesses require surgical lancing and may be drained to the exterior. Exudate from the abscess should be cultured to determine appropriate antibiotic treatment. Breastfeeding on the opposite breast is desirable throughout treatment, and feeding from the affected breast is possible in many cases. The safety of breastfeeding on the affected breast is likely to depend on the location of the drain(s). Milk expression via hand or pump should continue when feeding is suspended on the affected breast.

Infant Discomfort

Infants are often uncomfortable. The breastfeeding mother may decode all signs of discomfort as indicators of problems with herself and her milk. Midwives may need to help mothers assess infant discomfort and determine appropriate comfort strategies. Mothers often worry, for example, that the foods they ate may be the cause of infant's gas or gastric discomfort. Food eaten by mother rarely causes problems for her infant. Gassy foods eaten by the mother do not cause gas in her infant—gas is formed as a byproduct of the digestion of insoluble fiber in the intestinal tract [71]. Myths abound about colic caused by chocolate, broccoli, onions, and other tasty foods. However, it is unusual for infant discomfort to be relieved by changes in mother's diet. Colic is a poorly understood phenomenon that peaks between three weeks and three months of age, gradually subsiding after that time. It is characterized as crying and screaming that continues for three to four hours at a time [71]. Research indicates that about 35 percent of colicky infants improved after their mothers had removed cow's milk whey from their diets for more than a week [73]. An important role for the midwife is to distinguish between fussy behavior and true colic. All infants have fussy times. Fussy infants are typically soothed by being cuddled close, rocked, talked or sung to gently, and/or nursed. When the infant cries inconsolably for long periods of time, pediatric evaluation of the infant is indicated. No infant

should be left to cry for any period of time without being soothed—holding and cuddling does not "spoil" infants.

Occasionally infants will refuse to feed at the breast. When this happens in the newborn period, it can be a symptom of birth trauma, a reaction to being forced to the breast or fed in an awkward position, oral aversive behavior due to painful procedures (e.g., deep suctioning), anesthesia side effects, or a symptom of neurologic or craniofacial anomalies. Unexplained breast refusal requires physical assessment and follow-up.

In an older baby, sudden refusal to breastfeed is referred to as a "nursing strike"[71]. This can be related to ear infection, teething, superimposed pregnancy, or a reaction to parenting interactions (e.g., the baby who is scolded for biting at the breast may refuse the breast at the next feeding). Unexplained ongoing rejection of one breast requires follow-up: oncologists have reported that occasionally, breast cancer has been diagnosed in the rejected breast up to five years later [74].

Milk Supply

Milk production over the first four months of lactation has been estimated at 725 to 750 mls per day although volumes of over 1000 mls have been reported [75]. Early initiation of suckling and a pattern of frequent feedings are related to production of sufficient milk. When the infant's condition is such that he or she cannot participate in early initiation by feeding at the breast (prematurity is the most notable example), pumping should be started as soon as the mother's condition permits. The mother should be encouraged to mimic an infant feeding routine using the pump [76].

"Not enough milk" continues to be the number one reason for weaning in the early weeks of lactation, although about half of the mothers who are concerned about the milk supply have a baby who is gaining well [77]. This is called "perceived" (versus "actual") milk insufficiency. A feeding evaluation by a lactation specialist should be considered for both perceived and actual milk insufficiency.

There is no known limit to the ability to make milk. Mothers have exclusively breastfed twins, triplets, and quadruplets. The demand of multiple infants suckling appears to drive the milk supply. Early, frequent breastfeeding (or expressing if the infants are premature) will optimize the mother's long-term ability to produce milk. Midwives may refer mothers to La Leche League or a Lactation Consultant for assistance with positioning and caring for multiples.

Myths abound concerning milk supply and may lead mothers to unhelpful and potentially harmful behaviors. Following are some examples:

1. *Myth:* Drinking more will increase the milk volume (and the converse, drinking less will speed weaning). *Response:* mother's fluid intake and her milk composition and volumes have been studied in experimental trials. Neither the volume [78] nor the composition [79] is affected by the mother's fluid intake.
2. *Myth:* Eating better will make better milk (and the converse, eating poorly will cause the milk to be inferior). *Response:* as mammals, humans make human milk. Diet has almost no effect on the volume or composition of milk unless the mother is grossly undernourished, as in a prolonged famine. Studies of marginally nourished women have shown that the breastfed babies of those women whose diets were improved as part of the research design did not have babies who gained weight any better that those babies whose mothers' diets were not improved [80, 81]. Women who "diet" to regain their figure faster also have not been shown to negatively affect their babies growth pattern [82].
3. *Myth:* Hard work will decrease the milk supply and plenty of rest is needed to make enough milk. *Response:* there is no evidence that hard work has a negative impact on milk supply; indeed working hard has been the norm for generations of women. Separation from the baby, lack of nipple stimulation, and milk retention *do* negatively impact the milk supply.
4. *Myth:* Drinking (whatever is popular) herb tea or eating (an indubitably hard to find or expensive) food will increase the milk supply (or not drinking or eating them is the reason for the low supply). *Response:* many cultures have favorite galactogogues (substances that are thought to increase milk). There is no evidence that eating or drinking specific herbs or foods will increase the milk supply; indeed certain herbs can be harmful [71]. Herbs must be treated with the same respect as other medications and should be prescribed only by those with special training in their use and appropriate dosing. (See Chapter 10 for more information on medications and breastfeeding.)

Through discussions with pregnant women and new mothers, the midwife will uncover other local or emerging myths and theories about milk supply

and be able to counteract them, all the while giving culturally competent care.

Strategies for Increasing Milk Supply

The first step in increasing the milk supply is to assess the mother, infant, and breastfeeding in order to determine the reason (or reasons) that the supply is presently inadequate:

1. Infrequent or scheduled feedings, not on cue
2. Replacing or spacing breastfeedings with pacifier
3. Replacing breastfeedings with formula or baby foods
4. Compression of milk-making cells (too tight bra, engorgement)
5. Use of nipple shield
6. Stopping night feedings too soon
7. Poor letdown
8. Prematurity, dysmaturity
9. Retained placental fragments
10. Inadequate glandular tissue (often presents with breasts of markedly discrepant size)
11. Class 2 or 3 inverted nipples
12. Poor milk transfer by the infant
13. Breast surgery or injury
14. Cigarette smoking by the mother
15. Drugs or medications that could negatively impact milk supply, such as bromocriptine (Parlodel), L-dopa, or ergotamine [71]
16. Endocrine (especially thyroid) problem

The breastfeeding related behaviors (such as infrequent or scheduled feeds, use of a pacifier), the mother's physical condition, and the baby's behavior at the breast (with before and after weights using a digital scale with breast milk intake function) should all be part of the assessment. A skilled observer, such as a lactation specialist, may determine that there are problems with the mechanics of the feeding process.

Any interventions directed toward improving the milk supply should ensure adequate nutrition for the infant. Underfed babies do not nurse well and may decrease the mother's milk supply further by becoming sleepy and lethargic. Careful monitoring of the increase in the mother's milk supply and the decrease in other nutrition for the infant should be combined with frequent weight checks.

Corrective interventions should be focused on removing the cause of the poor milk supply and also remediation of the milk supply. Merely finding the cause is insufficient, especially if the baby is unable to stimulate the breast adequately. Pumping with a soft flange compression pump has been shown to stimulate the mother's prolactin levels equal to that of the baby [76]. The mother may find it helpful to pump after the feeding, between feedings, or during feedings. During the first months after birth if the cause of the low supply has been correctly identified and nipple stimulation is optimal, an increase in milk volume should be seen 24 to 48 hours after pumping is initiated. If an improvement in milk volume is not forthcoming, further evaluation is needed.

Supplementing the Breastfed Infant

The limited number of medical reasons for supplementation of the breastfed infant recognized by the UNICEF guidelines for Step 6 of the Baby-Friendly Hospital Initiative are shown in Table 43-4. Occasionally families will request supplementation for nonmedical reasons—for example, for relief feedings. While offering respect for the family's choices, midwives should offer informed consent about the rationale for exclusive breastfeeding, and the possible hazards of introducing formula. It is clear that the health benefits of breastfeeding accrue to those babies who are exclusively breastfed.

When supplementation is required or chosen, it is best done in a way that interferes least with feeding at the breast. Infants may be supplemented at the breast with the assistance of an at-breast supplementer [83], a tube and storage container device that delivers supplement to the baby while the baby suckles at the breast. When possible, expressed mother's milk can be used in the supplementer.

Many clinicians have noted that supplemental feeding appears less detrimental to the breastfeeding pattern when offered as a separate feeding (or feedings, as needed). This allows the mother to manually express or pump her breasts just before or after the infant receives formula, thus preserving the frequency of breast stimulation and milk removal. This is preferred over strategies for "topping up" the infant by offering a supplement after each feeding. Topping up strategies appear to increase the spacing between feedings (due to the slower digestion of formula), effectively delaying the timing of the next feeding, and thereby decreasing the stimulation and removal of milk.

Various feeding modalities, including cup and bottle, have been examined. Cup feeding and bottle-feeding take approximately the same amount of time.

Breastfeeding During the First Year of Life and Beyond

The experience of infant feeding changes for both mother and baby over time. At first, during the newborn period, the baby's need to feed may have no discernible pattern, averaging 10 to 12 cue-initiated feedings in 24 hours in order to gain at least one-half to one ounce per day. The baby may also have "frequency days"; feeding more often is recommended during these times. Night feedings are important for good weight gains in the early months.

By four months many babies begin to have a regular pattern of waking, nursing, and sleeping. Night feedings are common. "Distractible" is the best word to describe nursing babies from around four months through six months. "Playful" is another descriptive. The length of the feeding shortens as the baby becomes a pro at getting the milk to flow and transferring the desired amount. That leaves plenty of time for playing with mom's earrings, turning around to watch interesting motions, and practicing all kinds of gymnastic maneuvers at the breast. Solid foods are introduced around six months, although many breastfed babies prefer modified table food to packaged "baby" food.

Feeding during the second half of the first year is characterized as breaks in the infant's busy life of crawling and walking, falling, teething, and playing. Although mother's milk continues to be important nutritionally and immunologically, breastfeeding is important to the baby as a connection to mom—reassuring, winding down, and soothing. Juice, if given in the second half of the first year, should be offered via cup in moderate amounts (not more than about 4 oz daily). Overfeeding of juice has been associated with malnutrition, diarrhea, gas, abdominal discomfort, and tooth decay [84].

Fruits, vegetables, cereals, and other simple foods may be introduced to the diet of infants at about six months. Small amounts of new foods should be offered by spoon, rather than in a bottle. As the infant becomes more adept at dealing with solids, the texture and variety of foods can be increased. However, mother's milk, or formula, provides the backbone of the diet throughout most of the first year.

After the first year, the nursing bond is defined by the individual mother and child. For one family, nursing is the early morning and nighttime way to snuggle. For another, it is much like it was at seven or eight months.

Some women are concerned about teeth and teething if the baby is breastfeeding. Closeness to mom can be a real comfort to the baby who is experiencing the discomfort of teething. The bottom teeth are covered by the tongue during nursing, thus protecting the breast from biting during feeding. Biting happens rarely but is usually at the end of a feeding or during a hurried feed. The mother should firmly end the feeding and watch carefully for signs that the baby may bite at future feeds.

Breastfeeding the Special Needs Infant

Babies are born with congenital problems that affect their ability to breastfeed [85]. Most cleft defects do affect an infant's ability to latch on well and effectively transfer milk from the breast. Because of the variety of cleft defects and breast shapes and sizes it is difficult to predict the "success" of any particular mother baby dyad with a cleft defect. The midwife should support a mother's desire to breastfeed and assist her with interventions such as careful positioning, and expression of any residual milk, which also gives more breast stimulation to increase or maintain a milk supply. The infant's weight needs to be assessed frequently to ensure adequate milk intake. Whether or not a mother breastfeeds exclusively or combines feeding at the breast with giving expressed breast milk needs to be determined on an individual basis. Alternate breast massage and creative positioning are two techniques that mothers have found helpful in optimizing the infant's ability. The midwife can read breastfeeding literature or contact a lactation consultant for additional assistance. Early surgical repair of the cleft can be very beneficial. Generally speaking, the infant with a unilateral defect of the lip alone, lip and palate, or palate alone benefits from positioning that allows the breast to enter the mouth on the same side as the defect. Whether the baby's body is level with the breast, below the breast, or under the breast needs to be evaluated on an individual basis. Whatever position results in a rhythmic suck, followed by a swallow is a good position. The worst things that can be said to a mother are that she will not be able to breastfeed or that she should not have to express any milk but that she should try to feed at the breast only. Assist the mother and baby to reach their optimum level of proficiency and comfort. The midwife should be sensitive to each unique dyad.

Infants born with Down syndrome may also present a unique challenge [85]. As with infants with a cleft defect, early and prolonged contact

with the mother is very desirable. These infants may be more lethargic, do not give clear cues for feeding consistently, and do not sustain a rhythmic pattern of suck and swallow for any length of time. With good support and interventions for positioning and breast expression to remove residual milk and give additional breast stimulation, babies with a cleft defect usually go on to breastfeed well after repair. Again, the midwife can turn to resources such as literature, colleagues, and lactation consultants.

Premature infants have a special need for their mother's milk. Advantages of mother's milk for premature babies include enhanced brainstem maturation [86], decreased necrotizing enterocolitis [87], and improved wellness. Mothers should be assisted in collecting their milk as soon as possible after the birth. Expressed milk may be stored until the infant's condition allows oral feedings. The neonatal intensive care unit will have protocols for storage and containers that must be followed carefully, or the milk may be discarded as unsuitable. Nonnutritive suckling at the breast and kangaroo care have been shown to improve breastfeeding outcomes and should be implemented as soon as the infant is stabilized [88, 89]. Many mothers find that the high technology atmosphere of the NICU makes them feel insignificant and unneeded. Receiving support from their midwife to provide skin-to-skin contact and breast milk for their baby reinforces the irreplaceable connection of the mother-baby dyad.

Breastfeeding can often be reestablished. In the early months postpartum, a woman who has stopped breastfeeding her infant, or not chosen breastfeeding, can usually resume Lactogenesis III, which is called relactation. Women who have never been pregnant have been able to establish lactation; this is called induced lactation [90].

Relactation may be indicated when the infant is weaned prematurely or when a pump-dependent mother has a diminished supply. Nipple stimulation is often accomplished through the use of a breast pump. The baby may be enticed to suckle using formula in an at-breast feeding device [83]. A lactation specialist with experience helping mothers relactate or inducing lactation should be part of the support team. Close follow-up of the infant's weight gain is an important part of the plan, as underfed babies become sleepy and this can be misread as satiety.

Milk Expression

Mother's milk can be expressed manually or via pump. Hand expression is an important skill for all midwives to know and for breastfeeding mothers to practice. Hand expression is a method that is always available to women (see Chapter 62). Hand expression should be used prior to pumping to assist in the triggering of the milk flow.

A wide range of pumps is currently available on the market. Pumps range from the old "bicycle horn" pump that operates via compression of a rubber bulb, to high-tech hospital grade pumps that pump both breasts simultaneously with variable pressure. Not all breastfeeding mothers need a breast pump. Expression methods should be chosen and used in a way that is appropriate for the situation. For example, the mother who is pumping for a hospitalized premature infant will benefit from a hospital grade pump suitable for pump-dependent mothers. The mother who is expressing for a weekly relief bottle may use manual expression or an occasional-use pump. Occasional-use pumps are inexpensive and generally ineffective at building a milk supply.

Casual use pumps are used by a mother when she is away from a nursing infant, at work or school for example. These pumps are capable of removing substantial quantities of milk but not of building a milk supply.

Midwives should provide instruction about appropriate use of the pump and encourage women to use the manufacturer's directions for the cleaning and care of the pump.

Unless her milk is needed for medical reasons, mothers should be encouraged to wait until breastfeeding is well established before she begins to collect her milk. Many a mother has lost confidence in her ability to nurse after a dismal first pumping session where she has collected only a few droplets of milk. Mothers need to be told that babies are much more adept at expressing milk than either the mother's hand or her pump.

Milk Storage

Expressed milk should be treated carefully, like any other fresh food. Milk is best stored in food grade containers in feeding sized portions (2 oz for the newborn). Milk should be chilled, either in the refrigerator or in a cooler with ice packs, immediately after expression. Milk can be safely stored at room temperature (at a maximum of 25°C [77°F]) for 4 hours, in the refrigerator at 4°C (39°F) for 72 hours, and in the freezer at –20°C (–4°F) for 3 to 6 months or longer [91]. Chilled milk will separate into cream and liquid layers. Mothers are often concerned that this means the milk has soured and should be reas-

sured that milk can be gently swirled to remix the cream. (Specific storage requirements should be requested and followed for infants in special care.)

Expressed milk should be heated gently under running water. It need not be heated to body temperature. In fact, gentle warming will help to preserve living immune cells in the milk. Milk should never be boiled or microwaved. Frozen portions of milk can be thawed slowly in the refrigerator, or quickly in a pan of heated water that has been removed from the stove.

Combining Breastfeeding, Working, and/or School

Working outside the home, or attending school, is a reality for the majority of mothers with young children. While breastfeeding intentions do not appear to be different among women who plan to be employed postpartum, breastfeeding duration and exclusivity may be impacted by employment or schooling. Research indicates that full-time work decreases breastfeeding duration by 8.6 weeks on average relative to not working outside the home; however, part-time work (4 hours or less daily) does not appear to impact breastfeeding duration [92].

Helpful tips to share with mothers planning to return to work or school postpartum include the following:

1. Negotiate as generous a leave as possible during pregnancy.
2. Explore availability of job-sharing and at-home work possibilities.
3. Focus efforts in the immediate postpartum on building an adequate milk supply and making breastfeeding comfortable (rather than on expressing milk).
4. Determine feeding plans for return to work. Will breastfeeding continue after the return to work? Will mother collect milk during her work hours? How will she do so? How will the milk be stored? What are her child care plans? Can the baby be brought to the mother to be fed during breaks or lunches?
5. Begin to assume the schedule of the working day a week or so prior to return to work/school.
6. Consider returning to work or school part-time at first, gradually increasing to full-time (if necessary).
7. Consider starting back to work or school toward the end of the work week, rather than at the beginning.
8. Plan clothing for easy access to the breast if milk expression is planned.
9. Identify coworkers who understand the importance of breastfeeding and will support and encourage the effort.

Weaning

Weaning is a process of change that begins with the introduction of the first supplemental food. It is important for midwives to understand, and help mothers to understand, the difference between lactation failure and weaning. Breastfeeding mothers may grieve and mourn during the weaning process, whether at two weeks or two years, and fail to ask for help with their pain [93].

Weaning—whether from the breast or from the bottle—can be a stressful process for families. A gradual process of weaning is best for mothers and children, allowing time for both to adjust to the change physically and emotionally. Mothers may drop one feeding, and watch for the child's response. Possible negative reactions can include whiny, clingy behavior, anger, and withdrawal. Suitable replacements should be offered for the feeding, based on the child's age (formula for the child under a year, milk or other foods for the child over one). Weaning continues as the mother gradually replaces an increasing number of daily feedings with acceptable substitutes. Breastfeeding mothers should monitor their breasts for possible overfullness, plugged ducts, and inflamed areas during the weaning process.

Throughout the time of weaning, mothers and other family members should be encouraged to offer many opportunities for nurturing interaction with the child. Nursing, from the breast or the bottle, offers much more than food to children, it is very comforting as well. Alternate comforts in the form of hugging, holding, playing, and blankets and other "lovies" should be offered.

When Breast Is Not Best

Infant Conditions

Unless there are rare special health needs such as intestinal lactase deficiency, galactosemia, or phenylketonuria (PKU), there are no nutritional contraindications for an infant to breastfeed. Special diets are recommended for these babies. For example, infants with galactosemia require a specific lactose-free formula while infants with PKU may partially breastfeed in addition to receiving a phenylalanine-free formula. Blood levels of the in-

fant are drawn periodically and the diet adjusted to maintain an infant blood level of between 5 and 10 mg per deciliter. Even infants with PKU need some phenylalanine in the diet.

Maternal Conditions

Maternal medications may affect breastfeeding by decreasing the volume of milk, affecting the infant's behavior or passing to the infant in undesirable amounts. However, Lawrence offers this advice: "Before breastfeeding is summarily discontinued, adequate information should be sought and the clinician should consider the risk of the drug versus the benefit of breastfeeding for the infant" [94]. Other resources [71, 95] address the issue of drugs and breastfeeding more specifically (see also Chapters 10 and 12).

Acute infectious diseases in the mother that are readily controlled and treated are not in general contraindications to breastfeeding. Antibodies and other host resistance factors are present in the breast milk. Some conditions, such as beta-hemolytic streptococcus, group A, require both the mother and the infant to be treated. Breastfeeding may not be contraindicated. The American Academy of Pediatrics *Red Book* [96], Lawrence and Lawrence's *Breastfeeding: A Guide for the Medical Profession* [71], and the Centers for Disease Control and Prevention are excellent resources in the case of illness in the mother.

Breastfeeding should be withheld temporarily if the midwife suspects that a lesion on the breast or nipple is herpes simplex virus (HSV). A culture should be obtained. If the infant is under six months, and HSV is suspected, breastfeeding should be discontinued until all lesions are assessed, and if culture is positive, until lesions are completely cleared. The infant should be fed formula or banked milk (from a donor milk bank) during diagnosis and treatment. If the mother pumps for comfort, the pumped milk and the pump kit should be discarded once the infection has resolved. In older babies, the effects of HSV are not so devastating, but cautious practice is recommended.

Women who are HIV positive or who are at high risk for becoming HIV positive are advised not to breastfeed when the risk of infection of the infant exceeds the risk of mortality from other causes such as diarrhea. Recommendations vary from country to country and are based on perceived risks and benefits. In the United States, women who are HIV positive or who are at high risk are advised not to breastfeed. High-risk women include seronegative women:

1. who are injection drug users,
2. whose sexual partners are known to be HIV positive, or
3. whose sexual partners are injection drug users [96].

Some conditions may be presented erroneously as contraindications. For example, poor maternal diet is not a breastfeeding contraindication [71]. Breastfeeding should be encouraged, even if the mother's diet is not perfect. Improving the diet of women with restrictive eating habits (such as low caloric intake) does not make a better quality or quantity milk. Dietary advice should be focused on the mother's well-being (replenishing her stores) rather than the erroneous idea that improving her diet will improve her milk supply or composition. Specific advice for some restrictive eating patterns includes the following:

1. Women who take in fewer than 1800 kcals per day may not have a satisfactory intake of nutrients. These women should be advised to consume nutrient-rich foods and perhaps a balanced multivitamin-multimineral supplement.
2. Vegans, who eschew all animal foods, are at risk of a vitamin B_{12} deficiency and so is the nursing infant. A B_{12} supplement should be taken each day. Mothers who have had gastric bypass or other surgical procedures that affect the stomach also require B_{12} supplementation.
3. A dietitian should evaluate women who eliminate whole food groups for possible supplementation. For example, women who eliminate dairy products may require dietary adjustment or caloric supplements for vitamin D, calcium, and protein. Women who have inadequate exposure to ultraviolet light may also require vitamin D evaluation.

Breast Milk Substitutes

Breast milk alone, exclusive breastfeeding, is recommended for infants for about the first six months, continuing with the addition of complementary foods for the first year and beyond. In the event that breastfeeding is not possible or the mother chooses not to breastfeed, formula should be recommended for the first year with the addition of solid foods after about six months. Cup feeding should be initiated by the six-month point. Formula-fed infants should receive formula throughout the first year, then switch-

ing to whole cow's milk until two years (the fats in whole milk are required for nerve development).

Cow's milk–based formulas are considered standard and should be the choice for formula-fed infants except those with a known allergy to cow's milk or if there is a genetic tendency to diabetes. Soy-based formulas are reserved for infants with a proven allergy to cow's milk or if the family is adverse to the use of animal products [97]. However, many infants who are allergic to bovine proteins will also be allergic to soy. Special formulas should be recommended only when the infant's condition is such that a standard formula cannot be tolerated—for example, if the infant has been diagnosed with phenylketonuria (PKU). Hydrolysate formulas have had the cow's milk proteins modified, and lactose-free formulas do not contain lactose as the carbohydrate. In addition, some formulas have added ingredients that purport to be more like breast milk. However, research is clear that although they may be nutritionally adequate they are suboptimal compared to breast milk.

Donor milk banks provide screened and pasteurized human milk. A processing fee is charged and the distributing milk bank may prioritize recipients according to medical need. As Arnold explains, "One should remember, however, that banked donor milk is the only transplanted tissue that retains its functional properties and bioactivity after heat treatment"[98]. Informal sharing of milk (without a milk bank) should be discouraged.

Formula Feeding Methods

Formula should be prepared according to the manufacturers' instructions and the midwife should be assured that the caretakers are able to determine the difference between ready-to-feed, concentrated, and powdered formulations and dilute them appropriately. The water supply should be considered and if well water is used should be checked for the presence of organisms and heavy metals. Formula should also be stored according to the manufacturers' directions.

Cup feeding and bottle feeding have been found to take about the same amount of time [99]. Infants fed formula when there are inadequate resources available to clean the equipment are advised to cup feed with an open, easily cleaned cup. Research does not support the use of one type of bottle nipple over another or indicate that the shape of the bottle influences baby behavior. Feeding implements should be cleaned carefully, especially the tip of the nipple.

Parents and other caretakers should hold the baby closely while feeding, keeping eye-to-eye contact. It has also been suggested that the baby be switched from side to side as is the baby fed at the breast. Babies should never be fed "propped" bottles or given a bottle in the crib to hold. Stroking, talking, and interaction are important components of feeding that all babies should receive. When teeth have erupted, formula or juice should be carefully wiped away before the baby sleeps to prevent the development of "bottle mouth" caries.

Conclusion

Feeding is one of the most intensive interactions shared by parent and child during the first year. With the support and expert guidance of their midwife, families can learn to nurture and nourish their little one.

References

1. American Academy of Pediatrics Workgroup on Breastfeeding. Breastfeeding and the Use of Human Milk (RE9729). *Pediatrics* 100(6):1035–1039 (December) 1997.
2. Association of Women's Health, Obstetric, and Neonatal Nurses. *Breastfeeding: Clinical Position Statement*. Washington, DC: AWHONN 1997.
3. American Dietetic Association. Breaking the barriers to breastfeeding: Position of the ADA. *J. Am. Diet. Assoc.* 101(10):1213–1220 (October) 2001.
4. American College of Nurse Midwives. *Position Statement: Breastfeeding*. Washington, DC: ACNM, 1992.
5. U.S. Breastfeeding Committee. *Breastfeeding in the United States: A National Agenda*. Rockville, MD: U.S. Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau, 2001. May be accessed online at http://www.usbreastfeeding.org.
6. Department of Health and Human Services, Office on Women's Health. *HHS Blueprint for Action on Breastfeeding*. Washington, DC. U.S. Department of Health and Human Services, Office on Women's Health, 2000. Document may be accessed online at http://4women.gov/Breastfeeding/index.htm

7. Cadwell, K. C. (Ed). *Reclaiming Breastfeeding for the United States*. Sudbury: Jones & Bartlett Publishers, Inc., 2002.
8. Weimer, J. *The Economic Benefits of Breastfeeding: A Review and Analysis*. Washington, DC: U.S. Department of Agriculture, Food Assistance and Nutrition Research Report No. 13, March 2001.
9. Collaborative Group on Hormonal Factors in Breast Cancer. Breast cancer and breastfeeding: collaborative reanalysis of individual data from 47 epidemiological studies in 30 countries, including 50,302 women with breast cancer and 96,973 women without the disease. *Lancet* 360(9328):187–195 (July 20) 2002.
10. Kalkwarf, H. J., and Specker, B. L. Bone mineral changes during pregnancy and lactation. *Endocr*. 17(1):49–53 (February) 2002.
11. Zheng, T., Holford, T. R., Mayne, S. T., et al. Lactation reduces breast cancer risk in Shandong Province, China. *Am. J. Epidemiol*. 152(12):1129–1135 (December) 2000.
12. World Health Organization. UNICEF. *Protecting, Promoting and Supporting Breastfeeding: The special role of maternity services*. Geneva: WHO, 1989.
13. U.S. Breastfeeding Committee. *Statement on Exclusive Breastfeeding*. Raleigh, NC. August 5, 2000. May be accessed online at http://www.usbreastfeeding.org/Exclusive-Breastfeeding.html.
14. Kyenkya-Isabrrye, M. UNICEF launches the Baby-Friendly Hospital Initiative. *Am. J. Maternal Child Nurs*., 17:177–179, 1992.
15. Kramer, M. S., Chalmers, B., Hodnett, E. D., et al. Promotion of Breastfeeding Intervention Trial (PROBIT): a randomized trial in the Republic of Belarus. *JAMA* 285(4):413–420 (January) 2001.
16. United Nations Children's Fund. *Innocenti Declaration on the Protection, Promotion and Support of Breastfeeding*. New York: UNICEF, 1990.
17. World Health Organization. *International Code of Marketing of Breast-milk Substitutes*. Geneva: WHO, 1981.
18. Howard, C., Howard, F., Lawrence, R., et al. Office prenatal formula advertising and its effect on breastfeeding patterns. *Obstet. Gynecol*. 95(2):296–303 (February) 2000.
19. Donnelly, A., Snowden, H. M., Renfrew, M. J., et al. Commercial hospital discharge packs for breastfeeding women (Cochrane Review). Cochrane Databases Syst. Rev. 2000; (2):CD00275.
20. Walker, M. *Selling Out Mothers and Babies: Marketing Breast Milk Substitutes in the USA*. Weston, MA: NABA REAL, 2001.
21. Nissen, E., Lilja, G., Widstrom, A.-M., et al. Elevation of oxytocin levels early postpartum in women. *Acta Obstet. Gynecol. Scand*. 74:530, 1995.
22. Lund, L. R., Romer, J., Thomasset, M. et al. Two distinct phases of apoptosis in mammary gland involution: proteinase-independent and -dependent pathways. *Development* 122:181, 1996.
23. Huggins, K., et al. Markers of lactation insufficiency: a study of 34 mothers. *Curr. Issues Clin. Lactation* 1:25–35, 2000.
24. MAIN Trial Collaborative Group. Preparing for breast feeding: treatment of inverted and non-protractile nipples in pregnancy. *Midwifery* 10(4):200–214 (December) 1994.
25. Han, S., and Hong, Y. G. The inverted nipple: its grading and surgical correction. *Plast. Reconstr. Surg*. 104(2)389, 1999.
26. Lipitz, S., Barkai, G., Rabinovici, J., et al. Breast stimulation test and oxytocin challenge test in fetal surveillance: a prospective randomized study. *Am. J. Obstet. Gynecol*. 157:1178, 1987.
27. Alexander, J. M., Grant, A. M., and Campbell, M. J. Randomized control trial of breast shells and Hoffman's exercises for inverted and non-protractile nipples. *Br. Med. J*. 304:1030, 1990.
28. Barber, C. M., Abernathy, T., Steinmetz, B., et al. Using a breastfeeding prevalence survey to identify a population for targeted programs. *Can. J. Public Health* 88(4):242–245 (July/August) 1997.
29. Baydar, N., McCann, M., Williams, R., et al. *Final Report: WIC Infant Feeding Practices Study*. Alexandria, VA: U.S. Department of Agriculture, 1997.
30. Ransjo-Arvidson, A. B., Matthiesen, A. S., Lilja, G., et al. Maternal analgesia during labor disturbs newborn behavior: effects on breastfeeding, temperature, and crying. *Birth* 200:28(1):5–12 (March) 2001.
31. Walker, M. Do labor medications affect breastfeeding? *J. Hum. Lactation* 13(2):131–137 (June) 1997.
32. Wittels, B., et al. Postcesarean analgesia with both epidural morphine and intravenous patient-controlled analgesia: neurobehavioral outcomes among nursing neonates. *Anesth. Analg*. 85(3):600–606 (September) 1997.
33. Righard, L., and Alade, M.O. Effects of delivery room routines on success of first breastfeed. *Lancet* 336(8723):1105–1107 (November) 1990.

34. Halpern, S. H., Levine, T., Wilson, D. B., et al. Effect of labor analgesia on breastfeeding success. *Birth* 26(2):83–88 (June) 1999.

35. Riordan, J., Gross, A., Angeron, J., et al. The effect of labor pain relief medication on neonatal suckling and breastfeeding duration. *J. Hum. Lactation* 16(1):7–12 (February) 2000.

36. Scott, K. D., Klaus, P. H., and Klaus, M. H. The obstetrical and postpartum benefits of continuous support during childbirth. *J. Womens Health Gender Based Med.* 8(10):1257–1264 (December) 1999.

37. Division of Child Health and Development. *Evidence for the Ten Steps to Successful Breastfeeding*. Geneva: World Health Organization WHO/CHD/98.9, 1998.

38. Widstrom, A. M., Wahlberg, V., Matthiesen, A. S., et al. Short-term effects of early suckling and touch of the nipple on maternal behaviour. *Early Hum. Dev.* 21(3):153–163 (March) 1990.

39. Gill, S. L. The little things: perceptions of breastfeeding support. *J. Obstet. Gynecol. Neonatal Nurs.* 30(4):401–409 (July/August) 2001.

40. Chapman, D. J., and Perez-Escamilla, R. Identification of risk factors for delayed onset of lactation. *J. Am. Diet. Assoc.* 99(4):450–454 (April) 1999.

41. Klaus, M. Mother and infant: early emotional ties. *Pediatrics* 19102(5 Suppl. E):1244–1246 (November) 1998.

42. Renfrew M. J., et al. Feeding schedules in hospitals for newborn infants. *Cochrane Database Systematic Review* 2000;(2):CD000090.

43. Howard, C. R., Howard, F. M., Lanphear, B., et al. The effects of early pacifier use on breastfeeding duration. *Pediatrics* 19103(3):E33 (March) 1999.

44. Warren, J. J., et al. Pacifier use and the occurrence of otitis media in the first year of life. *Pediatr. Dent.* 23(2):103–107 (March/April) 2001.

45. Pugh, L. C., Milligan, R. A., Frick, K. D., et al. Breastfeeding duration, costs, and benefits of a support program for low-income breastfeeding women. *Birth* 29(2):95–100 (June) 2002.

46. DiGirolamo, A. M., Grummer-Strawn, L. M., and Fein, S. Maternity care practices: implications for breastfeeding. *Birth* 28(2):94–100 (June) 2001.

47. Widstrom, A. M. *Lessons from Sweden: aren't babies clever?* Accessed at http://www.acegraphics.com.au/articles/widstrom01.html on 9/25/02.

48. Charpak, N., Ruiz-Pelaez, J. G., de Figueroa, C. Z., et al. A randomized, controlled trial of kangaroo mother care: results of follow-up at 1 year of corrected age. *Pediatrics* 108(5):1072–1079 (November) 2001.

49. Nissen, E., et al. Effects of maternal pethidine on infants' developing breast feeding behaviour. *Acta Paediatrica* 84(2):140–145 (February) 1995.

50. Brazelton, T. B. The Brazelton Neonatal Behavior Assessment Scale: introduction. *Monographs of the Society for Research in Child Development* 43(5-6):1–13, 1978.

51. Wiessinger, D. A breastfeeding teaching tool using a sandwich analogy for latch-on. *J. Hum. Lactation* 14(1):51 (March) 1998.

52. Powers, N. G., and Slusser, W. Breastfeeding Update 2: clinical lactation management. *Pediatr. Rev.* 18(5):147–161 (May) 1997.

53. Locklin, M. P., and Jansson, M. J. Home visits: strategies to protect the breastfeeding newborn at risk. *J. Obstet. Gynecol. Neonatal Nurs.* 28(1):33–40 (January) 1999.

54. Hoddinott, P., and Pill, R. A qualitative study of women's views about how health professionals communicate about infant feeding. *Health Expectations* 3(4):224–233 (December) 2000.

55. Grummer-Strawn, L. M., Rice, S. P., Dugas, K., et al. An evaluation of breastfeeding promotion through peer counseling in Mississippi WIC clinics. *Maternal Child Health J.* 1(1):35–42 (March) 1997.

56. Morrow, A. L., Guerrero, M. L., Shults, J., et al. Efficacy of home-based peer counselling to promote exclusive breastfeeding: a randomised controlled trial. *Lancet* 353(9160):1226–1231 (April 10) 1999.

57. Kuan, L. W., Britto, M., Decolongon, J., et al. Health system factors contributing to breastfeeding success. *Pediatrics* 104(3):e28 (September 3) 1999.

58. Svedulf, C. I., Bergbom Fengbert, I. L., Berthold, H., et al. A comparison of the incidence of breast feeding two and four months after delivery in mothers discharged within 72 hours and after 72 hours post delivery. *Midwifery* 14(1):37–47 (March) 1998.

59. Whelan, A., and Lupton, P. Promoting successful breastfeeding among women with low income. *Midwifery* 14(2):94–100 (June) 1998.

60. Ertem, I. O., Votto, N., and Leventhal, J. M. The timing and predictors of the early termination of breastfeeding. *Pediatr.* 107(3):543–548 (March) 2001.

61. Ziemer, M. M., Paone, J. P., Schupay, J., et al. Methods to prevent and manage nipple pain in

breastfeeding women. *West. J. Nurs. Res.* 12(6):732–743 (December) 1990.

62. Heinig, M. J., Francis, J., and Pappagianis, D. Mammary candidosis in lactating women. *J. Hum. Lactation* 15(4):281–288 (December) 1999.

63. Livingstone, V. H., Willis, C. E., and Berkowitz, J. Staphylococcus aureus and sore nipples. *Can. Fam. Physician* 42:654–659 (April) 1996.

64. Lawlor-Smith, L., and Lawlor-Smith, C. Vasospasm of the nipple—a manifestation of Raynaud's phenomenon: case reports. *Br. Med. J.* 314(7081):644–645 (March 1) 1997.

65. Sakorafas, G. H., Blanchard, D. K., Sarr, M. G., et al. Paget's disease of the breast. *Cancer Treatment Rev.* 27(1):9–18 (February) 2001.

66. Buchko, B. L., Pugh, L. C., Bishop, B. A., et al. Comfort measures in breastfeeding, primiparous women. *J. Obstet. Gynecol. Neonatal Nurs.* 23(1):46–52 (January) 1994.

67. Pugh, L. C., Buchko, B. L., Bishop, B. A., et al. A comparison of topical agents to relieve nipple pain and enhance breastfeeding. *Birth* 23(2):88–93 (June) 1996.

68. Hale, T. W., and Berens, P. *Clinical Therapy in Breastfeeding Patients*, 2nd ed. Amarillo, TX: Pharmasoft Medical Publishing, 2002.

69. Snowden, H. M., Renfrew, M. J., and Woolridge, M. W. Treatments for breast engorgement during lactation. *Cochrane Database of Systematic Reviews* (2):CD000046, 2001.

70. Roberts, K. L., Reiter, M., and Schuster, D. Effects of cabbage leaf extract on breast engorgement. *J. Hum. Lactation* 14(3):231–236 (September) 1998.

71. Lawrence, R. A., and Lawrence, R. M. *Breastfeeding: A Guide for the Medical Profession*, 5th ed. St. Louis: Mosby, 1999.

72. Fetherston, C. Risk factors for lactational mastitis. *J. Hum. Lactation* 14(2):101, 1998.

73. Jakobsson, I., Lindberg, T., Benediktsson, B., et al. Dietary bovine B-lactoglobulin is transferred in human milk. *Acta Paediatrica Scandia.* 74:342, 1985.

74. Saber, A., Dardik, H., Ibrahim, I. M., et al. The milk rejection sign: A natural tumor marker. *Am. Surg.* 998, 1996.

75. Butte, N. F., Garza. C., Stuff, J. E., et al. Effect of maternal diet and body composition on lactational performance. *Am. J. Clin. Nutr.* 39:296, 1981.

76. Research by Zinaman, M. J., Hughes, V., and Queenan, J. T. indicated that the White River [CAMP Healthcare] electric pump was able to equal the prolactin levels of a nursing baby in a mother. (Acute prolactin, oxytocin preponses and milk yield to infant suckling and artificial methods of expression in lactating women. *Pediatrics* 89:437, 1992.)

77. Schwartz, K., d'Arcy, H., Gillespie, B., et al. Factors associated with weaning in the first 3 months postpartum. *J. Fam. Pract.* 51:5, 439 (May) 2002.

78. Dusdieker, L. B., Stumbo, P. J., Booth, B. M., et al. Prolonged maternal fluid supplementation in breastfeeding. *Pediatrics* 86(5):737–740 (November) 1990.

79. Dearlove, J. C., and Dearlove, B. M. Prolactin, fluid balance and lactation. *Br. J. Obstet. Gynecol.* 88:652–654, 1981.

80. Rahmanifar, A., Kirksey, A., Wachs, T. D., et al. Diet during lactation associated with infant behavior and caregiver infant interaction. *J. Nutr.* 123:164–175, 1993.

81. Wohlleb, J., Pollitt, E., Mueller, N. H., et al. Bacon Chow study: maternal supplementation and infant growth. *Early Hum. Dev.* 9:79–91, 1983.

82. Lovelady, C. A., Williams, J. P., Garner, K. E., et al. Effect of energy restriction and exercise on vitamin B-6 status of women during lactation. *Med. Sci. Sports Exerc.* 33(4):512–518 (April) 2001.

83. Lact-Aid Nursing Trainer System (Lact-Aid International) or Supplemental Nursing System (Medela, Inc.) are two examples of at-breast supplements.

84. American Academy of Pediatrics, Committee on Nutrition. The use and misuse of fruit juice in Pediatrics (RE0047). *Pediatrics* 107(5):1210–1213 (May) 2001.

85. Danner, S. C. Breastfeeding the neurologically impaired infant. *NAACOG's Clin. Perinatol.* 3(4):640–646, 1992.

86. Amin, S., Merle, K. S., Orlando, M. S., et al. Brainstem maturation in premature infants as a function of enteral feeding type. *Pediatrics* 106:318, 2000.

87. Schanler, R. J., Hurst, N. M., and Lau, C. The use of human milk and breastfeeding in premature infants. *Clin. Perinatol.* 26(2):379, 1999.

88. Narayanan, I., Mehta, R., Choudhury, D. K., et al. Sucking on the "emptied" breast: non-nutritive sucking with a difference. *Arch. Dis. Child.* 66:241–244, 1991.

89. Nyqvist, K., Sjoden, P. O., and Ewald, U. The development of preterm infants' breastfeeding behavior. *Early Human Development* 55:247–264, 1999.

90. Department of Child and Adolescent Health and Development. *Relactation: a review of ex-*

perience and recommendations for practice. Geneva: World Health Organization, 1998.

91. Williams-Arnold, L. D. *Human Milk Storage for Healthy Infants and Children*. Sandwich, MA: Health Education Associates, 2000.

92. Fein, S. B., and Roe, B. The effect of work status on initiation and duration of breastfeeding. *Am. J. Public Health* 88(7):1042–1046, 1998.

93. Richards, M. P. M. Breastfeeding and the mother-infant relationship. *Acta Paediatrica Scandia* (Suppl.) 299:33, 1982.

94. Lawrence, R. A. *A Review of the Medical Benefits and Contraindications to Breastfeeding in the United States*. Maternal and Child Health Technical Information Bulletin. Arlington, VA: National Center for Education in Maternal and Child Health, 1997, p. 23.

95. Hale, T. W. *Medications and Mothers' Milk*, 10th ed. Amarillo, TX: Pharmasoft Publishing, 2002.

96. American Academy of Pediatrics. *1997 Red Book: Report of the Committee on Infectious Diseases*. Elk Grove Village, IL, AAP, Committee on Infectious Diseases, 1997.

97. American Academy of Pediatrics, Committee on Nutrition. Soy protein-based formulas: recommendations for use in infant feeding (RE9806). *Pediatrics* 101(1):148–153 (January) 1998.

98. Arnold, L. D. W. Using banked donor milk in clinical settings. In Cadwell, K. (Ed.) *Reclaiming Breastfeeding for the United States, Promotion, Protection and Support*. Sudbury, MA: Jones and Bartlett, 2002.

99. Howard, C. R., de Blieck, E. A., Ten Hoopen, C. B., et al. Physiologic stability of newborns during cup and bottle-feeding. *Pediatrics* 104(5) (Suppl.):1204–1207, 1999.

• • • Professional Resources

Baby-Friendly USA
8 Jan Sebastian Way #22
Sandwich, MA 02563
(508) 888-8092
www.babyfriendlyusa.org

Baby Milk Action
www.babymilkaction.org/

Breastfeeding Legislation
www.house.gov/maloney/issues/womenchildren/breastfeeding/index.html

Healthy Children Project, Center for Breastfeeding Health Education Associates
8 Jan Sebastian Way #13
Sandwich, MA 02601
(508) 888-8044
www.healthychildren.cc

Human Milk Banking Association of North America
Mothers' Milk Bank
P/SL Medical Center
1719 East 19th Ave.,
Denver, CO 80218

International Lactation Consultant Association
1500 Sunday Drive, Suite 102
Raleigh, NC 27607
(919) 787-5181
www.ilca.org

La Leche League
1400 North Meacham Road, P. O. Box 4079
Schaumburg, IL 60168-4079
(847) 519-7730
www.lalecheleague.org

National Alliance for Breastfeeding Advocacy
254 Conant Road
Weston, MA 02193-1756
(781) 893-3553

National Commission on Donor Milk Banking
8 Jan Sebastian Way #11
Sandwich, MA 02563
(508) 888-9366

United States Breastfeeding Committee
1500 Sunday Drive, Suite 102
Raleigh, NC 27607
(919) 787-5181
www.usbreastfeeding.org

• • • Equipment and Supply Resources

Ameda Breastfeeding Products
C/O Hollister Incorporated
2000 Hollister Drive
Libertyville, IL 60048
www.ameda.com

CAMP Healthcare
P.O. Box 89
Jackson, MI 59204
www.camphealthcare.com

Lact-Aid International
P.O. Box 1066
Athens, TN 37371-1066
www.lact-aid.com

Medela
1101 Corporate Drive
McHenry, IL 60050
www.medela.com

Motherwear
320 Riverside Dr.
Florence, MA 01062
www.motherwear.com

CHAPTER

44

Screening for and Midwifery Management of Puerperal Abnormality

The complications of the puerperium presented in this chapter are those that the midwife is most likely to confront. Those complications requiring physician consultation or referral in all cases are not included. Examples of the latter are Sheehan's syndrome, broken coccyx, muscle paralysis in the lower extremities, extended pelvic infections, and separation of pelvic joints. Students interested in these topics are encouraged to pursue their interests in medical and obstetric textbooks and journals.

The midwife needs to be thoroughly familiar with the normal physiological and anatomical changes of the puerperium in order to differentiate between the discomforts associated with healing after childbirth and abnormal conditions as early as possible. It is essential that the midwife be familiar with the signs and symptoms of complications in order to consult or collaborate with a physician as appropriate.

Puerperal infection, although fortunately rarely seen today after vaginal birth, is discussed in this chapter. The discussion serves as a reminder of what once was a most feared sequela of childbirth. The specter of puerperal morbidity and mortality can rise again if no thought is given to the routine use of third and fourth generation antibiotics so that more strains of bacteria develop resistance to antibiotics, and as professionals become careless about hand washing and aseptic technique. The history of puerperal infection is tragic and fascinating at the same time.

Puerperal Morbidity

Puerperal morbidity has long been defined by the Joint Committee on Maternal Welfare as a "temperature of 100.4°F (38.0°C), the temperature to occur on any two of the first ten days postpartum exclusive of the first 24 hours, and to be taken by mouth by a standard technique at least four times daily." Puerperal morbidity and puerperal infection are sometimes thought of as synonymous, although it is incorrect to do so. Puerperal morbidity may be caused by infections and conditions other than puerperal infection, such as dehydration, urinary tract infection, upper respiratory infection, and mastitis.

Nonobstetric Causes of Puerperal Morbidity

Making a differential diagnosis entails determining (1) whether evidence of puerperal morbidity reflects puerperal infection or one of the other causes; (2) if the morbidity is a result of puerperal infection, where the source is; and (3) if the morbidity is a result of another infection, what the offending organism is and to which antibiotics it will respond.

Temperature elevation caused by dehydration usually occurs during the first 24 hours postpartum. This time period is excluded from the definition of puerperal morbidity. Dehydration may be present in the first 24 hours as a carryover from decreased fluid intake during labor (especially if labor was prolonged) and may be compounded by a pe-

riod of rest and sleep during the early hours of the puerperium. If dehydration continues into the next day postpartum it may confuse the etiology and symptoms associated with temperature elevation. This confusion can be prevented by encouraging a woman to drink at least one glass of water per hour during her waking hours and anytime she awakens briefly from sleep. The woman should also be encouraged to urinate frequently. Frequent urination helps to prevent urine stasis and the increased potential for urinary tract infection.

During the immediate postpartum period, a urinary tract infection may be difficult to differentiate by signs and symptoms. Its symptoms are similar to those of some types of puerperal infection and may vary depending on whether it is a simple cystitis or pyelonephritis. Women catheterized during labor or with anterior vaginal trauma are more likely to be at risk. Urinary tract infections may cause urinary frequency, urgency, dysuria, and occasionally, lower abdominal pain; with the onset of pyelonephritis, low-grade fever with spikes, flank pain, and CVA tenderness appear. Definitive diagnosis of a urinary tract infection is made by culture of a clean-catch urine specimen demonstrating a significant number of a single type of bacteria (see Chapter 7).

Auscultation of the lungs should be part of the early postpartum examination of the woman with any respiratory symptoms. This examination would disclose the sounds of a lower respiratory infection, and point toward this as the cause of temperature elevation, as would the other usual signs and symptoms of bronchitis or pneumonia.

If a woman has an elevated temperature of more than 100.4°F (38°C) the midwife reviews her chart for possible predisposing causes of infection, collects an interval history and reviews current symptoms, performs an examination of her lungs, breasts, urinary tract, abdomen, lochia, and legs; obtains urine or lochial specimens, for culture and sensitivity if indicated; and discusses all findings to date with the consulting physician.

Puerperal Infection

Puerperal infection is a bacterial infection originating in the reproductive tract during labor or the puerperium. It is no longer responsible for a high incidence of puerperal mortality as it was historically, when it was known as childbed fever. However, puerperal infection is still responsible for a significant percentage of puerperal morbidity.

Predisposing Causes

The following circumstances predispose a woman to puerperal infection:

1. Prolonged labor, especially with ruptured membranes
2. Prolonged rupture of the membranes prior to labor
3. Numerous vaginal examinations during labor, especially with ruptured membranes
4. Breaks in aseptic technique
5. Carelessness regarding hand washing
6. Any intrauterine manipulation (e.g., uterine exploration, manual removal of the placenta)
7. Extensive tissue trauma or an open wound such as an unrepaired laceration
8. Hematoma
9. Hemorrhage, especially if more than 1000 mL of blood are lost
10. Operative delivery, particularly cesarean birth
11. Retention of placental fragments or membranes
12. Improper perineal care
13. Untreated vaginal/cervical infection or sexually transmitted disease (e.g., bacterial vaginosis, chlamydia, gonorrhea)

Infectious Organisms Organisms in puerperal infections come from three sources:

1. Those that normally exist in the lower genital tract or in the bowel
2. Infections of the lower genital tract
3. Bacteria that are in the nasopharynx or on the hands of attending personnel or in the air and dust of the environment

Bacteria from the first source are endogenous and become pathogenic only when there is tissue damage or when there is contamination of the genital tract from the bowel. Women should be routinely screened and treated prenatally for infections of the lower genital tract. The third source is best prevented with scrupulous attention to hand washing and asepsis.

Organisms common in puerperal infection include many *Streptococcus* species (including *S. viridans*, *S. pyogenes*, and *S. agalactiae*) *Staphylococcus aureus*, *Gardnerella vaginalis*, *E. coli*, *Klebsiella* species, *Proteus* species, the anaerobic *peptostreptococci*, *Bacteroides* species, *Ureaplasma*, and *Mycoplasma*. Some of these are common enough as

vaginal flora that their relationship to the infection is unclear. Both *Neisseria gonorrhoeae* and *Chlamydia trachomatis* may also cause postpartum genital infections, although prenatal screening will minimize the risk of their presence.

Signs and Symptoms

The signs and symptoms of infection generally include elevated temperature, general malaise, pain, and malodorous lochia. An increased pulse rate may occur, particularly with severe infection. Interpretation of laboratory cultures and sensitivities, further investigation, and treatment require discussion and collaboration with your consulting physician.

Sites of Puerperal Infection

While most postpartum infections are endometritis, which is far more common following cesarean birth than vaginal birth, any lacerated or traumatized tissue in the genital tract can become infected following birth. There are also extended infections, which originate from a localized infection and extend via the path of venous circulation or the lymphatics to produce bacterial infection in more distant sites. Extended sites of puerperal infection include pelvic cellulitis, salpingitis, oophoritis, peritonitis, pelvic and/or femoral thrombophlebitis, and bacteremia.

Infected Trauma of the Vulva, Perineum, Vagina, or Cervix Signs and symptoms of infected episiotomies, lacerations, or other trauma include the following:

1. Localized pain
2. Dysuria
3. Low-grade temperature—seldom above 101°F (38.3°C)
4. Edema
5. Red and inflamed repair edges
6. Oozing of pus or gray-green exudate
7. Wound separation or dehiscence

Visible episiotomy and laceration repairs should be checked routinely. The treatment of an infected repair includes first removing any sutures; opening, debriding, and cleaning the wound; and administering a broad-spectrum antimicrobial drug. In addition to episiotomy or lacerations, trauma may include bruising, abrasions (skid marks) too small to suture, and hematoma formation; it may also be caused by foreign objects such as a gauze sponge inadvertently left in the vagina.

Endometritis Signs and symptoms of endometritis include the following:

1. Persistently elevated fever to 104°F (40°C), depending on the severity of the infection
2. Tachycardia
3. Chills with severe infection
4. Uterine tenderness extending laterally
5. Pelvic pain with bimanual examination
6. Subinvolution
7. Scanty, odorless lochia, or malodorous, seropurulent lochia
8. Variable onset depending on the organism, with Group B streptococcus presenting earlier
9. White blood cell count may be elevated beyond the physiological leukocytosis of the puerperium

Treatment is with broad-spectrum antimicrobial drugs, including the cephalosporins (e.g., cefoxitin, cefotetan) and extended-spectrum penicillin, or a combination penicillin/betalactamase inhibitor (Augmentin, Unasyn). The combination of clindamycin and gentamicin may also be used, as may metronidazole if the mother is not breastfeeding. Mild endometritis can be treated with oral therapy, although more serious infections require hospitalization for intravenous therapy.

The spread of endometritis, if left untreated, can lead to salpingitis, septic thrombophlebitis, peritonitis, and necrotizing fasciitis. Any suspicion of worsening infection, unexplained symptoms, or acute pain mandates physician consultation and referral.

Other Puerperal Complications

Mastitis

Mastitis is an infection of the breast. Although it can occur in any woman, it is almost exclusively a complication of the lactating woman. It should be distinguished from the transient temperature elevation and breast pain associated with early engorgement as milk comes in. Mastitis develops as a result of invasion of breast tissue (e.g., glandular, connective, areolar, fat) by an infectious organism or in the presence of breast injury. Common organisms include *S. aureus*, *streptococci*, and *H. parainfluenzae*. Injury to the breast may be caused by bruising from rough manipulation, breast engorgement, milk stasis in a duct, or cracking or fissures of the

nipple. The bacteria may originate from a number of sources: (1) the mother's hands; (2) the hands of people caring for the mother or for the baby; (3) the baby; (4) the lactiferous ducts; or (5) the circulating blood. Stress and fatigue have been associated with mastitis [1]. This makes sense, as stress and fatigue can lead to carelessness in technique, especially hand washing, or a missed feeding or change in frequency of feedings, which could lead to engorgement and stasis.

The best treatment of mastitis is prevention. Prevention is accomplished through meticulous attention to hand washing with antibacterial soap; prevention of engorgement with early and frequent feedings; proper positioning of the baby on the breasts; good support of the breasts without constriction; cleansing with water only and no drying agents; daily observation of the baby for skin or cord infection; and avoiding close contact with people with a known staphylococcal infection or lesion.

Cracked or fissured nipples may provide a pathway for *S. aureus* infections to become established. The application of a few drops of breast milk to the nipple area at the end of the feeding seems to promote healing. Consideration should be given to culturing the milk if deep or persistent fissures occur, and to prophylaxis with a topical or systemic antibiotic when appropriate.

Other than severe engorgement, precursory signs and symptoms of mastitis usually are not evident before the end of the first postpartal week. After that time, the woman may have any of the following symptoms:

1. Mild pain in one lobe of the breast, which is exaggerated when the baby nurses
2. Flu-like symptoms: muscle aches, headache, fatigue

Mastitis is almost always confined to one breast. The actual signs and symptoms of mastitis include the following:

1. Rapid elevation in temperature to 103 to 104°F (39.5 to 40°C)
2. Increased pulse rate
3. Chills
4. General malaise, headache
5. Painful, swollen, inflamed, hard area of the breast

Untreated mastitis has approximately a 10 percent risk of developing an abscess. Signs and symptoms of abscesses include the following:

1. Purulent nipple discharge
2. Remittent fever with chills
3. Breast swollen and extremely painful; a large, hard mass with an area of fluctuation, reddening, and bluish tinge to the skin indicating the location of the pus-filled abscess

Early intervention when mastitis is suspected may prevent worsening. Intervention includes several hygiene and comfort measures:

1. Supportive but nonconstricting bra
2. Meticulous attention to hand washing and breast care
3. Warm compresses to the affected area
4. Massage of the area while breastfeeding to facilitate milk flow
5. Increased fluid intake
6. Rest
7. Helping the mother set priorities to reduce stress and fatigue in her life
8. Supportive, nurturing caretaking of the mother

The infant should continue to nurse, and if nursing is impossible due to breast pain or infant rejection of the infected breast, regular pumping should continue. Frequent emptying of the breast will prevent stasis.

Antibiotic therapy can include a penicillinase-resistant penicillin or a cephalosporin. Erythromycin may be used if the woman is allergic to penicillin. The most common initial therapy is dicloxacillin 500 mg by mouth qid for 10 days. This regimen can be prescribed based on signs of mastitis even if an office visit is impractical—for example, on a weekend or at night. In any case, follow-up in 72 hours to evaluate progress is essential. If the infection is not resolving, milk cultures should be performed.

If the mother is one of the approximately 10 percent of women who develop an abscess, the midwife needs to involve the consulting physician for either needle aspiration (small abscess) or incision of the abscess and drainage of the pus. The incision is left open, often with a drain, so as not to lock in the bacteria again. Healing is from the inside out and takes one to two weeks. Antibiotics should be continued even though the woman will experience a dramatic recovery within a couple of days.

Mother, midwife, and physician should agree on a plan for breastfeeding. Generally speaking, if the incision is not in the way, breastfeeding can continue on both breasts and is the best way to continue emptying the affected breast and avoid repeated problems. It helps to remember that any bacteria in the milk will be killed by the acids in the

baby's gastrointestinal tract and will not harm the baby [2]. If it is not physically possible for a woman to continue breastfeeding on the affected breast, then it should be emptied by pumping and massage, and she should continue to breastfeed on the other breast. Involvement of a lactation consultant who has experience with mastitis is most helpful.

Yeast infections of the breast can develop when the infant has thrush, or if the mother has persistent vaginal yeast infections. If the nipple has been injured, or when the mother has been on antibiotics that affect normal skin flora, breast yeast is more likely to occur [3, 4]. These infections are identified by the acute onset of sharp, stabbing pain at the nipple when the infant nurses. Few other objective signs are present. Treat both mother and infant, even if the child has no symptoms of thrush. Nystatin is the usual first-line therapy. Hand washing, treating the infant at the same time as the mother, and careful breast care that avoids touching both nipples without washing hands in between, and frequent changes of breast pads will reduce the risk of spreading infection from one nipple to the other.

Thrombophlebitis and Pulmonary Embolism

Postpartum thrombophlebitis is more common in women with varicosities or who perhaps are genetically susceptible to vein wall relaxation and venous stasis. Pregnancy fosters venous stasis by virtue of vein wall relaxation resulting from the effects of progesterone and pressure on the veins by the uterus. Pregnancy is also a hypercoagulable state. Compression of the veins during positioning for labor or birth may also contribute to the problem. Thrombophlebitis is described as superficial or deep, depending on which veins are involved.

Superficial thrombophlebitis is evidenced by leg pain, localized heat, tenderness, or inflammation at the site, and palpation of a knot or cord. Deep venous thrombophlebitis is evidenced by the following signs and symptoms:

1. Possible slight temperature elevation
2. Mild tachycardia
3. Abrupt onset with severe leg pain worsening with motion or when standing
4. Edema of the ankle, leg, and thigh
5. Positive Homans' sign
6. Pain with calf pressure
7. Tenderness along the entire course of the involved vessel(s) with palpable cord

Homans' sign is elicited by placing one hand on the mother's knee and applying gentle pressure in order to keep the leg straight. If there is calf pain with dorsiflexion of the foot, the sign is positive.

Treatment includes bed rest, elevation of the affected extremity, hot packs, elastic stockings, and analgesia as needed. A cradle for bedclothes may be needed if the leg is quite tender to touch (more likely with superficial thrombophlebitis). Referral to the consulting physician is necessary for decisions concerning anticoagulant therapy and antibiotics (more likely with deep venous thrombophlebitis). Under no circumstances should the leg be massaged.

The greatest risk associated with thrombophlebitis is pulmonary embolism. This is particularly true with deep venous thrombophlebitis and unlikely with superficial thrombophlebitis. Tachypnea, dyspnea, and sharp chest pain of sudden onset are the most common symptoms. Many other less specific symptoms may be present, and include altered lung or heart sounds and apprehension as the woman's blood oxygen level decreases. *Sudden onset of the first three symptoms mandates urgent physician evaluation of the woman.*

Hematomas

A hematoma is a tissue swelling that contains blood. The dangers of a hematoma are blood loss amounting to hemorrhage, anemia, and infection. Hematomas arise from spontaneous or traumatic rupture of a blood vessel. In the childbearing cycle, hematomas occur most often during delivery or shortly thereafter as vulvar, vaginal, or broad ligament hematomas. Possible causes include the following:

1. Operative delivery
2. Unrepaired laceration of a blood vessel torn during injection of local or pudendal anesthesia, or during repair of an episiotomy or laceration
3. Failure to effect complete hemostasis prior to repair of a laceration or episiotomy
4. Unligated vessels above the apex of an incision or laceration, or failure to start the suture line at that point
5. Rough handling of vaginal tissue at any time or of the uterus during massage

The common sign of a hematoma is extreme pain out of proportion to the expected amount of discomfort and pain. Other signs and symptoms of a vulvar or vaginal hematoma are as follows:

1. Perineal, vaginal, urethral, bladder, or rectal pressure and severe pain
2. A tense, fluctuant swelling
3. Bluish or blue-black discoloration of tissue

Vulvar hematomas are the most obvious, and vaginal hematomas are generally identifiable when careful inspection of the vagina and cervix are performed. Small and moderate-sized hematomas may be spontaneously absorbed. If a hematoma continues to enlarge, rather than stabilizing, the midwife should notify the consulting physician for further evaluation and care, which might include monitoring continued bleeding with hematocrits, an incision to evacuate blood and blood clots and closure of the cavity, and the need for any other surgical intervention, blood replacement, or antibiotics. The midwife continues to manage the other aspects of the mother's postpartum course and adjustments.

The signs and symptoms of a broad ligament hematoma include the following:

1. Lateral uterine pain sensitive to palpation
2. Extension of pain into the flank
3. A painful swelling identified on high rectal examination
4. Ridge of tissue just above the pelvic brim extending laterally (this is the edge of the swollen broad ligament)
5. Abdominal distention

If a broad ligament hematoma is suspected, physician consultation is essential.

Late Postpartum Hemorrhage

Late (delayed) postpartum hemorrhage is hemorrhage that occurs after the first 24 hours postpartum. Common causes include the following:

1. Subinvolution of the placental site
2. Retained placental fragments or membranes
3. Previously undiagnosed reproductive tract laceration
4. Hematoma

The signs and symptoms of late postpartum hemorrhage include obvious external bleeding and the signs and symptoms of shock and anemia. The midwife collaborates with the consulting physician for diagnosis of the cause and appropriate treatment.

Hemorrhage that occurs during the first 24 hours postpartum is managed as discussed for immediate postpartum hemorrhage (see Chapter 34). The first step is to diagnose the cause (e.g., uterine atony, reproductive tract laceration), and institute appropriate management while awaiting the arrival of the consulting physician or resolution of the problem. This might include use of pitocin or methergine to contract the uterus, or, if the cause is a laceration, a reconsideration of the need for repair. This repair should be done in consultation with a physician.

Subinvolution

Subinvolution occurs when the process of uterine contraction does not take place as it should and is either prolonged or stops. The process of involution may be hampered by retained placental fragments, myomata, or infection. Retained fragments of membranes or placenta are the most frequent cause.

Subinvolution may be diagnosed during the postpartum examination or when the woman calls to complain of increased or persistent bleeding. The usual history includes a longer than normal period of lochia, followed by leukorrhea and irregular, heavy bleeding. Pelvic examination will reveal a soft uterus that is larger than normal for the week postpartum during which the woman is being examined.

Subinvolution early in the puerperium presents as a soft, boggy uterus that does not decrease in size and whose fundal height remains stationary rather than descending. The lochia is profuse and bright red to reddish brown. A lochial culture should be taken to rule out endometritis. At the four- to six-week postpartum visit, an infection is not considered unless there is tenderness or pain of the adnexa or on movement of the uterus.

Subinvolution is treated with ergonovine (Ergotrate) or methylergonovine (Methergine), 0.2 mg by mouth every 4 hours for 3 days; the woman is reevaluated in two weeks. If the woman also has endometritis, the midwife additionally prescribes broad-spectrum antibiotic therapy.

Postpartum Depression

The identification of postpartum depression rests in the hands of midwives and other clinicians who see women throughout the first postpartum year. As with any other disease process about which a woman may be reticent to speak, active listening and acceptance of her description of her experiences are key to hearing her fears and concerns. Beck has cited the phrase "the thief that steals motherhood" to describe the effect of postpartum depression on the woman's life [5]. In fact, as many as half of all women with postpartum depression either do not seek help or are not diagnosed with this common disease [6, 7]. One estimate of the rate of

postpartum depression puts major depression at 12 percent, with an additional 19 percent of women experiencing symptoms of minor depression. Other estimates are similar [8, 9].

In contrast to the baby blues, which are mild and transient, true postpartum depression can develop at any point in the first months postpartum, and shares the diagnostic characteristics of major or minor depression. At the far end of the spectrum of postpartum mood disorders, the rare postpartum psychosis is characterized by suicidal or infanticidal behaviors, and delusional thinking, in addition to symptoms related to depression [10].

Postpartum depression also must be differentiated from postpartum thyroiditis, which has an incidence of 5 to 7 percent. A thyrotoxic phase is followed by hypothyroidism. Fatigue and depression are associated with both phases. Although thyroiditis has generally been considered to be transient, there is a relationship with the later development of permanent clinical hypothyroidism [11].

Screening for thyroid dysfunction in cases of depression may lead to better therapy for some women. Beck's extensive work with postpartum depression has led to the development of the Postpartum Depression Predictors Inventory (PDPI) [12]. The most recent version of this screening tool includes 13 predictors:

1. Prenatal depression
2. Child-care stress
3. Life stress
4. Social support
5. Prenatal anxiety
6. Marital satisfaction
7. History of previous depression
8. Infant temperament
9. Maternity blues
10. Self-esteem
11. Socioeconomic status
12. Marital status
13. Unwanted/unplanned pregnancy

Table 44-1 shows the tool used in collecting the data for the PDPI-Revised. The format is that of an interviewing rather than a self-assessment tool. The

TABLE 44-1 Postpartum Depression Predictors Inventory (PDPI)–Revised/Guide Questions for Use

During Pregnancy	**Check One**	
Marital Status		
Single	❑	
Married/cohabitating	❑	
Separated	❑	
Divorced	❑	
Widowed	❑	
Partnered	❑	
Socioeconomic Status		
Low	❑	
Middle	❑	
High	❑	
Self-esteem	**Yes**	**No**
Do you feel good about yourself as a person?	❑	❑
Do you feel worthwhile?	❑	❑
Do you feel you have a number of good qualities as a person?	❑	❑
Prenatal Depression		
Have you felt depressed during your pregnancy?	❑	❑
If yes, when and how long have you been feeling this way?_____		
If yes, how mild or severe would you consider your depression? _____		
Prenatal Anxiety		
Have you been feeling anxious during your pregnancy?	❑	❑
If yes, how long have you been feeling this way?_____		

TABLE 44-1 Postpartum Depression Predictors Inventory (PDPI)–Revised/Guide Questions for Use (continued)

During Pregnancy	**Yes**	**No**
Unplanned/Unwanted Pregnancy		
Was the pregnancy planned?	❑	❑
Is the pregnancy unwanted?	❑	❑
History of Previous Depression		
Before this pregnancy have you ever been depressed?	❑	❑
If yes, when did you experience this depression?_____		
If yes, have you been under a physician's care for this past depression?_____		
If yes, did the physician prescribe any medication for your depression?_____		
Social Support		
Do you feel you receive adequate emotional support from your partner?	❑	❑
Do you feel you receive adequate instrumental support from your partner (e.g., help with household chores or babysitting)?	❑	❑
Do you feel you can rely on your partner when you need help?	❑	❑
Do you feel you can confide in your partner?	❑	❑
(Repeat social support questions for family and again for friends.)		
Marital Satisfaction		
Are you satisfied with your marriage or living arrangement?	❑	❑
Are you currently experiencing any marital problems?	❑	❑
Are things going well between you and your partner?	❑	❑
Life Stress		
Are you currently experiencing any of the following stressful events in your life:		
Financial problems	❑	❑
Marital problems	❑	❑
Death in the family	❑	❑
Serious illness in the family	❑	❑
Moving	❑	❑
Unemployment	❑	❑
Job change	❑	❑
After delivery, add the following items:		
Child-Care Stress		
Is your infant experiencing any health problems?	❑	❑
Are you having any problems with your baby feeding?	❑	❑
Are you having any problems with your baby sleeping?	❑	❑
Infant Temperament		
Would you consider your baby irritable or fussy?	❑	❑
Does your baby cry a lot?	❑	❑
Is your baby difficult to console or soothe?	❑	❑
Maternity Blues		
Did you experience a brief period of tearfulness and mood swings during the first week after delivery?	❑	❑
COMMENTS		

_____

_____

Source: Reproduced by permission from AWHONN. Beck, C. T. Revision of the postpartum depression predictors inventory. *JOGNN* 31(4)394–402, 2002.

strongest associations were with prenatal depression, poor self-esteem, child-care stress, and prenatal anxiety. Those with the smallest effect were single (nonpartnered) status, poverty, and unplanned or unwanted pregnancy [7].

Prevention through the identification of risks during the prenatal period as well as early intervention, including telephone or office follow-up in the early postpartum phase based on indicators of risk, is key to shortening the cycle of postpartum depression [7]. A recent program of individualized and enhanced postpartum care in Britain supported this argument for extension of postpartum care beyond assessment of purely physical recovery from childbirth [13].

The midwife's role is one of identification, support for women with mild symptoms, and referral to a supportive therapist or psychiatrist for women with significant depressive symptoms.

Coaching women to plan for life changes that will increase positive stimulation, open lines of good communication with family and friends, and care for themselves are helpful tools, but they do not replace the need for professional mental health care with true depression. Midwives who wish to participate in this care need to develop counseling skills, be informed about medication and talk therapies, and be prepared to devote significant time to this component of practice. It is also essential that consultation with a mental health professional be available.

Attachment Failure and the Potential for Child Abuse or Neglect

In the calendar year 2000, in the United States alone, approximately 879,000 children were identified as neglected or abused. Child maltreatment is the global term that is used to describe neglect of the physical, educational, or emotional needs of the child as well as physical abuse, sexual abuse, and emotional abuse [14]. The causes are diverse and complex; it is impossible to point to a single event or condition in most cases and to allege that this is the "cause" of neglect or active abuse. Among the factors that have been identified as potential causes are the following:

1. *Parenting:* History of abuse of the parent during childhood, substance abuse, personality traits such as poor self-esteem, depression, isolation, or immaturity, poor parenting skills, and the specific social situation of the family.
2. *Infant or child:* Social isolation, "differentness" such as illness or developmental delay, child behaviors.
3. *Family:* Financial, relationship, or violence issues.
4. *Environment:* Poverty, cultural issues, lack of social support [15].

Another study of family characteristics during early infancy identified low levels of social support, maternal depression, poor education, complaints of physical aches and pains, alcohol use, financial dependence on public programs, multiple dependent children, and maternal separation from her own mother at an early age as predictive of child maltreatment [16]. There is an obvious overlap between the issues that may lead to postpartum depression discussed earlier in this chapter and those associated with neglect or abuse of the young child. Beck's meta-analyses of studies on the relationship between postpartum depression and maternal-infant interaction, on infant temperament, and on depression's effect on child development suggest that the mother's inability to interact effectively with her infant not only affects early infant behaviors but also has a long-term effect on both emotional and cognitive function [17–19]. The midwife observes for behaviors that suggest not only maternal illness but also a home in which the infant is at risk.

Morton and Browne reviewed the literature on attachment and child maltreatment in 1998 [20]. Attachment is the process by which infants, at around six months of age, begin to develop behaviors that help them maintain proximity to their caregivers—a change from earlier months, when infants rely on sounds and facial expressions to attract attention and care. On the adult side, the response of the caregiver (usually considered to be the mother) reinforces or alters infant behavior. Rejection, inconsistency, or withdrawal behaviors by parents thus affect the infant's repertoire of behaviors. A synthesis of this research supported a belief that impacting these early relationships can break a cycle of maltreatment.

Periodic home visits have been explored as one intervention to promote healthy parenting and observe for risks of neglect and abuse. Several studies have provided repeated nursing visits during pregnancy and infancy and found that there was a potential benefit, although it is not clear whether the benefit is in promoting more effective parenting,

providing information the mothers could use to respond more effectively to their infants and develop secure attachment behaviors, or identifying risks and intervening earlier in cases of maltreatment [21–23]. The presence of domestic violence has been reported to interfere with the effectiveness of a program of home visiting [24].

Active abuse is not the only factor that plays a role in subsequent development. The midwife needs to be alert for indications of neglect, which has been linked to defects in learning, social interactions, developing independence, and coping skills [25]. Because neglect—especially neglect based on emotional detachment—may be subtle, observation of parent-child interactions during visits is an important tool.

There is also increased interest in the relationship of early neglect and abuse to brain development in the young child. The world to which the child is exposed—beginning with prenatal exposure to substances of abuse, to adaptation to negative stimuli (such as failure to interact with the infant), to malnutrition, to the chronic stressors of physical or emotional abuse—affects the ability to learn and to respond effectively. When the attachment process of early infancy is disrupted, the infant may not develop appropriate awareness of the self in relationship to others, or of other people's emotions. In addition, neglect and decreased stimuli may lead to decreased growth of the brain, with long-term deficits in learning and behavioral problems [26].

All midwives must assume the professional responsibility to observe for signs of childhood abuse and neglect and access the appropriate resources to protect children. Beyond that basic requirement, each midwife serves the families in her care by monitoring for warning signs and predictive behaviors, offering support for behavioral change, and working toward prevention of child abuse.

References

1. Riordan, J., and Auerbach, K. *Breastfeeding and Human Lactation*, 2nd ed. Boston: Jones and Bartlett, 1999.
2. Love, S., and Lindsey, K. *Dr. Susan Love's Breast Book*. Reading, MA: Addison-Wesley, 1990, p. 98.
3. Amir, L. H., Garland, S. M., Dennerstein, L., and Farish, S. J. *Candida albicans:* is it associated with nipple pain in lactating women? *Gynecol. Obstet. Invest.* 41(1):30–34, 1996.
4. Tanguay, K. E., McBean, M. R., and Jain, E. Nipple candidiasis among breastfeeding mothers. Case-control study of predisposing factors. *Can. Fam. Physician* 40:1407–1413 (August) 1994.
5. Beck, C. T. Postpartum depression: stopping the thief that steals motherhood. Cited in Beck, C. T. Revision of the postpartum depression predictors inventory. *JOGNN* 31(4):394–402 (July/August) 2002.
6. MacClennan, A., Wilson, D., and Taylor, A. The self-reported prevalence of postnatal depression. *Austr. N Z J. Obstet. Gynecol.* 36(3):313 (August) 1996.
7. Beck, C. T. Revision of the postpartum depression predictors inventory. *JOGNN* 31(4):394–402 (July/August) 2002.
8. Beck, C. T, and Gable, M. K. Further validation of the postpartum depression screening scale. *Nurs. Res.* 50(2):201–209, 2001.
9. O'Hara, M. W., and Swain, A. M. Rates and risk of postpartum depression—A meta-analysis. *Int. Rev. Psychiatry* 8:37–45, 1996.
10. Pederson, C. A. Postpartum mood and anxiety disorders: a guide for the nonpsychiatric clinician with an aside on thyroid associations with postpartum mood. *Thyroid* 9(7):691–697 (July) 1999.
11. Muller, A. F., Drexhage, H. A., and Berghout, A. Postpartum thyroiditis and autoimmune thyroiditis in women of childbearing age: recent insights and consequences for antenatal and postnatal care. *Endocr. Rev.* 22(5):605–630, 2001.
12. Beck, C. T. Predictors of postpartum depression: an update. *Nurs. Res.* 50(5):275–285 (September/October) 2001.
13. MacArthur, C., Winter, H. R., Bick, D. E., et al. Effects of redesigned community postnatal care on women's health 4 months after birth: a cluster randomised controlled trial. *Lancet* 359(9304):378–385 (February 2) 2002.
14. National Child Abuse and Neglect Data System (NCANDS) Summary of Key Findings from Calendar Year 2000. Children's Bureau, Administration on Children, Youth, and Families, Department of Health and Human Services, April 2002. Accessed online at www.calib.com/nccanch/pubs/factsheets/canstats.cfm on October, 14, 2002.
15. DePanfilis, D., and Salus, M. *A Coordinated Response to Child Abuse and Neglect: A Basic Manual.* Washington DC: U.S. Department of Health and Human Services Administration for Children and Families, Administration on Children, Youth, and Families, National Center on Child Abuse and Neglect, 1992.

16. Kotch, J. B., Browne, D. C., Dufort, V., and Winsor, J. Predicting child maltreatment in the first 4 years of life from characteristics assessed in the neonatal period. *Child Abuse Negl.* 23(4):305–319, 1999.
17. Beck, C. T. The effects of postpartum depression on maternal-infant interaction: a meta-analysis. *Nurs. Res.* 44(5):298–304 (September/October) 1995.
18. Beck, C. T. A meta-analysis of the relationship between postpartum depression and infant temperament. *Nurs. Res.* 45(4):225–230 (July/August) 1996.
19. Beck, C. T. The effects of postpartum depression on child development: a meta-analysis. *Arch. Psychiatr. Nurs.* 12(1):12–20 (February) 1998.
20. Morton, N., and Browne, K. D. Theory and observation of attachment and its relation to child maltreatment: a review. *Child Abuse Negl.* 22(11):1093–1104, 1998.
21. Olds, D. L., Henderson, C. R., Chamberlin, R., and Tatelbaum, R. Preventing child abuse and neglect: a randomized trial of nurse home visitation. *Pediatr.* 78(1):655–678 (July) 1986.
22. Olds, D. L., Henderson, C. H., Jr., Kitzman, H., and Cole, R. Effects of prenatal and infancy nurse home visitation on surveillance of child maltreatment. *Pediatr.* 95(3):365–372 (March) 1995.
23. Armstrong, K. L., Fraser, J. A., Dadds, M. R., and Morris, J. A randomized controlled trial of nurse home visiting to vulnerable families with newborns. *J. Paediatr. Child Health* 35(3):237–244, 1999.
24. Eckenrode, J., Ganzel, B., Henderson, C. R., Jr., et al. Preventing child abuse and neglect with a program of nurse home visitation. *JAMA* 284(11):1385–1391 (September 20) 2000.
25. Hilyard, K. L., and Wolfe, D. A. Child neglect: developmental issues and outcomes. *Child Abuse Negl.* 26:679–695, 2002.
26. National Clearinghouse of Child Abuse and Neglect Information, Administration for Children and Families, U.S. Department of Health and Human Services. *In Focus: Understanding the Effects of Maltreatment on Early Brain Development*. Accessed online at www.calib.com/nccanch/pubs/focus/earlybrain.cfm on October 14, 2002.

• • • Additional References

Creasy, R. K., and Resnik, R. *Maternal-Fetal Medicine: Principles and Practice*, 4th ed. Philadelphia, PA: W. B. Saunders, 1999.

Gabbe, S. G., Niebyl, J. R., and Simpson, J. L. (Eds.), *Obstetrics: Normal and Problem Pregnancies*, 4th ed. New York: Churchill Livingstone, 2002.

Helfer, R. E. The neglect of our children. *Pediatr. Clin. N. Amer.* 37(4):923–942 (August) 1990.

James, D. K., Steer, P. J., Weiner, C. P., and Gonik, B. *High Risk Pregnancy: Management Options*, 2nd ed. Philadelphia, PA: W. B. Saunders, 1999.

Love, S., and Lindsey, K. *Dr. Susan Love's Breast Book*. Reading, MA: Addison-Wesley, 1990.

Newberger, E. H. Pediatric interview assessment of child abuse: challenge and opportunities. *Pediatr. Clin. N. Amer.* 37(4):943–954 (August) 1990.

Riordan, J., and Auerbach, K. G. *Breastfeeding and Human Lactation*, 2nd ed. Boston: Jones and Bartlett, 1999.

Rooks, J. P., Weatherby, N. L., and Ernst, E. K. M. The national birth center study: Part III—intrapartum and immediate postpartum and neonatal complications and transfers, postpartum and neonatal care, outcomes, and client satisfaction. *J. Nurse-Midwifery* 37(6):361–397 (November/December) 1992.

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PART

VIII

Skills

Part 8 is a compilation of some of the necessary skills and procedures used in managing the primary care of nonpregnant women, normal childbearing women, and neonates in a variety of different settings both within and outside the United States. Some of these skills are used in obtaining a database for evaluation; others for implementing a plan of care. Skills that were discussed in the management sections in other parts of the book are not repeated here (e.g., timing contractions, Nitrazine test for ruptured membranes, evaluation of dilatation). Conversely, the skills and procedures discussed here are referred to but not described in other parts of the book.

As long as a skill or procedure is performed safely, effectively, accurately, and with the minimum possible trauma, variations in *how* it is done do not matter. The step-by-step procedures and rationale detailed in this book are based on experience that has shown the described method to be safe, effective, and accurate and to inflict the least possible trauma. However, other approaches may be equally valid. Alternative methods are described for some skills and procedures, and the advantages and disadvantages of each method are stated. Because of the multitudinous variations among hospitals and medical supply companies in packaging materials for procedures, a listing of necessary supplies is not given. The essential supplies for a given procedure are obvious from the discussion.

The importance of being able to perform essential skills efficiently need not be belabored. Suffice it to say that you should *never* base management of care decisions on whether you are capable of performing the necessary skill or procedure. Since experience and efficiency reduce trauma, it is essential to practice, practice, practice.

This portion of the book discusses only how to perform a skill or procedure once you have made the decision to do it. When and why to use a skill or do a procedure and the factors involved in making these decisions are part of the management process and are discussed in other parts of the book.

In accord with the educational principle that theoretical content is best learned when it is applicable, relevant anatomy is presented when pertinent. When this content is not presented, references are given for the learner to use for study purposes. The discussion of physical and pelvic examination skills also differs from the discussion of other skills and procedures in Part 8 in that observations and findings elicited by the examination and their significance are included. This is in keeping with the same principle of learning.

In addition to performing a skill or procedure in a manner that is safe and effective, yields accurate results or findings, and causes the minimum possible trauma, you should follow certain general principles and approaches with all procedures:

1. Obtain the woman's consent and cooperation.
2. Inform the woman of what you are doing or will be doing throughout the procedure.

3. Use a gentle, smooth, and firm touch (not jerky, rough, or inconsiderate, with additional nervous or repetitious movements).
4. Demonstrate respect for the woman's body and for her as a person.
5. Do the procedure safely as quickly as possible.
6. Forewarn the woman immediately prior to any step in a procedure that will be uncomfortable or painful.
7. Be honest; if a procedure is going to hurt, say so.
8. Reassure the woman and praise her for how well she is coping with the procedure.
9. Time the procedure so it is not done at a time when another procedure is being done or when the woman is experiencing temporary pain or other distraction. For example, unless the situation is an emergency, drawing blood from a woman in labor can wait until she is between contractions.

CHAPTER

45

Universal Precautions

Modern-day hospitals have always followed isolation precautions for the protection of both patients and care providers. In addition, obstetric personnel for years took extra precautions to protect themselves and others if they knew they were working with a woman with infectious hepatitis, syphilis, tuberculosis, or other communicable disease. For years, the use of sterile technique for normal birth was predicated on not bringing infection to the mother and her baby. Nurse-midwives prided themselves on changing labor and delivery room policy and eliminating the barriers between mother and provider and mother and baby created by sterile technique "overkill" for normal childbearing. Caps, masks, gowns, foot gear, wrist straps (to keep the mother from contaminating the sterile field), and extensive sterile draping gave way in the hospital as birth became more humanized.

Then came HIV/AIDS. In 1987, the Centers for Disease Control and Prevention (CDC) first published a document entitled *Recommendations for Prevention of HIV Transmission in Health-Care Settings* [1] in which it recommended that blood and body fluid precautions be used with *all* patients, regardless of their bloodborne infection status. The policies outlined in this document became known as *universal precautions*—an approach that considers all patients potentially infectious for HIV, hepatitis B virus, and other bloodborne pathogens. The CDC subsequently updated, clarified, and elaborated its universal precautions and guidelines for prevention [2, 3]. These have not changed since 1989. The most recent CDC publication on this subject, issued in 2001, addresses management of health care personnel with occupational exposure to human immunodeficiency virus (HIV), hepatitis B virus (HBV), or hepatitis C virus (HCV) [4].

Midwives went through a period of difficult transition getting back into masks, gowns, and footgear and adding eye protection and double gloving for delivery [5]. In 1988 a survey of Certified Nurse-Midwives revealed that only 55.1 percent were using universal precautions. Concern that precautions might interfere with the relationship between the midwife and the woman was identified as the most frequent reason for not using universal precautions [6]. Denial of the problem (with resulting carelessness) was another factor [7]. It may well be that the midwives most at risk for transmission of a bloodborne pathogen are those working with a population that is at low risk for HIV/AIDS and who foolishly think they thus do not need to be as conscientious in using universal precautions. However, as Zeidenstein writes, "responsibility to ourselves, our families and loved ones, and future generations of midwives must take precedence" [8].

Copies of universal precautions can be obtained from the CDC's National AIDS Clearinghouse ((800) 458-5231). The basic components of universal precautions specific to midwifery are as follows:

1. Appropriate barrier precautions should be used to prevent exposure of skin and mucous membranes (eyes, nose, mouth) to blood, amniotic fluid, vaginal secretions, semen, repeated contact with breast milk, and body fluids or secretions containing visible blood. Barrier precautions include gloves, cover gowns or aprons, masks, protective eyewear, footgear cover, and mouthpieces or other barriers for use during resuscitation.
2. Gloves should be worn for vaginal examinations; collection of cultures from lesions; birth;

phlebotomy, finger and heel sticks; handling the newborn before the baby is washed and dried; and handling of any sanitary or bed pads, clothing, linens, or other items soiled with body fluids.

When double-gloving, the first glove you put on should be one-half size larger than your usual size glove. Use your usual size glove for the outer glove. This will increase maneuverability [8].

3. Hands and skin surfaces that have been contaminated should be washed immediately and thoroughly.
4. Needles should not be recapped, removed from disposable syringes, bent, broken, or otherwise manipulated by hand after use.
5. All sharp instruments and needles should be placed in puncture-resistant disposal containers located in the immediate area.

References

1. Centers for Disease Control and Prevention. Recommendations for prevention of HIV transmission in health-care settings. *MMWR Morb. Mortal. Wkly. Rep*. (suppl.) 36(2S) (August) 1987.
2. Centers for Disease Control and Prevention. Update: Universal precautions for prevention of transmission of human immunodeficiency virus, hepatitis B virus, and other bloodborne pathogens in health-care settings. *MMWR Morb. Mortal. Wkly. Rep*. 37:377–388 (June 24) 1988.
3. Centers for Disease Control and Prevention. Guidelines for prevention of transmission of human immunodeficiency virus and hepatitis B virus to health-care and public-safety workers. *MMWR Morb. Mortal. Wkly. Rep*. 38, 1989.
4. Centers for Disease Control and Prevention. Updated U.S. Public Health Service guidelines for the management of occupational exposures to HBV, HCV, and HIV and recommendations for postexposure prophylaxis. *MMWR Morb. Mortal. Wkly. Rep*. 50(RR11):1–42 (June 29) 2001.
5. Baxter, L. Midwifery in the AIDS generation. *J. Nurse-Midwifery* 32(6):337–338 (November/December) 1987.
6. Loewen, N. L., et al. Use of precautions by nurse-midwives to prevent occupational infections with HIV and other bloodborne diseases. *J. Nurse-Midwifery* 34(6):309–317 (November/December) 1989.
7. Hsia, L. AIDS: Taking universal precautions seriously. *J. Nurse-Midwifery* 38(2):63–64 (March/April) 1993.
8. Zeidenstein, L. Adapting universal precautions in a CNM service. *J. Nurse-Midwifery* 34(5):280–283, (September/October) 1989.

CHAPTER

46

Finger Puncture

Procedure	Rationale
1. Check and organize materials and equipment, making sure all are present, appropriate, and placed conveniently.	**1.** Failure to do so may result in the need to stick the woman again, since hemostasis will occur while you gather missing equipment.
2. Ask the woman if she is left- or right-handed and if she has any preference as to which finger is used.	**2.** Use a finger on the hand least used because the puncture site will be sore for several hours upon direct pressure.
3. Ask the woman to hold her hand down while you get the materials ready. Do *not* milk the finger as preparation for the puncture. If needed, warm the puncture site area with a warm, moist gauze or cloth.	**3.** Utilize gravity to aid blood flow to the area. Milking the finger has potential for diluting the specimen with interstitial fluid, thereby possibly yielding inaccurate results. Warmth increases blood flow and results in arterial-enriched blood, which is more uniform in composition.
4. Put on gloves.	**4.** Universal precaution, to protect yourself from any bloodborne pathogen the woman may have.
5. Clean the ball of the selected finger with an alcohol sponge. Allow to air dry or wipe dry with a dry cotton ball or gauze square.	**5.** Wet alcohol will sting in an open wound such as will be created with the puncture.
6. Grasp the finger firmly in one hand, still holding it down, and tell the woman there will be a short, sharp stick pain and not to jerk her hand away (see Figure 46-1).	**6.** Elicit the woman's cooperation. If she jerks her hand, it may spoil your puncture and require you to stick her again. Your firm grasp of the finger helps to control any tendency to jerk.
7. Make a deep puncture slightly lateral to the center of the ball of the finger. Use a quick down-and-up (in-and-out) movement with deliberate pressure behind the movement to make the lancet go deeper. Some clinicians also twist the lancet a bit at the bottom of their thrust.	**7.** You want to create a puncture from which blood will flow freely; this requires a puncture that cuts enough tissue to obtain this result. Otherwise, excessive pressure and milking the finger to get blood will dilute the specimen with interstitial tissue fluid and render test results inaccurate. A deep puncture is therefore preferable to a shallow one. One deep puncture is no more painful than two shallow punctures. Don't worry about going too deep, as the length of the lancet prohibits this. You should take advantage of the full length of the lancet.
8. Apply slight pressure just above the puncture site with the thumb of the hand holding the finger.	**8.** This causes the blood to flow freely. More than slight pressure will contaminate the specimen with tissue fluid.

FIGURE 46-1 Proper positioning for finger puncture.

Procedure	Rationale
9. Wipe off the first drop of blood with a dry gauze square or cotton ball.	**9.** The first drop of blood usually contains tissue fluid and may be otherwise contaminated. Dry gauze is preferable to a dry cotton ball because the fibers of the cotton ball may stick to the wound or on the finger.
10. Again apply slight pressure above the puncture site and, when a drop of blood has formed, do either of the following:	**10.**
a. Place the blood drop on a special slide used in a hemoglobin machine; or	**a.** Be sure to read the instructions for the particular machine being used so you know where to put the blood drop without getting blood everywhere.
b. Fill capillary tubes for a hematocrit by holding one end of a red-tipped (heparinized) capillary tube against the blood in as close to a horizontal position as possible.	**b.** Holding the capillary tube horizontal facilitates the flow of blood into the tube, which operates by capillary action. Holding the capillary tube below the blood drop will cause blood to flow into the tube even faster because of the additional effect of gravity. Holding the tube above the blood drop will inhibit the blood flow.
Do *not* milk the finger.	
11. Control blood flow into the tube with your index finger, which is held at the end of the capillary tube opposite the end touching the blood. Blood will not flow in any direction if your finger covers that end. Otherwise, blood will ascend or descend in the tube depending on whether the tube is touching blood and the angle of the tube.	**11.** If air gets into the capillary tube it must be expelled. Cover the end of the tube with your index finger, hold the opposite end over a dry gauze square, and release your finger. Allow the blood to drop on the gauze square or cotton ball without touching it with the tube. (If blood at the end of the tube touches the gauze, more plasma than red cells will be attracted by the gauze and escape from the tube. The blood remaining in the tube will then be a false sample of the proportion of the component parts in the woman's blood. If this happens, a new specimen must be collected.) When the air is expelled, cover the end of the tube again with your finger to preserve the remaining blood in the tube and refill the tube with blood from the puncture site.

Procedure	Rationale
12. Fill two capillary tubes two-thirds full of blood with no more than one-sixth of the two-thirds that contains blood being air.	**12.** A small amount of air will not affect a hematocrit reading so long as the air is not of sufficient quantity to prevent blood from occupying over half of the tube. Filling the tube two-thirds full leaves room for the sealing clay.
13. When each tube is filled, cover the end, move the tube to a horizontal position, uncover the end, and gently tilt the tube back and forth without letting the blood get too close to either end of the tube.	**13.** Tilting the tube back and forth mixes the blood with the heparin in the tube. If not mixed immediately with the dried heparin in the tube, the blood will clot and readings will be inaccurately high. If blood gets in the end of the tube it may prevent a good seal with the sealing clay.
14. With sealing clay, close the end of the tube that did not touch the blood, by pressing with a rotary motion. Fill one end of the tube with approximately 5 mm of clay. If the hematocrit is not going to be run immediately, seal both ends of the tube.	**14.** Some of the plasma will evaporate if the tube is left sitting. This can raise the hematocrit reading considerably and erroneously. Evaporation can be prevented for a longer period of time by sealing both ends of the tube. Sealing both ends has no effect on the accuracy or running of the hematocrit.
15. Note where the blood is in the tube when you seal it and be sure it is not too close to either end.	**15.** If the blood is too close to the end being sealed, an ineffective seal may result and the pad of sealing clay will be smeared. If the blood is too close to the other end, it may be pushed out while the first end is sealed and you may be left with too little blood for the test.
16. Seal the tubes either by holding the sealing clay vertically and the tube horizontally or by placing the sealing clay on a flat surface and holding the blood tube vertically and inserting it into the clay. If you use the latter method, be sure to cover the upper end of the blood tube with the tip of your index finger. This will keep the blood suspended no matter at what angle you hold the tube, thereby preventing the blood from moving or escaping from the tube.	
17. When you are sure that you have two unbroken, appropriately filled, sealed tubes, clean off the woman's finger and, using an alcohol sponge for antisepsis, apply pressure (or ask the woman to apply pressure) to the puncture site until hemostasis has occurred and there is no further bleeding.	**17.** Do not apply pressure and effect hemostasis until you are sure you have all the blood you need. Otherwise, you may have to restick the woman.
18. Dispose of the lancet, gauze, hemoglobin slide (after reading the results), and gloves in a biological hazardous waste disposal receptacle.	**18.** Protect yourself and others from bloodborne pathogens.

Some medical supply companies make microcollection systems. If using such a system, read the directions carefully, wear gloves, and dispose of materials appropriately.

The purpose of the colored ends of the microcapillary tubes is color coding. A red-tipped tube is heparinized with dried heparin in it; a blue-tipped tube is plain with nothing in it. Red-tipped tubes, then, are the capillary tubes to use in doing a finger puncture to obtain blood for a hematocrit.

The colored tips can serve an additional function. Since only one end is colored, you can use them for remembering which end has touched the blood drop; fill the other end with sealing clay, thereby ensuring an effective seal. Form a habit of always using the same end (plain or colored) for the same substance, blood or clay.

Bibliography

Henry, J. B. *Clinical Diagnosis and Management by Laboratory Methods*, 20th ed. Philadelphia, PA: W. B. Saunders, 2001, ch. 1.

Pendergraph, G. E. *Handbook of Phlebotomy*, 4th ed. Philadelphia, PA: Lea and Febiger, 1998.

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CHAPTER

47

Venipuncture

Procedure	Rationale
1. Check and organize materials and equipment, making sure all are present, appropriate, and placed conveniently.	**1.** Failure to do this may have a number of results, all leading to having to restick the woman. The blood may clot in the syringe prior to transfer to the appropriate test tube; body movements made in trying to reach ill-placed equipment may cause the needle to slip out of or go through the vein wall; you may discover that the syringe is not large enough to collect all the blood needed or that not enough blood tubes are on hand.
2. Poke a hole through each rubber stopper in each test tube with a needle. Discard the needle. This step is not necessary if you use a Vacutainer.	**2.** This releases the pressure vacuum in the tubes. See Step 19.d. The needle is no longer sterile.
3. Apply the tourniquet.	**3.**
a. The tourniquet should be 1 inch wide.	**a.** A wide tourniquet causes less discomfort than a narrow one.
b. Place the tourniquet approximately 3 inches proximal to the intended insertion site.	**b.** Position it far enough so that it does not interfere with blood drawing but close enough to provide the needed occlusion and distention of the vein.
c. Slip the tourniquet around the arm with the ends up; hold one end steady while stretching the other end. Hold both ends away from the arm. Then (1) cross the stretched end in front of the steadied end, (2) cross over the steadied end, and (3) create a half loop in the stretched end under the steadied end with your finger.	**c.** Stretching one end of the tourniquet provides the necessary tension on the arm for occlusion of the vein; holding the ends away from the arm prevents you from pinching the woman's skin while you form and anchor the loop that creates the slipknot.
d. Lower both ends of the tourniquet onto the arm with the loop of the stretched end anchored underneath the steadied end of the tourniquet and release your grasp on the tourniquet (see Figure 47-1).	**d.** Anchors the slipknot.

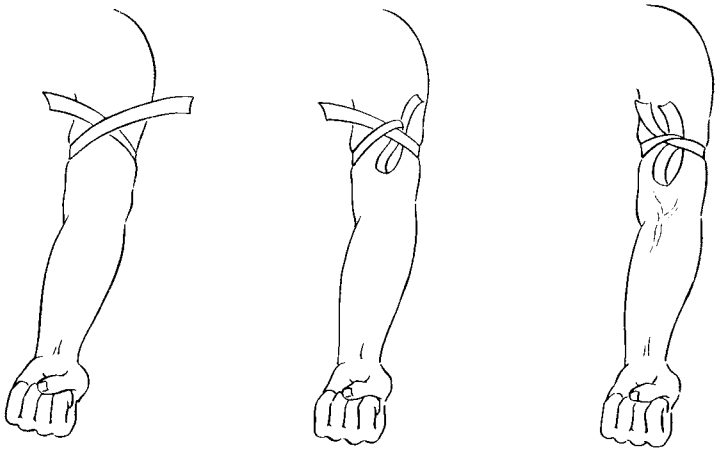

FIGURE 47-1 Applying a tourniquet for venipuncture.

Procedure	Rationale
e. Check if the tourniquet is too tight or too loose, and reapply it in either case.	**e.** The tourniquet should be tight enough to occlude the vein but not tight enough to occlude arteries. If the tourniquet is too tight, the woman usually complains. If the tourniquet is too loose, the vein will not become distended.
f. Do not leave the tourniquet on longer than one minute. An unduly long length of time for the tourniquet to be in place is evidenced by the extremity below the tourniquet becoming cyanotic or distended and the woman complaining of pain.	**f.** Prolonged application of the tourniquet causes hemoconcentration as well as discomfort to the woman resulting from lack of venous circulation below the tourniquet.
4. Put on gloves.	**4.** Universal precaution to protect yourself from any bloodborne pathogen the woman may have. It is easier to put on the tourniquet without gloves, as gloves tend to stick to the tourniquet. Once the tourniquet is applied, however, you need to put on your gloves without delay (see 3f).
5. Distend the vein by one or more of the following methods with the extremity angled downward:	**5.** Enlarges the vein, which makes it easier to find the vein and insert the needle.
a. Ask the woman to open and close her hand several times.	
b. Rub vigorously with the alcohol sponge while cleaning the area.	
c. Tap or gently slap the vein.	
d. Apply warmth (a warm towel) to the vein.	
6. a. The vein you select should be well supported by subcutaneous tissue and should appear full without being prominent.	**6. a.** A well-supported vein will not roll and tissue will not dimple as the needle is inserted; either may happen with a prominent, easily movable vein.
b. The vein should be in the forearm—look first at or near the bend of the elbow, in the antecubital fossa (see Figure 47-2).	**b.** Veins in the forearm are larger than those around the wrist or on the back of the hand. These other veins may also be used but not as the primary choice, since they are smaller and the procedure in this area is more painful.

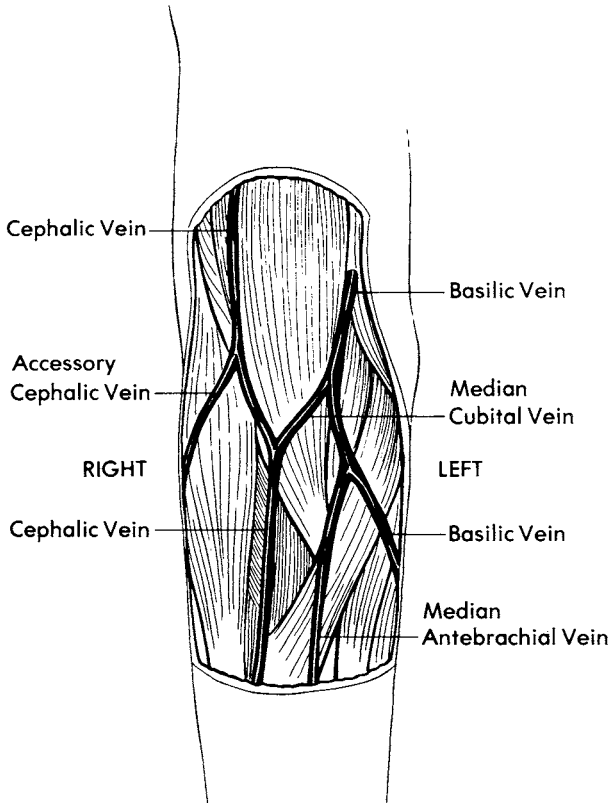

FIGURE 47-2 Veins in the antecubital fossa (right arm).

Procedure	Rationale
c. You should be able to feel and ideally also see the vein.	**c.** Touch is essential to inserting the needle into the vein. Being able to see it also promotes accuracy in hitting the vein, especially for the inexperienced, but it is not absolutely essential. Touch also aids in identifying whether the vein will roll when touched by the needle. There should be a feeling of give when you touch the vein, but it should not roll.
d. Do *not* use a vein in the same arm as one receiving an intravenous transfusion. If it is absolutely mandatory to use the same arm, select a vein that is distal to the IV insertion site (not the same vein), turn off the IV, and apply the tourniquet below the IV site.	**d.** The fluid entering the vein from the intravenous transfusion has chemicals and a diluting effect, which cause erroneous results on most laboratory tests.
e. The vein should *not* be anatomically adjacent to a nerve or artery.	**e.** There is less chance for the inexperienced to puncture a nerve or artery accidentally—the former causing excruciating pain and the latter yielding the wrong blood for lab tests, unless arterial blood is specified.
7. Clean the insertion site with a circular motion, starting at the insertion site, moving outward, and ending peripherally to the insertion site. Use firm pressure and a rather vigorous motion. An alcohol sponge is usually used as the antiseptic.	**7.** Make the area as clean as possible in order to reduce the possibility that the skin will contaminate the needle, leading to subsequent infection.

Procedure	Rationale
8. Let the area dry.	**8.** This lessens discomfort. Wet alcohol stings when it touches tissue such as at the insertion site.
9. If you feel the vein again, clean the area again with another alcohol sponge.	**9.** You have contaminated the insertion site with your palpating finger.
10. Double-check the needle and syringe to make sure the needle is well attached to the syringe, the barrel of the syringe moves easily, and the syringe is large enough for the amount of blood needed. If you are using a Vacutainer holder and needle, be sure the holder is securely screwed onto the needle and the first tube is placed in the holder and started onto the inner needle. If you push the tube no further than the guideline on the holder, then you will have pushed it just far enough for the needle to pierce but not go through the rubber stopper, which would release the vacuum in the tube.	**10.** If you notice a problem after the needle is in the vein, the subsequent manipulations to resolve them may dislodge the needle. The system will not work without this vacuum, as you have no syringe or other means with which to withdraw the blood.
11. Make sure there is no air in the syringe and that the barrel of the syringe fully occupies the syringe.	**11.** Avoid the danger of inserting air into the vein or of finding that there is no room for blood in the syringe because it is full of air. In the latter situation you have no way of getting rid of the air except to disconnect the syringe from the needle and expel the air; this manipulation may dislodge the needle.
12. Place the thumb of the hand not holding the syringe directly over the vein, approximately 1 to 2 inches below the probable point of entry into the vein, and the rest of your hand on the other side of the arm. Fix the vein by pressing down firmly with your thumb and pulling the skin away from the entry site, thereby making the skin over that area taut. Some clinicians anchor the vein by placing their thumb below and either their index or middle finger above the insertion site, firmly pressing down over the vein, and pulling away from each other (see Figure 47-3).	**12.** Fixing the vein helps keep the vein from rolling or the skin from dimpling when the needle enters.
13. Align the direction of the needle with the direction of the vein and hold the syringe at approximately a 15-degree angle from the woman's arm. See Figure 47-3.	**13.** A 15-degree angle reduces the chance of going through or missing the vein. A smaller angle may cause the needle to skim along the top of the vein. A wider angle may cause the needle to go through the vein.
14. Enter the vein directly or penetrate the skin and tissue directly adjacent to the side of the vein and then angle the needle into the vein. Either way, use a quick, steady motion and control the movement of the needle by holding your index finger against its hub.	**14.** The users of both methods of entry claim their method decreases the possibility of missing the vein because the vein does not roll. Those who enter the vein directly say they are in and the vein is stabilized before it has a chance to roll. Those who advocate penetration to the side of the vein first and then entry into the vein say that the tissue helps hold the vein in place, keeping it from rolling while the needle pushes against it.

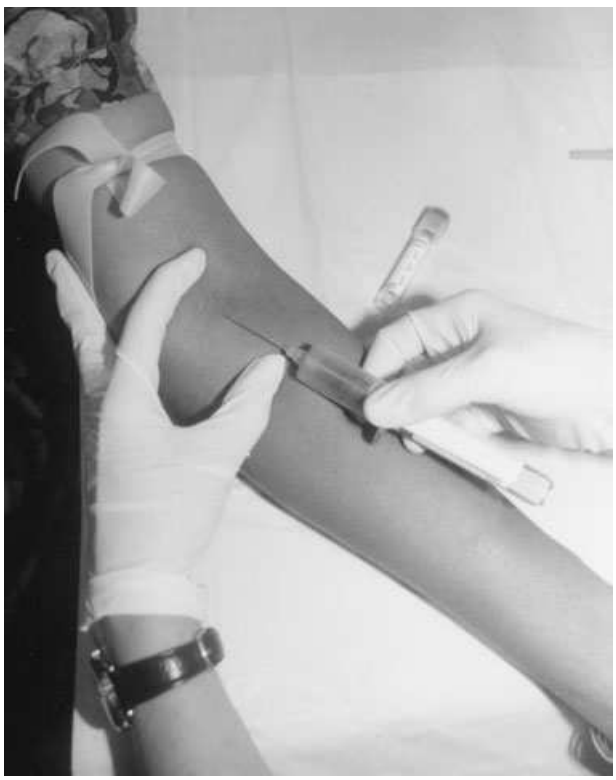

FIGURE 47-3 Preparing to perform a venipuncture: gloves on; skin held taut; vein fixed; needle aligned with vein and at a 15° angle.

Procedure	Rationale

Note: The unending discussion of whether the needle should enter the vein with the bevel up or down is based on the notion that one position or the other prevents the escape of any blood into the surrounding tissues, which may result from incomplete entry into the vein. However, the debate seems pointless, since extravasation of blood is possible with the bevel of the needle in either position. Use the method with which you are most comfortable as dictated by your own experience and experimentation.

15. Hold the barrel steady and withdraw the blood by pulling back on the plunger. Use slow, even tension. Fill the syringe to the amount needed. Some clinicians use their free hand (the hand that set the vein) to do this. Others use that hand to stabilize the needle in the vein by holding the hub or juncture of the needle and syringe steady while using the hand that had previously held the needle hub and syringe to pull back on the plunger.

If you are using a Vacutainer holder and needle, you can prevent the needle from becoming dislodged from the vein by holding the needle firmly in place and stabilizing it at the point of junction with the holder against the body part with one hand while the other hand manipulates the tube and holder.

15. The syringe is filled by the mechanism of negative pressure. Pulling back on the plunger too quickly may collapse the vein or cause hemolysis.

The manipulation involved in placing the tube on the inner needle and removing it again, which must be repeated for several tubes, may cause you to dislodge the needle from the vein. Unless the needle is stabilized, when you place a tube on the needle you may go through the vein; when you take a tube off the needle you may pull out of the vein.

Procedure	Rationale
An alternative is to use a 21-gauge butterfly needle attached to the Vacutainer.	A butterfly needle used when filling multiple tubes eliminates the risk of dislodging the needle from the vein while manipulating the tubes on and off the inner Vacutainer needle.
16. Release the tourniquet by pulling on one end of the tourniquet (Figure 47-4). It is important to release the tourniquet *before* withdrawing the needle. Some clinicians release the tourniquet when the blood begins to flow.	**16.** There will be extravasation of blood into the surrounding tissue from the distended vein when the needle is withdrawn if the tourniquet is not released first. This leaves the woman with a painful blood clot in her tissues, which will take some time to dissolve and be absorbed.
17. Slowly withdraw the needle as you gently but firmly apply an alcohol or dry sponge on the puncture site.	**17.** Slow withdrawal of the needle decreases the risk of injuring any tissue with the point of the needle. The alcohol or dry sponge allows you to apply pressure instantaneously with withdrawal of the needle. A dry sponge hurts less.
18. Apply pressure (or have the woman apply pressure) on the puncture site with the alcohol or dry sponge for 1 to 2 min. Contrary to popular practice, do not have the woman bend her elbow if an antecubital site was used.	**18.** Pressure facilitates hemostasis. Bending the elbow increases the chance of bruising.
19. The Vacutainer test tubes are filled with blood when the blood is drawn. If you drew the blood into a syringe, then fill the appropriate test tubes with the appropriate amount of blood: **a.** Remove the rubber stoppers from the tubes. **b.** Remove the needle from the syringe.	**19.** **a.** and **b.** If the needle is pushed through the rubber stopper, the blood will be drawn into the tube at a rapid rate. The rapidity and force of transfer and the narrow opening of the needle may hemolyze the red blood cells.

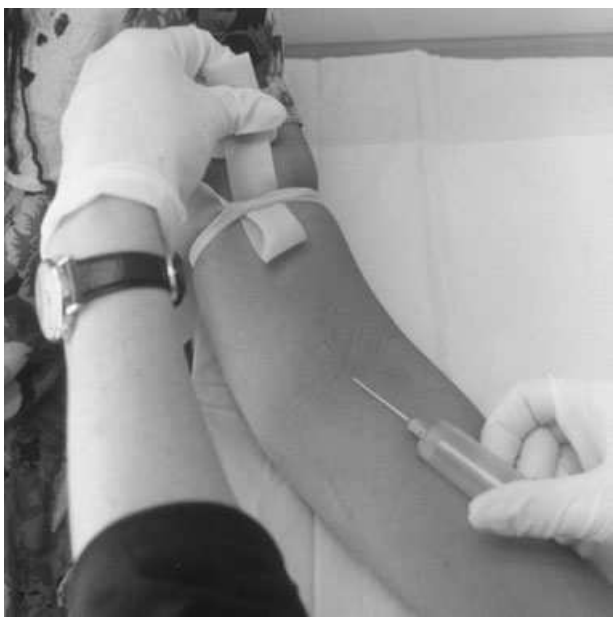

FIGURE 47-4 Releasing the tourniquet before removing the needle.

Procedure	Rationale
c. Fill the tubes with blood by slowly pushing the plunger and holding the syringe and test tube at such an angle that the blood runs down the side of the tube.	**c.** Forceful transfer of blood to the bottom of the tube may cause the blood to hemolyze. The appearance of froth on the surface of the blood is indicative of hemolysis.
d. Replace the rubber stoppers in the test tubes.	**d.** Keep the rubber stoppers from popping back off the tubes when replaced by releasing the pressure in the tube; see Step 2. Blood is not lost then if the tube subsequently is laid on its side. It doesn't matter if the holes are poked through the rubber stopper before they are replaced in the test tube as long as the holes are made before any blood is lost.
20. If you are using a heparinized test tube, then invert the stoppered test tube completely at medium speed approximately ten times without shaking.	**20.** The blood needs to be mixed with the heparin so that it will not clot; however, shaking the contents can cause hemolysis.
21. Label the test tubes with the woman's name and any other appropriate identifying information and the date and time of collection.	**21.** Test results may be mixed up if the woman's blood tubes are not properly identified.
22. Check the woman's puncture site and apply an adhesive bandage or tape and gauze dressing over the site if indicated.	**22.** Make sure the bleeding has stopped.
23. Dispose of the used needle, syringe, gauze, alcohol sponges, and gloves in a biological hazardous waste disposal receptacle.	**23.** Protect yourself and others from bloodborne pathogens.

If there is no blood return or if blood enters the syringe and then stops:

1. Rotate the needle in case it is simply flush against the vein wall. Blood may now enter the needle. If there still is no blood, proceed to the next step.
2. Recognize that the needle is not in the vein.
3. Palpate, with the index finger of the hand that was fixing the vein for the location of both the vein and the tip of the needle.
4. To identify the location of the tip of the needle, it helps if the hand controlling the needle angles the needle upward toward the surface or skin of the body part so you can feel the needle more readily with your palpating finger.
5. If the needle simply isn't far enough into the vein, insert it further and withdraw the needed blood.
6. If the needle is not in the vein but rather to the right, left, underneath, or on top of it, then withdraw your needle the necessary amount to reangle and redirect it for insertion into the vein. Do not withdraw any part of the bevel through the puncture site in order to avoid contaminating the needle. Insert the needle into the vein and withdraw the needed blood.
7. If the needle was in the vein but then went on through it (as evidenced by obtaining several drops of blood and then no more blood), *slowly* withdraw the needle while simultaneously pulling back on the plunger of the syringe until the blood flows again into the syringe. Stop withdrawal of the needle at that point until the needed amount of blood is obtained.
8. If at any time during this procedure or through manipulations to get the needle into the vein you touch the needle or scrape it against the woman's skin, the needle is contaminated and must be withdrawn and discarded and the woman must be restuck with a new sterile needle. Be alert for contamination of the needle; concentration on getting it into the vein may cause you not to notice breaks in sterile technique.
9. If you cannot get the needle into the vein successfully, try again, paying particular attention to selecting a likely vein. If you fail twice, ask someone who has a high success rate to do the venipuncture. Do not ask someone inexperienced or try again yourself. Venipuncture is painful and the woman should not have to endure multiple attempts. This is an unwarranted assault on the woman's body.

Bibliography

Ernst, C., and Ernst, D. Phlebotomy 101. *Advance for Nurses* 2(2):26–29 (January 21) 2002.

Henry, J. B. *Clinical Diagnosis and Management by Laboratory Methods*, 20th ed. Philadelphia, PA: W. B. Saunders, 2001, ch. 1.

Pendergraph, G. E. *Handbook of Phlebotomy*, 4th ed. Philadelphia, PA: Lea and Febiger, 1998.

CHAPTER

48

Inserting an Intravenous Catheter

Procedure	Rationale
1. Hang the intravenous infusion bag with tubing attached. Clear the tubing of air in preparation for connection to the intravenous catheter.	**1.** Once the intravenous catheter is in place there is an open route into the woman's vein. If you are not ready to connect the infusion, blood will be lost if the catheter is left open or may clot in the catheter if the system is closed without being connected to the intravenous fluid. An open system also increases the chance of infection.
2. Apply a tourniquet and distend the veins in accord with Steps 3 and 5 in the procedure on venipuncture (Chapter 47).	**2.** Aids in identification and selection of a vein into which to insert the intravenous catheter.
3. Select a vein in accord with Steps 6(a), (c), and (e) in the procedure on venipuncture (Chapter 47). It is preferable to select a vein site such that the catheter will not cross a joint. Veins in the forearm are first choice, with the vein just beside and above the wrist bone a frequent selection. Veins in the back of the hand frequently are used but are not as ideal as well-defined veins in the forearm (see Figure 48-1).	**3.** An intravenous catheter is more painful when inserted in the hand than in the forearm. Although one of the ideas behind the flexible catheter was that it would not injure the patient when in place as was possible with a straight needle, it does bend with flexion of a joint and may occlude the intravenous infusion. This then necessitates placing an arm, wrist, or hand board on the woman to immobilize the joint, which is uncomfortable. A board is unnecessary if the catheter does not cross a joint.
4. Place a disposable absorbent pad, such as a Chux, under the limb into which you will be inserting the intravenous catheter.	**4.** This catches any blood or fluid lost during the procedure, thereby avoiding the necessity of changing the bed linen and the possibility of contamination with a bloodborne pathogen.
5. If blood specimens are going to be collected at the same time, decide which of the following methods you are going to use to collect these specimens:	**5.** All actions must be preplanned so you do not lose blood, risk blood clotting in the catheter, or have to do manipulations to the point that the catheter comes out of the vein. The procedure should proceed smoothly, quickly, and with minimal trauma to the woman.
a. Have the blood flow directly from the catheter into the blood tubes.	**a.** Care must be taken not to contaminate the catheter when using this method.
b. Attach a syringe (a size large enough for the number of milliliters of blood needed) to the intravenous catheter hub.	**b.** This method may be cleaner than the one described in 5(a).

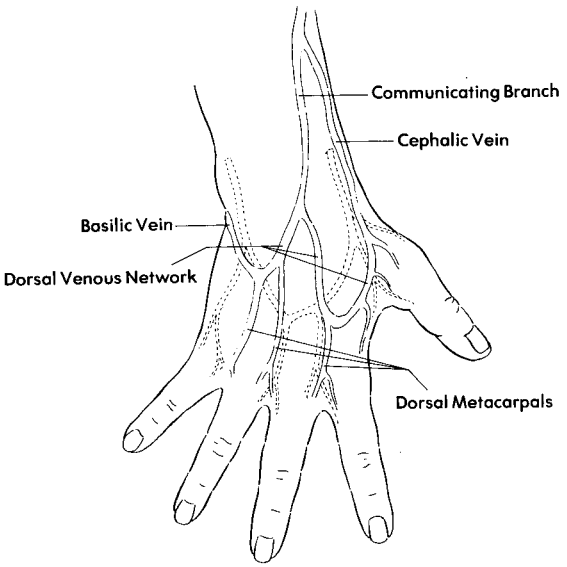

FIGURE 48-1 Veins of the hand and forearm.

Procedure	Rationale
If the latter method is to be used, attach the syringe and make sure there is no air in the syringe.	This eliminates the danger of injecting air into the vein.
If the former method is to be used, have available a paper cup into which you can place the tubes of blood.	Once they are filled the blood tubes need to stand upright since the tops may pop off if they are replaced. If the tubes are on their sides, you will lose the blood. After you are through with the procedure, you can ensure that the tops will stay on the blood tubes if you do one of the following: (1) pierce the rubber top with a needle to release the vaccum; (2) make sure that the rubber top and the part of the blood tube where the top inserts are both dry before replacing the top.
6. Put on gloves.	**6.** Follow universal precautions to protect yourself from any bloodborne pathogen the woman may have.
7. Clean the insertion site in accord with Steps 7, 8, and 9 in Chapter 47, Venipuncture.	
8. Perform a venipuncture in accord with Steps 11 through 14 in the procedure on venipuncture (Chapter 47).	**8.** Emphasis should be placed on fixing the vein and holding the woman's skin taut. This facilitates insertion because the vein does not roll and the skin is prevented from puckering at the site of puncture. In doing this be careful not to contaminate the catheter against the woman's skin or against your finger.
9. Make sure the tips of the needle and the catheter are in the vein by advancing both approximately $^1/_4$ inch once you are getting blood back into the unit.	**9.** The tip of the needle extends approximately $^1/_8$ inch beyond the tip of the catheter in intravenous catheter units. It is possible to get a blood return with just the tip of the needle in the vein. However, the vein will be lost during Step 11 if the catheter is not in the vein also.

Procedure	Rationale
10. If using a syringe to draw blood for blood specimens, fill the syringe with the number of milliliters of blood needed.	
11. Again, hold the woman's skin taut with one hand and do one of the following with the other hand: **a.** Withdraw the needle a short distance, advance the catheter into the vein, and then remove the needle altogether. **b.** Withdraw the needle altogether and advance the catheter into the vein. **c.** Leave the needle where it is, advance the catheter into the vein, and then withdraw the needle altogether. Whichever method is used, never advance the needle inside the catheter once it has been even slightly withdrawn and never move it back and forth within the catheter. If the vein is lost during this step, *do not* reinsert the needle through the catheter. Instead, remove the entire unit, discard, and start again with a new sterile intravenous catheter unit. Be careful during this step not to contaminate the catheter by sliding it over the woman's skin while inserting it.	**11.** Taut skin will not pucker. Puckered skin causes difficulty in advancing the catheter and creates the need for forceful action, which may ram the catheter through the vein. **a.**, **b.**, and **c.** No matter which method is used, the principle is to cover the needle point, thereby both protecting the vein from the possibility that the needle might go on through it, and allowing the flexible catheter to be threaded into the vein. If the needle is not totally removed before advancing the catheter, the needle needs to be immobilized while the catheter is advanced. If the needle is totally removed, blood will drip through the catheter during the threading process. It is imperative that the needle never be advanced again once its tip has been withdrawn inside the catheter. If the needle is advanced again, its sharp tip may shear off a fragment of the catheter, which would then remain in the bloodstream as a foreign object embolus.
12. If you are collecting blood by having it drip directly from the catheter into the blood tubes, press down over the area of the tip of the catheter inside the vein between tubes, between manipulation of materials, and before starting the intravenous infusion.	**12.** Applying pressure stops the blood from flowing since the vein is occluded at the point where blood enters the catheter. This is done briefly so that blood will not clot inside the catheter.
13. Connect the intravenous infusion tubing to the catheter, release the tourniquet, and start the infusion flow at the desired rate.	**13.** It is essential to release the tourniquet before starting the flow of the infusion. Otherwise the vein fills with fluid and ruptures from overdistention. These three steps are listed as one, as they must be accomplished quickly and in sequence, in order to have a patent intravenous system.

14. Tape the catheter and IV tubing securely to the limb involved. The following method is one way of taping (see Figure 48-2):

- **a.** First use a narrow ($^1/_8$ to $^1/_4$ inch) strip of tape underneath the hub of the intravenous catheter with its edge against the place where the catheter enters the skin and with its sticky side up. Crisscross the tape over the insertion site with the ends going at an angle away from the site. Attach the tape to the woman's skin so that the catheter is straight and not bent, which would interfere with the flow of the infusion.
- **b.** Now use a wide (1 to $1\,^1/_2$ inch) strip of tape over the crisscross at the insertion site.
- **c.** Make a loop of the intravenous tubing and tape it down just beside the edge of the catheter hub.
- **d.** You may need to tape down one or both sides of the loop of the intravenous tubing so it does not catch on anything and pull apart from the hub of the catheter.
- **e.** Run the intravenous tubing a few more inches away from the insertion site and tape it to the woman's skin so the strain of the tubing isn't at the site of insertion. Avoid taping over where the catheter hub and IV tubing join, covering up any connectors, or taping over the rubber medication appendage, since you may need access to these sites.
- **f.** Be considerate of people with hairy arms by using a minimal amount of tape.

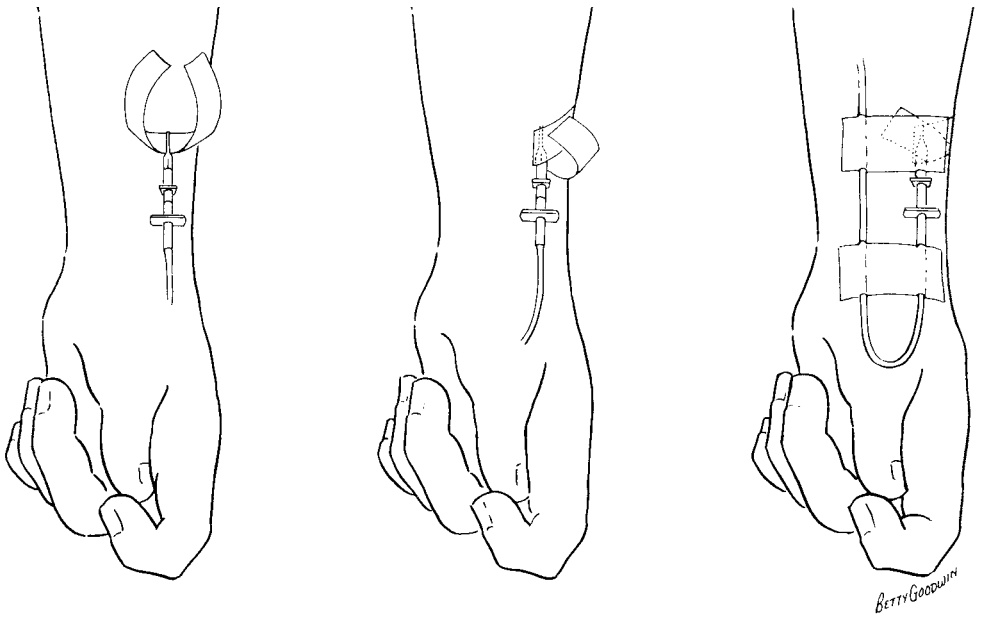

FIGURE 48-2 Taping an intravenous catheter and tubing.

Procedure	Rationale
15. Wipe any blood off the woman with water or soap and water, and dry the skin.	**15.** This is done for the woman's comfort since blood is sticky. Alcohol sponges will not remove blood.

16. After the procedure is completed, ask the woman to wriggle her fingers, do range of motion at the wrist and elbow, and wave at you. This helps her realize that it will not hurt her to move her fingers, hand, or arm with the IV in place and she therefore will not hold herself rigid in fear hour after hour.

17. Label the blood tubes in accord with Step 21 in Chapter 47, Venipuncture.

18. Dispose of the used needle, syringe, alcohol sponges, gauzes, disposable pad (Chux), and gloves in a biological hazardous waste disposal receptacle.

Note: If you anticipate that the IV will be in place more than 24 hr, the following additional steps should be added to this procedure to decrease the incidence of phlebitis:

1. Use povidone-iodine (Betadine) instead of alcohol for cleaning the insertion site prior to puncture if the woman is not allergic to Betadine.

2. Apply an antibiotic ointment to, and a sterile dry dressing over, the puncture site.

• • • Bibliography

Millam, D.A., Sr. Starting IVs: How to develop your venipuncture expertise. *Nursing* 92: 33–46 (September) 1992.

CHAPTER

49

Giving Intravenous Medications

Procedure	Rationale
By Venipuncture	
1. Perform venipuncture. (See Chapter 47, Venipuncture.)	
2. Remove the tourniquet when the needle is in the vein but before giving the medication.	**2.** The tourniquet occludes the vein, which facilitates the venipuncture. However, the vein must not be occluded for receipt of the medication.
3. Aspirate to be sure that the needle is still in the vein.	**3.** Movement during removal of the tourniquet may have dislodged the needle from the vein.
4. Inject at a rate in accord with the medication—for example, 50 mg of meperidine hydrochloride (Demerol) would be injected slowly over a 2-minute period.	4. Slow injection is for safety and comfort of the mother and safety of the baby. For example, Demerol given rapidly can cause the mother to have nausea, vomiting, flushing, dizziness, and a sense of being too warm—all of which can be avoided by slow injection of the medication.
By Intravenous Infusion Tubing	
1. Ascertain status of the IV.	**1.** You must be sure that the IV is patent and that the medication will be going into a vein and not into infiltrated tissue.
2. Wipe off the rubber medication appendage on the IV tubing with an alcohol sponge.	**2.** Cleanse the site of entry into the sterile system.
3. Insert the needle of the syringe containing the medication through the rubber medication appendage on the IV tubing.	**3.** Rubber seals itself, and the appendage is on the IV tubing for the purpose of giving medications. To stick a needle into the IV tubing itself would cause the IV to leak through the resulting hole since the tubing does not self-seal.
4. Pinch off the IV tubing above the rubber medication appendage.	**4.** This prevents the medication from going up the tubing rather than down the tubing into the body during injection. Occluding the tubing stops the flow of intravenous fluid, which allows you to control the amount of medication the mother is receiving and the rate at which it infuses.

Procedure	Rationale
5. Inject at a rate in accord with the medication—for example, inject a few milligrams of Demerol, remembering that the entire injection should take 2 min for 50 mg and 1 min for 25 mg of this drug.	**5.** to **9.** Inject the drug slowly for the safety and com-fort of the mother and safety of the baby (see Step 4 under "By Venipuncture," above). If you follow this procedure you are better able to control how much medication the mother is getting at a given time. A full amount of medication entering the maternal-fetal circulatory system at once can produce fetal depression. Remember that the drug injected prior to letting the IV fluid run probably does not even reach the vein as there is insufficient volume to traverse the distance of the tubing from the rubber medication appendage to the vein. Running the IV fluid forces the medication on through the tubing in small, controlled amounts.
6. Release the IV tubing, open the IV flow, and let the IV solution run for approximately 15 to 30 sec.	
7. Pinch off the IV tubing above the rubber medication appendage.	
8. Inject more of the medication—in the present example, a few more milligrams of Demerol. If the amount of Demerol is 50 mg/mL, inject one-quarter of the medication over a period of 15 sec and then let the IV run for 15 to 30 sec; within the combined 30- to 45-sec period, 12.5 mg of Demerol would be administered.	
9. Repeat steps 6, 7, and 8 until you have given all of the medication.	

CHAPTER

50

Spin-Down Hematocrit

Procedure	Rationale
1. Obtain the blood specimen. If the blood specimen is taken directly from a finger puncture site, fill two red-tipped (heparinized) capillary tubes (see Chapter 46, Steps 10b–16). If the blood specimen is in a blood tube with an anticoagulant, fill two blue-tipped (plain) capillary tubes as follows:	**1.** Two tubes are always obtained in order to balance the hematocrit machine and to still have one tube to use in case one gets broken. This prevents having to stick the woman again.
a. Put on gloves	**a.** Follow universal precautions to protect yourself from any bloodborne pathogen the woman may have.
b. If the sample has been sitting, mix the blood sample thoroughly by inverting the tube back and forth gently, without shaking, 10 to 15 times.	**b.** Shaking can cause hemolysis of the red blood cells.
c. Cover the stopper with gauze. Twist, do not pull, the stopper out.	**c.** Gauze prevents the blood from getting on your fingers. Twisting the stopper out prevents the blood from splattering, which might happen if the stopper were pulled out.
d. *Slowly* tilt the blood tube until the blood approaches the edge of the tube.	**d.** Tilt slowly because blood moves more rapidly after it begins to flow and might spill if the tube is tilted too fast or too far.
e. Place the end of the capillary tube in the blood and hold it at an angle as close to the same longitudinal plane of the blood tube as possible.	**e.** The capillary tubes are filled by capillary action.
f. Fill and seal the tubes as described in Steps 11, 12, 14, 15, and 16 in Chapter 46 on finger puncture.	
g. *Do not* fill the capillary tubes with blood that has collected in the stopper of the blood tube.	**g.** Such a sample may contain dried red cells and plasma that would yield erroneous results and invalidate the test.
2. Open the microhematocrit centrifuge and remove the cover on the head.	
3. Check the rubber lining inside the rim of the head. If there are holes in this lining where you intend to place your capillary tubes, rotate the lining so the capillary tubes will rest against an unbroken surface. The liner should be replaced if it is cracked and brittle.	**3.** The rubber lining serves two functions: **a.** It cushions the sealed end of the capillary tube from the metal rim. **b.** It prevents loss of the specimen that can occur if clay is forced out during centrifuging.

Procedure	Rationale
4. Place the capillary tubes in grooves opposite each other.	**4.** Balance the centrifuge.
5. Make note of the numbers of the grooves you place your specimens in and the woman's name for each set of numbers.	**5.** Specimens will not get mixed up when several capillary tubes are centrifuged at the same time.
6. Be sure the sealed end of the capillary tube is resting against the rubber lining.	**6.** The sealed end is to the outside so blood will not fly out when the centrifuge is spinning. Resting the sealed end against the rubber lining reduces the chance of breakage, which can happen if the capillary tube is not properly in the groove or is only partly protruding from the end of the groove.
7. Place the cover on the head and tighten it with your hand until there is no give. Do not use a wrench to tighten the cover and do not overtighten it.	**7.** Hand tightening is sufficient. Repeated overtightening ruins the thread on the screw.
8. Close the microhematocrit centrifuge and lock the lid by closing the latch.	
9. Check to see that the centrifuge is firmly attached to the surface on which it rests. If it is attached with suction cups but is loose, put a few drops of oil or water in each cup and force the centrifuge down to create a suction that will hold.	**9.** "Walking" of the centrifuge disturbs its balance. Oil is better than water in creating a suction that will hold, but water may be all that is available.
10. Turn on the centrifuge and set the time by turning the timer dial past 5 min and then returning the indicator to 3 min.	**10.** Red blood cells are completely packed down within 3 min of very high speed rotation.
11. The centrifuge will stop by itself. Do not open the lid and try to stop the spinning head with your hand.	**11.** Trying to stop the spinning head can be dangerous. Also, the red cells can become loosened or dislodged if the spinning head is stopped suddenly. This may yield erroneously high readings.
12. Unlock the lid by unlatching it. Open the centrifuge after it has stopped.	
13. Loosen the cover and lift it off the head. The centrifuge comes with a wrench to loosen the cover if needed. Place the cover inside the open lid of the centrifuge.	**13.** The force of the high speed rotation may tighten the cover so that you cannot open it by hand. Routinely placing the cover inside the centrifuge lid ensures that the cover will not become separated from the centrifuge and get lost.
14. Examine each capillary tube. **a.** If the tube is not in the groove (missing), it has probably shattered. Most likely the tube was not properly placed in the groove and became dislodged. **b.** If the tube is empty or only partially full, the blood has leaked out. The seal was not good or the tube did not rest against the rubber rim of the head. **c.** Look for red cell hemolysis. This is indicated by the red color of the plasma layer.	**14. a.**, **b.**, and **c.** If both tubes are missing, have leaked out, or have hemolyzed, another blood specimen will have to be obtained and the procedure repeated. If this specimen was a finger puncture, the woman will have to be stuck again. If the blood was taken from a blood tube, fill two more capillary tubes from the specimen already drawn after checking for hemolysis (if this was the problem with the capillary tubes). If the blood specimen is no longer good for tests, perform another venipuncture and obtain a fresh specimen. If one capillary tube is not usable but the other one is, read the results on the satisfactory tube.

Procedure	Rationale
15. Remove the capillary tubes from the head of the microhematocrit centrifuge.	
16. Read the results by using a microhematocrit reader. There are a variety of microhematocrit reader devices. Each has its own way of doing it, but they all follow the same basic procedure.	**16.**
a. Align the junction of the bottom of the red cell layer and the sealing clay with the zero percent reading. Move the tube up and down in whatever slot is provided for it until it is aligned.	**a.** and **b.** Precision in aligning the junctions with the zero percent and 100 percent lines is essential to obtaining an accurate reading.
b. Align the top of the plasma layer with the 100 percent reading. Do not move the tube to make this alignment because the tube's position was set in the preceding step; move the reader instead.	
c. Read the hematocrit at the junction of the top of the red cell layer and either the bottom of the plasma layer or the bottom of the buffy layer if it is present.	**c.** The buffy layer of white blood cells and platelets often is visible as a narrow white band between the packed red blood cells and the plasma layer. The buffy layer is not to be included in the reading, since you only wish to measure the volume of the packed red blood cells. An unusually large buffy layer generally indicates leukocytosis (increased number of white blood cells).
17. The hematocrit value can also be obtained with the following measurements and formula:	**17.** This is handy to know in the event your microhematocrit reader gets broken or lost.
a. Using a ruler calibrated in millimeters, measure (1) the length of the red cell layer; (2) the length of the entire contents in the tube (red cell, buffy, and plasma layers)	
b. Calculate as follows: $\frac{\text{length of red cell layer (in mm)}}{\text{length of total contents (in mm)}} \times 100 = \text{hematocrit value}$	
18. If two tubes are used, the findings should be within a 1 percent reading value of each other.	
19. Record the results.	
20. Dispose of the capillary tubes and gloves in a biological hazardous waste disposal receptacle.	**20.** Protect yourself and others from bloodborne pathogens.

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CHAPTER

51

Removal of Norplant

The key to an easy removal of Norplant is proper insertion. There are at least five removal procedures: standard [1, 2, 3], pop-out [3, 4], Emory [3], needle-lift [5], hook-traction [6], and the "U" or "modified U" technique [3, 7]. All removal procedures involve local anesthetic, an incision, some measure of "nicking" or dissection of the fibrous tissue sheath that forms around each implant and surrounds their ends, and some means of guiding the implant capsule into the incision and grasping it for removal. Complications that affect removal of Norplant include breaking the implant during the removal procedure, imbedding of the implant, incorrect spacing or displacement/migration of the implant, and considerable weight gain after the implants are inserted [3, 6]. These complications make removal difficult and time-consuming for the approximately 5 percent of women in which they occur [3].

Two of the more commonly used removal procedures are presented here: standard and pop-out. The pop-out method requires less time, creates less pain, involves a shorter incision, and reduces trauma, but is not as effective a method with deeply placed or immobile capsules or for difficult removals.

Procedure	Rationale
1. Check and organize materials and equipment, making sure all are appropriate and placed conveniently: sterile surgical drapes, talc-free sterile gloves, antiseptic solution, sterile water, marking pen, 5 mL syringe, 22 gauge $1^1/_2$ in. needle, 1% lidocaine, #11 scalpel, one straight and one curved mosquito forceps, steri-strips or other skin closures, sterile 4×4s, gauze or cling wrap, and adhesive tape. The trocar is not necessary, but one 5 in. straight forceps and one 5 in. curved forceps is required. Removal usually takes about 20–30 minutes.	**1.** Having all equipment together and conveniently placed facilitates an organized, smoothly executed procedure.
2. Have the woman lie down on an examination table; raise the head of the bed. Flex the elbow of the woman's nondominant arm and have her rotate her arm externally. Her hand should be lying by her head.	**2.** Removal will proceed more quickly if the woman is relaxed and her arm is positioned to make the site more accessible.

3. Palpate the capsules and mark both the proximal and the distal end of each implant with a marking pen. Choose a point for the removal incision that is equidistant from the proximal ends of the capsules and mark this spot. Avoid, if possible, the old incision site.	**3.** Marking the capsules helps you plan the removal. Avoiding the old incision site prevents the problem of removing the capsules through any scar tissue that may have formed.
4. Put on talc-free sterile gloves.	**4.** Using talc-free gloves helps prevent an allergic reaction in the incision.
5. Prep the arm with antiseptic using forceps and 4×4s.	**5.** Cleanse the surgical area to decrease risk of infection from bacteria on the skin.
6. Place sterile drapes under and over the arm, exposing a large enough opening to remove the capsules.	**6.** Create a sterile field.
7. Draw up 5 mL of 1% lidocaine. Inject a small amount of anesthetic at the incision site and *under* the proximal end of each capsule.	**7.** Injection of the anesthetic *over* the capsules will obscure the ends of the capsules. Injection under the ends of the capsules not only provides anesthesia but also raises the tips of the capsules.
8. Make a small transverse 4 mm incision at the chosen site.	**8.** Keep the incision small to minimize bleeding, swelling, and scarring.
9. Insert the straight forceps in the incision and gently spread and move horizontally in two planes, one above and one below the ends of the implants.	**9.** Opens a plane of dissection above and below the capsules.
10. Start with the capsule closest to the incision and nearest to the skin. Pressing on the distal end, push this capsule gently toward the incision.	
Standard Method	*Pop-Out Method*
a. When the end of the capsule becomes visible at the incision, grasp the capsule with the curved mosquito forceps.	**a.** Use the fingers of both hands to maneuver the end of the implant into the incision.
b. As an alternative, introduce a closed curved forceps into the incision. Work the forceps under the capsule by gently dissecting the tissue while maintaining finger pressure on the distal end of the capsule. Grasp the end of the capsule with the forceps and bring it to the incision. Be careful to grasp as little tissue as possible.	**b.** Use a scalpel to incise the fibrous tissue sheath.
c. Incise the end of the fibrous tissue sheath with a scalpel to open it.	**c.** The implant will pop out through the incision, after which you can grasp it with your fingers and pull it out.
d. Grasp the capsule with the straight forceps, remove the curved forceps, and pull out the capsule through the incision.	
11. Now choose the next capsule that appears easiest to remove. Add more anesthetic under the capsule if needed.	
12. Repeat steps 10 and 11 until all capsules are removed.	
13. Show all six capsules to the woman and document that all six capsules were removed.	**13.** To assure her and yourself that all the capsules have been removed and to have in her medical record the complete removal of all Norplant capsules.

14. Achieve hemostasis with direct pressure to the site for 2 to 3 min.	**14.** Applying pressure will minimize bruising and hematoma formation.
15. After cleansing the area with sterile water or Zephiran and patting it dry, press the skin edges together and apply a butterfly bandage or steri-strip skin closure. Cover the site with a folded 4 × 4 to make a dry compress and wrap gauze or cling wrap snugly around the woman's arm to hold the compress in place.	**15.** The bandage and compress continue pressure and hemostasis.

Postremoval instructions to the woman include:

1. Keep the pressure dressing in place 24 hours.
2. Leave the butterfly bandage or steri-strips on until they are ready to fall off in 3 to 4 days.
3. Keep the incision area dry for 24 to 48 hours.
4. Expect tenderness, bruising, or swelling in the area for the first few days. This is normal.
5. Call the midwife if you have
   a. arm pain
   b. excessive swelling
   c. pus or bleeding at the insertion site
6. Begin using an alternative form of contraception *immediately* if you do not wish to become pregnant.

Occasionally, you may be unable to remove all the capsules at the first visit. If you encounter difficulties, the resulting trauma and edema make the procedure even more difficult and you may be unable to remove all of the capsules in 30 minutes. If so, STOP. Apply a compression dressing and ask the woman to return in 4 to 6 weeks when the area has fully healed, so that you can remove the remaining capsule(s). You may want to consider using one of the other methods for removal described in the references.

References

1. Emerling, J. M., Paluzzi, P., Cullins, V. E., et al. Subdermal contraceptive implants in nurse-midwifery practice. *J. Nurse-Midwifery* 38(2 suppl.):80S–87S (March/April) 1993.
2. *Norplant System Removal Guide*. Philadelphia, PA: Wyeth-Ayerst Laboratories, 1992.
3. Inserting and removing levonorgestrel subdermal implants: An update. *The Contraception Report* V(5):4–12 (November) 1994.
4. Pymar, H. C., Creinin, M. D., and Schwartz, J. L. "Pop-out" method of levonorgestrel implant removal. *Contraception* 59:383–387, 1999.
5. Shihata, A. A., Salzetti, R. G., Schnepper, F. W., and Deutsch, G. Innovative technique for Norplant implants removal. *Contraception* 51:83–85, 1995.
6. Ward, C. R., Peterson, C. M., and Hatasaka, H. H. A hook-traction technique for Norplant removal. *Obstet. Gynecol.* 86(5):848–850 (November) 1995.
7. Reynolds, R. D. The "modified U" technique: a refined method of Norplant removal. *J. Fam. Pract.* 40(2):173–178 (February) 1995.

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CHAPTER

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Breast Examination

Relevant History

1. *Age:* the incidence of breast cancer increases with age [1].
2. *Symptoms*
   a. *tumor, when found:* note any change since the tumor was first discovered if the woman has delayed seeking medical consultation; location; any change during menstrual cycle, especially during premenstrual and menstrual phases; and changes in nipples.

      This information contributes during examination to the differential diagnosis between normal breast tissue with cyclic physiological nodularity and breast disease.

   b. *nipple discharge:* note whether spontaneous or elicited; unilateral or bilateral; character (serous, bloody, thin and watery without color, thick and yellowish, thick and grayish, greenish, or milky); amount; when noticed; related to pregnancy or nonpregnancy; using combination hormonal contraception or not; breastfeeding or not; date of termination of last pregnancy; date of termination of breastfeeding of last baby; whether discharge occurs during menstruation; whether discharge occurs during the period of breast growth and development; if the woman jogs or runs for exercise; amount of sexual stimulation and manipulation to the breasts and nipples.

      Discharge is significant and requires physician consultation *if* the woman is *not* pregnant, postpartal, breastfeeding, within a year of termination of breastfeeding, within 6 months of termination of last pregnancy, using combination hormonal contraception, in the period of breast growth and development, experiencing friction between clothing and nipples during jogging or running, experiencing excessive sexual stimulation and manipulation of her breasts and nipples, or making frequent attempts to elicit a discharge.

      Generally an elicited nipple discharge is not of pathological significance. Nipple discharge is pathologically significant if it occurs spontaneously [2]. Nipple discharge is especially significant if the woman is amenorrheic and not pregnant or postpartal. Pathologic nipple discharge is usually unilateral [3] A drop of thick, grayish discharge expressed from the nipple of a middle-aged woman is usually normal and comes from terminal ectatic (stretched) ducts. A bloody discharge requires consultation with a physician for further investigation.

   c. *pain or tenderness in one or both breasts:* constant or cyclic with the menstrual cycle; character: dull, sharp, constant, or intermittent.

      Cyclic pain or tenderness indicates physiological rather than pathological origin.

3. *Past history of mammograms/breast ultrasound:* routine? if not, what was the indication for the examination? note results.
4. *Past history of breast disease:* operations, biopsies, aspirations (date, physician, hospital); location of the disease in the breast(s); diagnosis, treatment, outcome.
5. *Family history of breast disease:* include woman's female and male relatives; type, if known; age of relative at time of breast disease.

   One first-degree relative (mother, sister, daughter) with breast cancer approximately doubles the risk [1].
6. *Menstrual history:* age at onset, frequency, duration, amount, regularity, age of onset of menopause.

Early menarche or late menopause increases the risk of breast cancer because of the extended number of ovulatory cycles.

7. *Pregnancy history:* age at time of first full-term birth; date of each pregnancy termination; length of each pregnancy.

   A first full-term birth before age 18 reduces the risk of breast cancer; a first full-term birth after age 35 increases the risk of breast cancer. Nulliparity also increases the risk of breast cancer.
8. *Lactation history:* whether each child was breastfed; length of time each one was breastfed; date of termination of last breastfeeding.
9. *Hormonal history:* for contraception, menstrual irregularity, menopausal symptom relief, cosmetic, or medical problems; length of time hormones were taken; name and dosage or date of termination of last use of hormones.
10. *Other specific significant history:*
    a. Oophorectomy decreases the risk of breast cancer, especially if before age 35.
    b. The risk of breast cancer increases with increased amounts of alcohol consumption [1].
    c. Exposure to radiation increases the risk of breast cancer.

Physical Examination

Inspection of Breasts and Palpation of Lymph Node Areas

Procedure	Rationale
1. The woman should be seated either at the end or the side of the examining table with her legs over the edge so she is facing you.	1. The breasts need to hang freely at a level that enables good visualization.
2. The woman should be draped up to her waist with her entire chest area exposed.	2. Exposure of only the area necessary protects the woman's sense of modesty.
3. The room must be well lighted.	3. Good lighting is necessary if you are going to be able to see slight changes in breast contour, color, retraction signs, and the nipple epithelium.
4. Inspect the breasts when the woman is in each of the following positions:	4.
a. with her arms by her side.	a. and b. These positions allow you to see different aspects of the breasts.
b. with her arms raised high over her head.	b. This position elevates the pectoral fascia. If there is a carcinoma, the fibrosis around it may have attached it to the underlying fascia and to the overlying skin. Arm elevation will reveal this through the signs of asymmetry (indentation in the contour) or skin retraction.
c. with her hands either pressed against her hips or with the palmar surfaces pressed against each other at the level of her chin.	c. Either of these maneuvers contracts the pectoral muscles underlying the breasts. Slight elevation of the breast is normal; a carcinoma may be evidenced by an abnormal elevation of the breast resulting from the fibrosis of the carcinoma being fixed to the underlying pectoral fascia, and by retraction signs such as skin dimpling and nipple deviation (Figure 52-1).
d. standing and bent forward from her hips with her chin up and her arms and hands extended toward you. Support her with your hands under her outstretched hands as you sit in front of her.	d. The normal breast will fall freely away from the chest wall when the woman is in this position and be symmetrical. The accompanying fibrosis of a breast lesion will fix the breast to the chest wall, and asymmetry and retraction signs that are not otherwise evident become evident in this position.

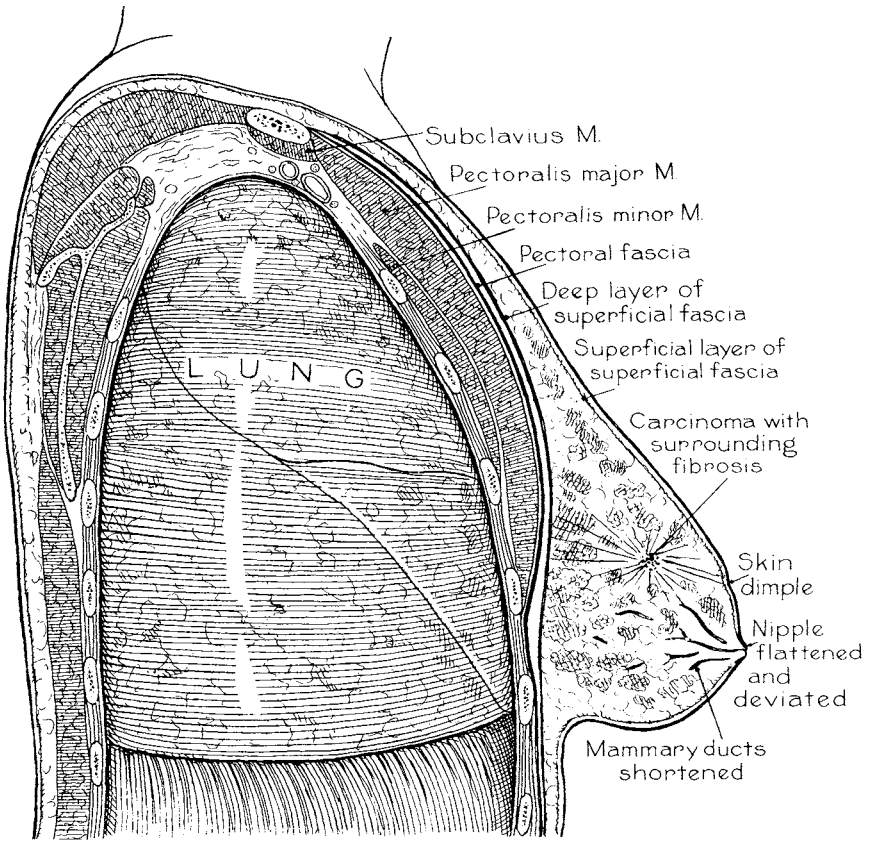

FIGURE 52-1 Diagram of the parasagittal section through the breast and thorax to illustrate the mechanism of retraction in carcinoma of the breasts.

Source: Reproduced by permission from Haagensen, C. D. *Diseases of the Breast*, 3rd ed. Philadephia, PA: W. B. Saunders, 1986, p. 528.

Observations	Significance
1. Breasts unequal in size (usually one breast is slightly larger than the other) but with the same contour.	**1.** Usually normal; developmental in origin.
2. Size of breasts small, large, or pendulous.	**2.** Individual variation is of no pathological significance.
3. Accessory breast tissue—alone or any combination of supernumerary nipples, areola, glandular parenchyma.	**3.** Developmental anomalies with no pathological significance; usually located along the embryological milk lines.
4. Asymmetry in breast contour, such as a bulge or indentation in the contour.	**4.** Abnormal; physician consultation/referral required.
5. Retraction signs, such as skin dimpling, puckering, or furrows (Figure 52-1).	**5.** Abnormal; physician consultation/referral required.
6. Nipple deviation (deviation in the direction the nipple is pointing) or nipple retraction with or without broadening and flattening of the nipple (Figure 52-1).	**6.** Abnormal; physician consultation/referral required.
7. Inverted nipples—not retracted or deviated.	**7.** No pathological significance.
8. Shrunken breast.	**8.** Abnormal; physician consultation/referral required.
9. Edema; orange-peel skin.	**9.** Abnormal; physician consultation/referral required.

Observations	Significance
10. Dilated subcutaneous veins—woman not pregnant.	**10.** Abnormal; physician consultation/referral required.
11. Elevation of skin temperature or redness—woman not postpartal.	**11.** Abnormal; physician consultation/referral required.
12. Ulcerations.	**12.** Abnormal; physician consultation/referral required.
13. Excessive breast elevation and asymmetry with contraction of pectoral muscles.	**13.** Abnormal; physician consultation/referral required.

Procedure	Rationale
5. With the woman again sitting on the side of the examining table with her arms by her sides, palpate the supraclavicular and infraclavicular regions on both sides for the subclavian nodes.	

Findings	Significance
1. Palpable nodes.	**1.** Abnormal, usually indicating advanced lymph node involvement; physician consultation/referral required.

Procedure	Rationale
6. Supporting the woman's arm with one of your own, gently palpate the axilla with the fingertips of your other hand. Move your palpating hand within the axilla area to press anteriorly for the pectoral nodes, posteriorly for the subscapular nodes, along the upper arm for the lateral brachial nodes, and deep in the middle for the central axillary nodes. Move the woman's arm through a full range of motion while palpating. Reverse the procedure for the opposite axilla. This procedure may also be done when the woman is lying down.	**6.** Supporting the woman's arm relaxes the pectoral muscles. This relaxation is essential to examination of the axilla. Taking the arm through range of motion may uncover lesions obscured by fat or muscles. Lymph nodes are more easily felt with gentle palpation.

Findings	Significance
1. Palpable nodes. In the absence of breast pathology, inspect the fingers and hand of the affected side for small abrasions and cuts, especially around the cuticles and fingernails.	**1.** Abnormal; physician consultation required. Infections distal to the nodes may cause inflammation of the lymph nodes and thus yield sizable, soft, palpable axillary nodes. The physician should be consulted for confirmation of this diagnosis.

Inspection of Nipple Epithelium and Palpation of Breasts

Procedure	Rationale
1. Have the woman assume a supine position on the examining table, again draping her so only her chest area is exposed.	**1.** Inspection of the nipple epithelium requires close observation in good light. This is more easily accomplished with the woman in a supine position.
2. Inspect the nipple epithelium.	

Observations	Significance
1. Erosion, ulceration, thickening, or unusual roughness.	**1.** Abnormal; physician consultation/referral required.
2. Redness—woman *not* breastfeeding or having nipples sexually manipulated.	**2.** Abnormal; physician consultation/referral required.
3. Crusting indicating dried discharge—woman *not* pregnant, postpartal, or breastfeeding.	**3.** Abnormal; physician consultation/referral required.
Procedure	**Rationale**
3. Have the woman raise her arm above her head on the same side of her body as the breast you are going to palpate. Place a small pillow under her shoulder on the same side if possible (that is, if a pillow is available and there is room for it on the examining table).	**3.** Raising the arm flattens and distributes the breast more evenly over the chest wall, thereby facilitating palpation of all breast tissue. Placing a small pillow under her shoulder distributes the breast tissue more medially toward the thorax, facilitating palpation of the outer lateral breast. The breast tends to fall to the side, especially if it is large, even if the woman raises her arm.
4. Palpate with the flat portion of the fingers of your examining hand (Figure 52-2), using a gentle to-and-fro or rotary motion that compresses the breast tissue against the chest wall.	**4.** Gentleness is the key to an informative, accurate examination. Soft breast lesions can be felt only with extremely gentle palpation. There is no excuse for an examination that traumatizes the woman with pain or causes bruising. It is also possible to cause metastasis of a breast carcinoma by a rough, heavy-handed, or kneading type of examination.
5. If the woman has pointed out an area in her breast where she has found a lump or point of tenderness, start your examination by palpating the opposite breast first.	**5.** Beginning with the opposite breast lessens the possibility of missing other findings because of concentrating on obvious disease, if present. It also facilitates your differentiating normal from abnormal breast tissue if you have first felt her normal breast tissue.
6. Palpate the breast, using any one of the following methods **a.** *Radial:* start on the upper outer margin of the breast and proceed in a circular, clockwise fashion in ever-smaller concentric circles, ending with palpation beneath the nipple (Figure 52-3).	**6.** This is an example of different but perfectly acceptable ways of doing the same thing. Certain principles are to be followed regardless of which method is used: **(1)** Every square inch of breast tissue is palpated. This includes beneath the nipple and into the axilla. It does not matter which

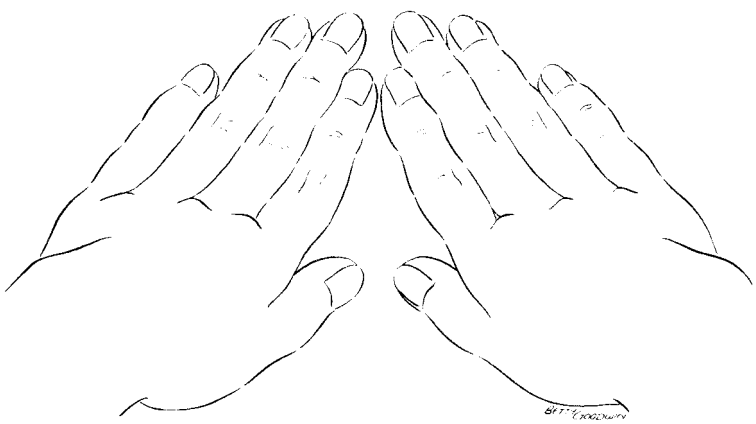

FIGURE 52-2 Position of hands for palpation.

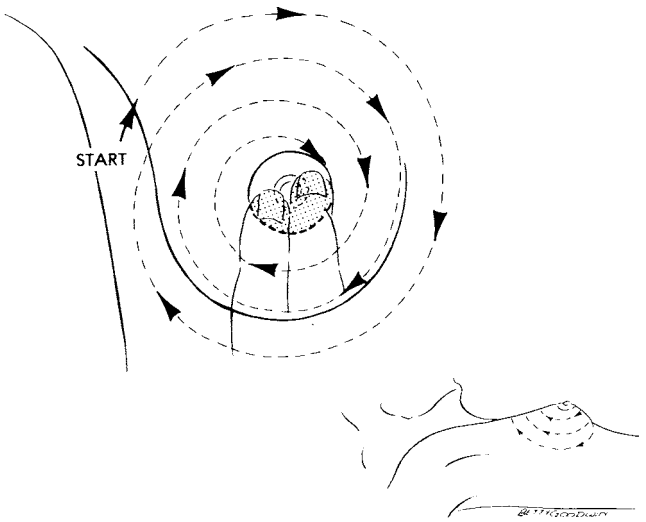

FIGURE 52-3 Radial method of palpating the breasts.

Procedure

A variation of this method is to start at the margin of the areola and proceed in a circular, clockwise fashion in ever-larger concentric circles to the outer margin of the breast, returning at the end to palpate beneath the nipple.

b. *Wheel-spoke:* start at the upper outer margin and palpate in to the areola as though following the spoke of a wheel. Move in a clockwise fashion around the breast, repeating the direction of palpation from outer margin to the areola for each spoke of the wheel. End with palpation beneath the nipple (Figure 52-4).

Rationale

method you use to cover the breast as long as you palpate every square inch. The inch you miss may have a lesion.

(2) Your palpation is gentle and nontraumatic.

(3) Your palpation compresses the breast tissue against the chest wall. Palpation that compresses breast tissue between your fingers or hands may give the erroneous impression of a mass.

Method a. has the advantage of ensuring coverage of every square inch of the breast and is particularly useful for beginning practitioners.

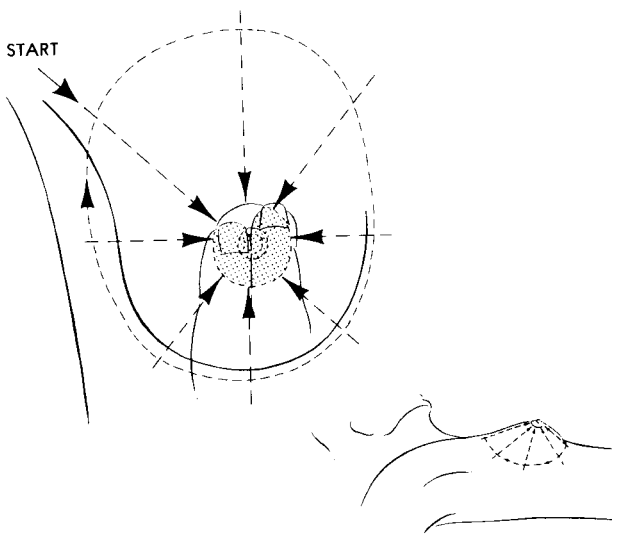

FIGURE 52-4 Wheel-spoke method of palpating the breasts.

Procedure	Rationale
A variation of this method is to start at the areola and palpate out to the breast margin, again as though following the spoke of a wheel. Repeat around the breast, ending with palpation beneath the nipple.	Method b. has two major drawbacks:
c. *Traversing:* divide the breast into its medial and lateral halves, using an imaginary vertical line through the nipple as the dividing line. Start with the medial half at the level of the clavicle and palpate in a series of parallel transverse lines from the nipple line to the sternum down to the caudal edge of the breast. Then move to the lateral half of the breast and again palpate in a series of parallel transverse lines, this time from the nipple line to the posterior axillary line back up to the level of the clavicle (Figure 52-5).	**(1)** Examiners frequently palpate the nipple and areola at the inner end of each "spoke." This means that this area is palpated a number of times in the course of the examination. This is unnecessary; repeated palpation can be traumatic. **(2)** While the inward ends of the spokes are being repeatedly palpated, areas between the outer ends of the spokes frequently are missed, especially by learners who are concentrating more on the method than on palpating every square inch of the breast. This problem can be alleviated by adding the maneuver of circularly palpating the outer margin of the breast either at the beginning or at the end of the method. Method c. is the most comprehensive coverage of tissue because its borders (clavicle, sternum, caudal breast edge, and posterior axillary line) encompass not only the observable protuberant breast tissue but also the thin layer of breast tissue that extends over a larger area at the outer limits of the visible breast.
7. In all three methods of palpation be sure to palpate the extension of the breast into the axilla. You will need to lower the woman's arm to the level of her shoulder while palpating the axilla.	**7.** Lower the arm in order to relax the muscles, which may otherwise interfere with your palpation of the axillary area.

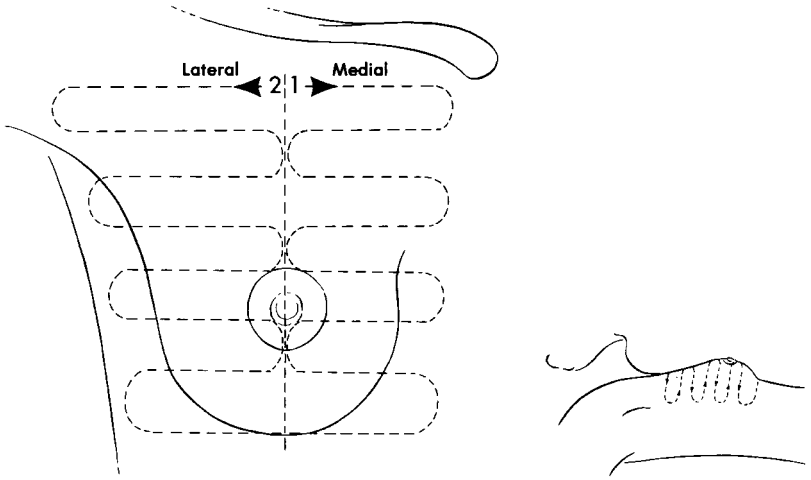

FIGURE 52-5 Transversing method of palpating the breasts.

Observations	Significance
Contrary to popular practice, it is *not* necessary to attempt to express discharge from the nipples as part of a routine breast examination. Unless it is most gently performed it is a traumatic procedure that may of itself cause a discharge from tissue damage. Discharge that is elicited by expression from the breast usually has no pathological significance. Discharge that escapes from the nipple spontaneously during palpation is significant and requires physician consultation or referral. If there is a cancerous lesion, traumatic examination and expression run the risk of causing metastasis.	

Observations	Significance
1. A transverse ridge, perhaps slightly tender, at the caudal edge of the breast.	**1.** Inframammary fold; normal.
2. Fine nodularity throughout the breast.	**2.** Normal breast tissue consisting of lobules of glandular tissue.
3. Coarse nodularity generalized throughout the breast, occurring during the premenstrual or menstrual phases of the menstrual cycle.	**3.** Normal physiological engorgement. If you are unsure of normality, consult with the physician.
4. Coarse, granular nodularity in a localized area.	**4.** Abnormal; physician consultation/referral required.
5. Loss of elasticity of nipples or breast tissue with increased firmness or thickening of the skin texture.	**5.** Abnormal; physician consultation/referral required.
6. Any mass. Note and chart the following: **a.** location—expressed in terms of location on a clock face with the woman in a supine position. Note the distance of the mass from the nipple. **b.** size—length and width in centimeters **c.** shape or contour—for example, round, nodular, smooth, elongated, irregular **d.** consistency—for example, elastic, tense, firm, soft, hard. **e.** delimitation (demarcation, discreteness, circumscription)—the degree of discreteness or sharpness of the edges or margins of the mass; usually charted as well defined or delimited, or poorly delimited, or difficult to determine boundaries **f.** mobility or movability—for example, freely movable, fixed, moderately fixed, movable only in certain directions.	**6.** Abnormal; physician consultation/referral required. All the information to be charted provides baseline data from the first time the mass is noted; the information is especially useful if you have to refer a woman to a physician from an outlying clinic. The specific observations about the mass aid the physician in making a differential diagnosis and deciding on a course of action. Generally, a cancerous lesion will be found in the upper outer quadrant, have an irregular shape, a wooden or hard consistency, poor delimitation, and be nonmovable, or fixed. Some breast cancers, however, do not fit this description. Even if you are quite sure that what you are feeling is a cyst, you must refer the woman to a physician. Final diagnosis is by biopsy.

Charting of Findings

If findings are normal, the following will be charted:

> Breasts symmetrical, soft, and without masses. Nipples symmetrical, clean, and not retracted. No palpable supraclavicular, infraclavicular, or axillary nodes. History noncontributory.

If findings are abnormal:

1. Describe any findings. If you note a mass, draw a sketch locating the mass. The sketch may be simple, simulating a clock face with the nipple in the center. Note whether the sketch is of the left or the right breast. Describe the size, shape, consistency, delimitation, and mobility or movability of the mass.
2. Note whether there were any palpable supraclavicular, infraclavicular, or axillary nodes and, if so, the number of them and the size and consistency of each.
3. Describe any asymmetry or retraction signs, note where these were located, what position the woman was in, and what maneuver allowed you to observe them.
4. Note and describe any nipple changes or discharge.
5. Note any relevant history.
6. End your note with the name of the physician with whom you will consult or to whom you are referring the woman.

Variations in Breast Examination and Findings for the Pregnant Woman

The basic breast examination is performed during the woman's initial prenatal physical examination. Because of physiological changes occurring during pregnancy, it is more difficult to diagnose breast

masses. The following breast findings are considered normal in the pregnant woman:

1. Bilateral increase in size, often accompanied by tingling, tenseness, and tenderness. Occurs in the first trimester.
2. Increased generalized coarse nodular and lobular feel of the breast as a result of hypertrophy of the mammary alveoli. Occurs in the first trimester.
3. Discharge of colostrum from the nipples. May appear as early as the sixth week of gestation as a clear viscous fluid. May become yellow and less viscous later in the pregnancy. Spontaneous discharge of colostrum may dry and form a crust on the nipples if they are not carefully cleaned daily with warm water.
4. Montgomery's follicles: hypertrophied sebaceous glands in the areola. Occurs in the first trimester.
5. Enlargement and increased erectility of the nipples. Occurs in the first trimester.
6. Broadening and increased pigmentation of the areola. Starts in the first trimester. Heavier pigmentation of the areola in the first trimester is called primary areola. A darkening and mottling of the skin around and beyond the primary areola during the second trimester is called secondary areola.
7. Dilated subcutaneous veins usually seen beneath the skin as a tracing of bluish veins. Occurs in the first trimester.
8. Vascular spiders on the upper chest (also upper arms, neck, and face). Occurs in the second trimester.
9. Striae of the breasts. May occur with excessive increase in the size of the breasts.

Although not part of every antepartal revisit, the woman's breasts are subsequently examined for the following:

1. Adequate support with a properly fitting brassiere.
2. Condition of the nipples (e.g., dried or crusted colostrum; duct openings clogged with powder; progress in bringing out flat or inverted nipples in women who plan to breastfeed).

There are certain situations in which it is of value to attempt to express colostrum from the nipples during pregnancy.

1. Presence of colostrum is a presumptive sign of pregnancy in primigravidas and in multigravidas who have not had a baby or breastfed in the past few years. Expression of colostrum is useful in clinically evaluating the possible diagnosis of pregnancy early in the first trimester, as colostrum appears by the sixth week of gestation.
2. An anxious woman who is close to term or immediately postpartum who wants to breastfeed may decide against it because she erroneously thinks she has nothing in her breasts to give her baby. Such anxiety is immediately allayed rather dramatically by expressing a few drops of colostrum.

Variations in Breast Examination for the Postpartal Woman

The woman has had the basic breast examination during her initial prenatal physical examination and again early postpartum. It is important to examine her breasts additionally during each postpartal examination:

1. Check for adequate support with a properly fitting brassiere or a breast binder.
2. Palpate the breasts to ascertain their condition:
   a. soft
   b. filling—tense, increasing firmness, slightly enlarged
   c. engorged—enlarged, hard, reddened, shiny, skin temperature elevated, painful, dilated veins
3. If the mother is breastfeeding, inspect the nipple epithelium:
   a. signs of irritation—reddened, tender
   b. precursory signs of cracking—tiny pinpoint blisters or subepithelial petechiae (best seen with a small magnifying glass)
   c. cracking—sore, possibly bleeding

There are also situations during the postpartal period in which it is of value to express colostrum or milk from the mother's nipples.

1. Expression of a drop or two of colostrum or milk helps the baby to learn where to suckle through immediate gratification.
2. When the breasts, and especially the areola, are engorged it will be easier for the baby to latch on properly if milk is first expressed, which diminishes the rigid hardness of the area so that it is soft enough that the baby can compress the lactiferous sinuses (see Chapter 62).

Teaching Breast Self-Examination

Teaching the woman how to do breast self-examination (BSE) is an inherent part of performing a breast examination on any woman. The importance of both annual breast examination by a clinician and monthly self-examination of the breasts should be emphasized to women throughout their life spans. Experienced clinicians often incorporate this teaching into their own examination of the woman rather than having a separate time for teaching the woman. (This approach saves time but still gets the teaching done, which is especially important in a busy clinic or office situation.) A number of pamphlets illustrate the technique for doing breast self-examination. These are available at no cost from the American Cancer Society.

You should begin by asking the woman if she knows how to do breast self-examination and if she is doing it. If the answer is affirmative, have her demonstrate her method. Also ascertain the frequency of her examinations. If she says she knows how to do self-examination but admits to not doing it, ascertain why she is not doing it. If she does not know how to do self-examination, ascertain if she wants to learn how and, if not, why not.

The following information should be included in any education about breast self-examination:

1. Why breast self-examination is important.
2. Assurance that a cancer identified early enough most often can be cured.
3. A reminder that not all lumps mean cancer but they must be diagnosed quickly.
4. When to do breast self-examination during the menstrual cycle and why. Instruct the woman to perform breast self-examination every month, a day or so after the end of her menstrual period. The end of the menstrual period serves as a reminder. It also keeps her from doing examinations during the premenstrual or menstrual phases of her menstrual cycle, when she may feel normal physiological changes that may unduly frighten her.
5. The positions to assume for inspection while situated in front of a mirror.
6. What she is looking for during inspection.
7. The position to assume for palpation (supine), the raising and lowering of her arm on the same side of her body as the breast she is palpating, and the placement of a small pillow under her shoulder on the same side.
8. Proper palpation technique and the importance of covering every square inch of the breasts and axillae. Women frequently squeeze or mash their breasts rather than palpating gently and compressing the breast tissue against the chest wall.
9. What she is looking for during palpation.
10. Anatomical structures that she might encounter during examination, such as ribs, the inframammary fold, and her normal breast tissue. (Have her feel them so she will not be unnecessarily frightened by them.)

In order for breast self-examination to be an effective screening tool for breast lesions, it is necessary for you to evaluate the effectiveness of your teaching. If your teaching has been effective, the woman should be performing monthly breast self-examination and should be able to do the following:

1. State the importance of doing breast self-examination.
2. State the proper time of the month for doing breast self-examination.
3. Demonstrate the proper positions for inspection in front of a mirror.
4. State accurately what she is looking for during inspection.
5. Demonstrate the proper position for palpation of her breasts.
6. Demonstrate a method of palpation that covers every square inch of each breast, includes palpation of her axillae, and gently compresses the breast tissue against her chest wall.
7. State accurately what she is looking for during palpation.
8. State what she is going to do if she finds something abnormal during inspection and palpation.

References

1. American Cancer Society. *Risk Factors for Breast Cancer*. Accessed online at www.cancer.org on August 17, 2002.
2. Haagensen, C. D. *Diseases of the Breast*, 3rd ed. Philadelphia, PA: W. B. Saunders, 1986.
3. McCool, W. F., Stone-Condry, M., and Bradford, H. M. Breast health care: a review. *J. Nurse-Midwifery* 43(5):406–430 (November/December) 1998.

• • • Additional References

Bickley, L. S., and Szilagyi, P. *Bate's Guide to Physical Examination and History Taking*, 8th ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2002.

Brucker, M., and Scharbo-DeHaan, M. Breast disease: the role of the nurse-midwife. *J. Nurse-Midwifery* 36(1):63–73 (January/February) 1991.

McCool, W. F. Barriers to breast cancer screening in older women: A review. *J. Nurse-Midwifery* 39(5):283–299 (September/October) 1994.

Netter, F. H. *Reproductive System*, Vol. 2. *The Ciba Collection of Medical Illustrations*. Section XIII: Anatomy and pathology of the mammary gland. Summit, NJ: Ciba Pharmaceutical Company, 1965, pp. 245–262.

Williams, P. L., et al. (Eds.) *Gray's Anatomy*, 38th ed. New York: Churchill Livingstone, 1995, pp. 417–424.

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CHAPTER

53

Obstetric Abdominal Examination

The term *obstetric abdominal examination* is used to indicate that this examination covers only the manifestations or results of pregnancy as elicited abdominally. This chapter is not intended to cover all that would be encompassed in an abdominal examination done during a routine screening physical examination as outlined in Chapter 2.

Antepartal/Intrapartal Abdominal Examination

General

As outlined in Chapter 22, abdominal examination of the pregnant woman includes the following:

1. noting any scars and obtaining explanation of them
2. checking for diastasis recti
3. checking for hernia
4. observation for linea nigra
5. observation for striae gravidarum
6. observation or palpation of fetal movement
7. measurement of fundal height
8. determination of lie, presentation, position, and variety
9. checking for fetal heart tones
10. estimation of fetal weight

The significance of these findings is also discussed in Chapter 22. The underlying physiology for findings that are presumptive, probable, or positive signs of pregnancy is discussed in Chapter 21.

This section on the antepartal and intrapartal abdominal examination is limited to the methods used in measuring fundal height; indications and procedure for measuring abdominal girth; the procedure for doing abdominal palpation and Leopold's maneuvers for determining abdominal muscle tone and fetal lie, presentation, position, variety, and engagement; and the probable location of the fetal heart tones based on the findings elicited using Leopold's maneuvers. The skill of estimating fetal weight is discussed in Chapter 22.

Measuring Fundal Height

Fundal height can be measured in a number of different ways. Engstrom and Sittler write the history of fundal height measurement from 1752 to present in fascinating detail [1].

Four ways of measuring fundal height are presented in this book. All have an inherent degree of inaccuracy because each depends on the examiner's identifying the top of the fundus correctly. Unfortunately, often some unidentifiable point on the anterior slope of the fundus is mistaken for the top of the fundus. This error can be avoided by doing the following:

1. Facing the woman's head as she lies supine, place your hands on each lateral side of the uterus approximately midway between the symphysis and the fundus.
2. Ballotte the uterus between your hands with gentle pressure and, being sure to keep your hands on the transverse (lateral) portion of the uterus, palpate up to the fundus.
3. As you near the top, make sure that your hands will begin to come together and they will meet at the top of the fundus.

Keeping your hands on the transverse (lateral) portion of the uterus assures reaching the actual top of the fundus and keeping off its anterior slope.

Even when the top of the fundus is identified correctly, sequential recording of fundal height from antepartal visit to antepartal visit will most likely be rendered useless if different examiners see the woman and use different ways of measuring fundal heights. If more than one person will be examining a woman during her pregnancy, all the persons involved must agree to measure fundal height the same way in order for this evaluation tool to have any meaning. They should also agree on the position of the woman during the measurement, as the measurement may vary depending on whether the woman is supine or has her trunk elevated with or without her knees flexed [2]. The discrepancies between ways of measuring fundal height become apparent in comparing the following discussion of each.

Method 1 The time-honored but most inaccurate way of measuring fundal height combines a knowledge of where to expect the fundal height to be at various weeks of gestation in relation to the woman's symphysis pubis, umbilicus, and tip of the xyphoid process and the use of the examiner's fingerbreadths as the measuring tool.

The inherent inaccuracies of this method are obvious immediately. First, women vary considerably in the distance from their symphysis pubis to their xyphoid process and in the location of the umbilicus between these two points. Second, the width of examiners' fingers varies considerably. For example, two fingerbreadths of a thick-fingered person can be the same as three fingerbreadths of a thin-fingered person.

Nevertheless, this method is useful if you do not have calipers or a tape measure immediately available, as it does enable you to ascertain that growth is occurring. Also, it does provide you with a good guide for establishing general expectations that can be used as a baseline against which to compare actual findings. Although this baseline may indeed be of somewhat questionable accuracy, it is a rule of thumb accurate enough to identify gross discrepancies between estimated gestational age by dates and by findings and to indicate the need for further investigation to rule out the possible causes for this discrepancy.

Table 53-1 lists the approximate expected location of the fundal height at various weeks of gestation. These are also shown in Figure 53-1.

Method 2 The caliper method of measuring fundal height is used infrequently, probably because a tape measure is cheaper, more portable, easier to read, and less awkward to use. The caliper method is, however, probably the most accurate method of measuring fundal height after the twenty-second to twenty-fourth week of gestation. A study by Engstrom, McFarlin, and Sittler indicates the possible improved reliability of fundal height measurement obtained with calipers over those obtained with a tape measure but also notes several practical problems [3].

The calipers are used by placing one tip on the superior border of the symphysis pubis and the other tip at the top of the fundus. Both tips are placed in the abdominal midline. Do not confuse the superior edge of the pubic hair line with the superior border of the symphysis pubis. These two *different* landmarks often do *not* coincide. You

TABLE 53-1 Approximate Expected Fundal Height at Various Weeks of Gestation

Weeks of Gestation	Approximate Expected Fundal Height
12	Level of the symphysis pubis
16	Halfway between symphysis pubis and umbilicus
20	1–2 fingerbreadths below umbilicus
24	1–2 fingerbreadths above umbilicus
28–30	One-third of the way between umbilicus and xyphoid process (three fingerbreadths above umbilicus)
32	Two-thirds of the way between umbilicus and xyphoid process (three to four fingerbreadths below xyphoid process)
36–38	One fingerbreadth below xyphoid process
40	Two to three fingerbreadths below xyphoid process if lightening occurs

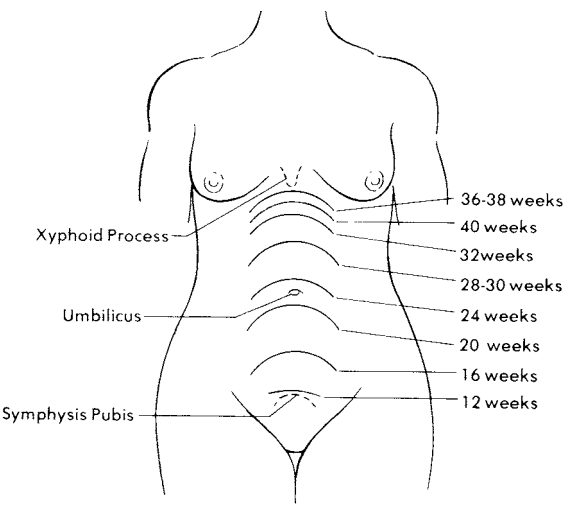


FIGURE 53-1 Approximate normal fundal heights during pregnancy.

must palpate for the symphysis pubis in order to locate its superior border. The measurement is then read on a centimeter scale located on an arc close to where the two ends of the calipers come together. The number of centimeters should be approximately equal to the weeks of gestation after about 22 to 24 weeks of gestation.

Method 3 Measuring fundal height with a tape measure is the most frequently used method for obtaining an exact measurement. It is also probably the second most accurate method of measuring fundal height after the twenty-second to twenty-fourth week of gestation. The zero line of the tape measure is placed on the superior border of the symphysis pubis and the tape measure is stretched across the contour of the abdomen to the top of the fundus. The abdominal midline is used as the line of measurement. Again, do not confuse the superior edge of the pubic hair line with the superior border of the symphysis pubis. The number of centimeters measured should be approximately equal to the weeks of gestation after about 22 to 24 weeks gestation.

Method 4 The fourth method of measuring fundal height also utilizes a tape measure, but the method of measuring differs. The zero line of the tape measure is again placed on the superior border of the symphysis pubis in the abdominal midline. The midwife's other hand is placed vertically—that is, with the thumb up, the palm toward the woman's abdomen, and the edge of the little finger touching the top of the fundus. The midwife then runs the tape measure through the index and middle finger of this hand and reads the measurement where the tape goes between the fingers over the top of the fundus. In effect, the tape measure follows the contour of the abdomen only as far as its apex and then is relatively straight to the point held by the midwife's fingers; the tape does not follow the anterior slope of the fundus. The centimeters not measured because the tape does not follow the anterior slope are accounted for mathematically, as follows:

Before the fundus reaches the level of the umbilicus, add 4 cm to the number of centimeters measured. The total number of centimeters should be approximately equal to the weeks of gestation.

After the fundus has reached the level of the umbilicus, add 6 cm to the number of centimeters measured. The total number of centimeters should be approximately equal to the weeks of gestation.

Although a number of clinicians use this method, there has not been any research done to show its equivalency to (or deviation from) the other methods of obtaining a centimeter measurement or to show whether the mathematical formula is indeed correct in relation to the weeks of gestation.

The problem is that if one examiner were to use this method and record the actual measurement (without the addition of the centimeters in the formula) and the next examiner were to measure the fundal height using the other tape measure method (method 3), there would be a discrepancy that would cause serious concern about the gestational growth of the fetus. Thus, the plea for communication and uniformity of method among clinicians practicing together is well founded.

Measuring Abdominal Girth

The measurement of abdominal girth is an adjunctive screening tool for determining any deviation from normal after the thirty-fourth week of gestation in women of no more than average size. Specifically, measuring abdominal girth is useful when you suspect the woman has an oversized uterus. Of the conditions that may cause an oversized uterus, two increase the breadth of the uterus as well as the length. These two conditions are multiple gestation and polyhydramnios.

To measure abdominal girth, encircle the woman's body with a tape measure at the level of the umbilicus. Generally, the normal girth measurement is approximately 2 inches less than the week of gestation. For example, you would expect a measurement of about 32 in. (81 cm) at 34 weeks gestation; 34 in. (86 cm) at 36 weeks gestation; 36 in. (91 cm) at 38 weeks gestation; and 38 in. (96.5 cm) at 40 weeks gestation.

A general rule of thumb is that any measurement more than 100 cm (or $39^1/_2$ in.) is larger than normal at any week of late gestation, and further investigation is necessary to ascertain the reason for this oversized uterus.

Gross obesity will skew the accuracy of abdominal girth findings, which is the reason for limiting the use of this tool to women of no more than average size. Possibly this inaccuracy could be circumvented by obtaining a baseline measurement on obese women prior to the thirty-fourth week of gestation.

Abdominal girth measurement, like fundal height measurement, may be inaccurate because of different body builds. It is, however, still accurate

enough to be useful as a gross screening tool, especially when in a situation of limited access to more sophisticated diagnostic tools such as ultrasound.

Abdominal Palpation and Leopold's Maneuvers

The term *abdominal palpation* is often used to mean doing Leopold's maneuvers for determining fetal lie, presentation, position, variety, and engagement. However, this is not precisely accurate. Other information is also obtained while doing Leopold's maneuvers, and further abdominal palpation may be involved than that strictly needed for doing Leopold's maneuvers. Abdominal palpation that includes the performance of Leopold's maneuvers is conducted for the following purposes:

Evaluation of uterine irritability, tone, tenderness, consistency, and any contractility
Evaluation of abdominal muscle tone
Detection of fetal movement
Estimation of fetal weight
Determination of fetal lie, presentation, position, and variety (see Chapter 26, pp. 747–749)
Determination of whether the head is engaged

Evaluation of abdominal muscle tone is important because poor muscle tone can influence the pregnancy in a number of ways, ranging from the discomfort of low back pain to the presenting part's overriding the symphysis pubis and having difficulty entering the true pelvis. Abdominal muscle tone becomes progressively more lax with increasing parity, especially if the woman has not done muscle tightening and toning exercises after each delivery. The method for evaluating abdominal muscle tone is described later in the chapter, in the discussion of the postpartal abdominal examination.

Before performing abdominal palpation and Leopold's maneuvers during the antepartal or intrapartal abdominal examination, make sure you carry out the following preparatory and general procedures:

Preparatory and General Procedures	Rationale
1. The woman's bladder should be empty.	**1.** A full bladder makes abdominal palpation very uncomfortable for the woman, as her bladder is subjected to pressure during the procedure. A full bladder also makes it difficult to feel fetal structures beneath the bladder, thereby obscuring findings pertaining to the presenting part.
2. The woman's abdomen should be completely exposed from just below the breasts to the symphysis pubis. (Have her lift her hips so she or you can pull down the back of her pants below the level of her hips.)	**2.** The abdomen should be completely exposed so you can observe its contours. Pulling down just the front of her pants causes her clothing to pull from her waist in the back, which interferes with your ability to locate the symphysis pubis and does not really expose the lower portion of her abdomen.
3. The woman's abdominal muscles should be relaxed. You can make sure they are by doing *all* of the following: **a.** Place a pillow under her head and upper shoulders. **b.** Ask her to place her arms by her sides or across her chest. **c.** Explain what you will be doing. **d.** Help her with relaxation breathing techniques, if needed. **e.** Have her bend her knees slightly. This is especially important for Leopold's third and fourth maneuvers.	**3.** Palpation is difficult for both the woman and the examiner if the woman's abdominal muscles are contracted. It is difficult for the examiner to feel the fetus and thus the examiner must take longer and use more forcible palpation. This causes the woman discomfort and she tenses her muscles. Thus, a vicious cycle is in operation. All of this can be avoided by starting with relaxed abdominal muscles. The examiner should have warm hands and use smooth and gentle but firm palpation, as described in Steps 4 and 6; these steps reduce stretching and, therefore, tension of the abdominal muscles.
4. Be sure your hands are warm. If not, hold them under warm water, rub them together, or hold them under a light until they are warm.	**4.** Cold hands are uncomfortable for the woman. They may also cause muscle contraction.

5. Before palpating, lightly rest your hand on the woman's abdomen (but not so lightly as to tickle). A good time for this is while you are explaining what you are going to do. (See Figure 53-2.)
6. The technique of palpation is as follows:
   a. Use the flat palmar surface of your fingers for palpating—*not* your fingertips.
   b. Keep the fingers of your hands together.
   c. Apply smooth deep pressure as firm as is necessary to obtain accurate findings.
   d. Avoid any sudden movement, jabbing, poking, or prodding—you are palpating a woman's abdomen, not kneading bread.

5. This action gives the woman an opportunity to adjust to your touching her. A light preliminary touch is not uncomfortable and allows her initial muscle-tightening reaction to being touched to dissipate.
6. This technique of palpation is designed to give the woman the least possible discomfort and to permit the examiner to gather the greatest amount of information and cover the greatest contiguous area in the shortest amount of time with the greatest degree of tactile sensitivity.
   d. There is no excuse for a rough abdominal examination. Not only do you lose the woman's cooperation and trust but such an examination may also cause abdominal muscle tension and uterine contraction, rendering it difficult if not impossible to obtain accurate findings.

Before starting palpation, inspect the abdomen to determine what its contours can tell you about the fetal lie, presentation, position, and variety. Palpation then gives you further information with which to confirm or rule out this initial impression.

Leopold's maneuvers (Figure 53-3) are four maneuvers that start at the fundus and end at the pelvic brim. The experienced midwife may start with any one of the four maneuvers. It is suggested that the learner, however, go through the steps sequentially, as the pattern they form contributes to a thought process and creates a mental image for determining fetal position that will most quickly aid you in developing skill and accuracy. Consistently following an orderly sequence will also help you remember to include all the maneuvers and gather all the necessary information. In doing Leopold's maneuvers, stand at the side of the bed most convenient and comfortable for you. Unless the room arrangement prevents it, right-handed people generally stand on the woman's right side and left-handed people generally stand on the woman's left side.

Observations	Significance
1. Uterine shape is a longitudinal ovoid; fundal height as expected for gestational age.	1. Indicates a longitudinal lie.
2. Uterine shape is a transverse ovoid; fundal height lower than expected for gestational age.	2. Indicates a transverse lie.
3. A long smooth curve is prominent on one side of the abdomen.	3. Indicates that the back of the fetus is on that side of the abdomen.

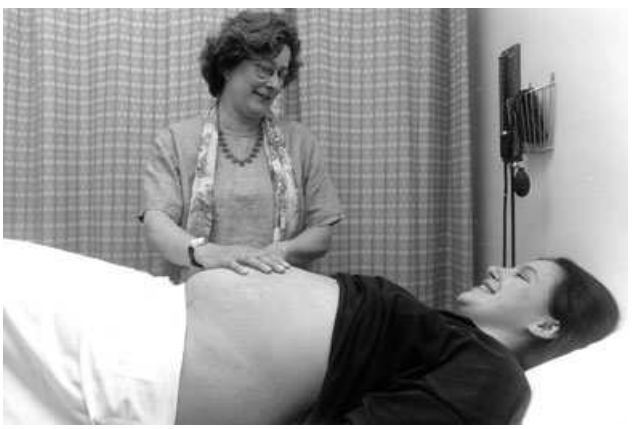


FIGURE 53-2 Midwife preparing to do an abdominal palpation.

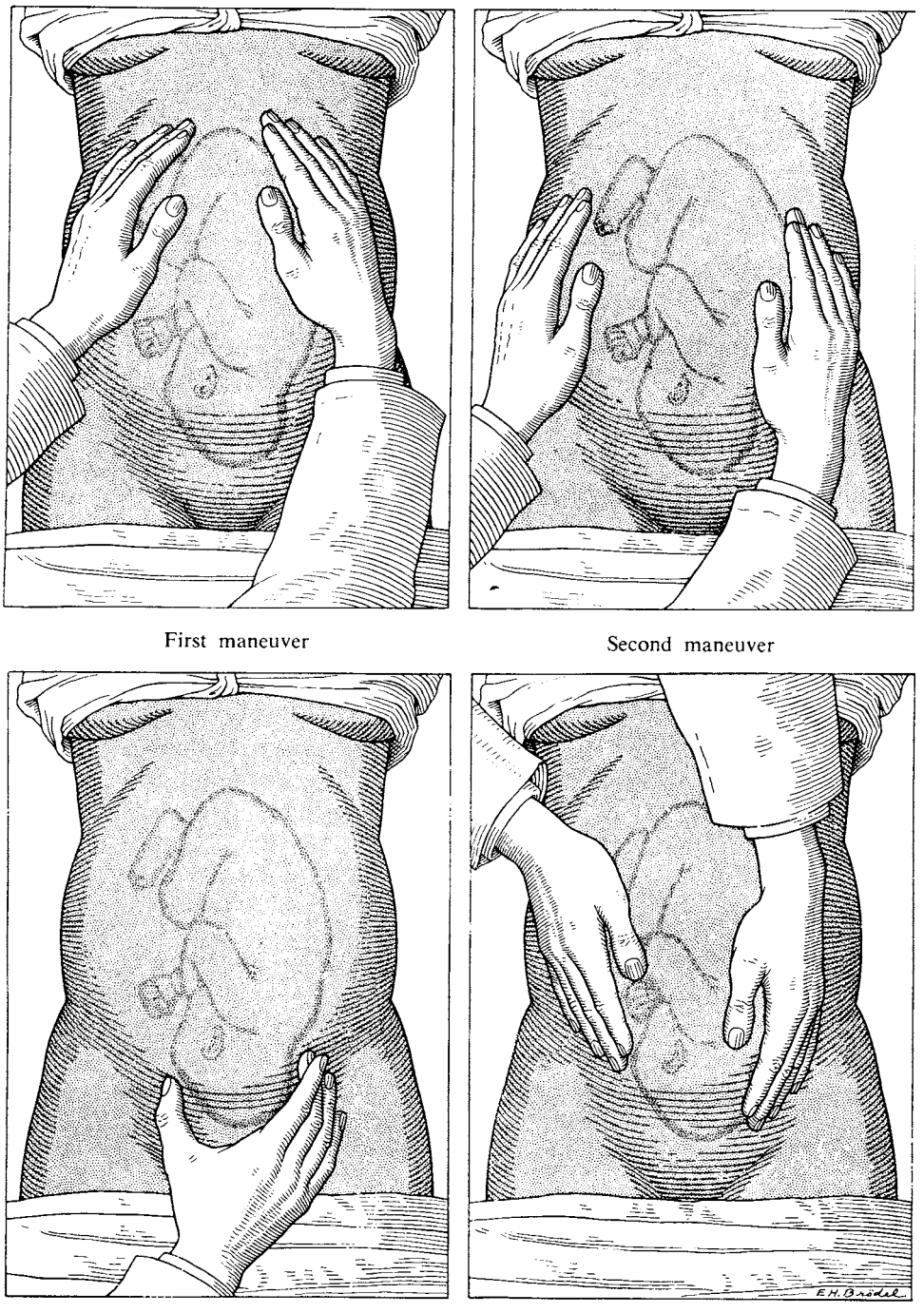


FIGURE 53-3 Leopold's maneuvers. Palpation of the fetus in left occiput anterior position.

Source: From Cunningham, F. Gary, Gant, Norman F., Leveno, Kenneth J., Gilstrap, Larry C. III, Hauth, John C., Wenstrom, Katherine D. *Williams Obstetrics*, 21st Edition. McGraw-Hill, New York, 2001. Reproduced with permission of the McGraw-Hill Companies.

Observations	Significance
4. A saucerlike depression appears just below the umbilicus and a bulge like a full bladder appears above the symphysis pubis.	**4.** Indicates a posterior position.
5. Movement of fetal small parts can be seen all over the abdomen.	**5.** Indicates a posterior position.

Procedure	Findings	Significance
1. First maneuver (see Figure 53-3):		
a. Face the woman's head.		
b. Place your hands on the sides of the fundus and curve your fingers around the top of the fundus.		
c. Palpate for shape, size, consistency, and mobility.		
d. Ask yourself the question: What is in the fundus?	**(1)** Fetal part feels round and hard; is readily movable; and can be ballotted between the fingers of your two hands or between the thumb and a finger of one hand.	**(1)** Indicates a fetal head. The mobility arises from the head's being able to move independently of the trunk. The lie is longitudinal.
	(2) Fetal part feels irregular, larger or bulkier, and less firm than a head. It cannot be well delineated or readily moved or ballotted.	**(2)** Indicates the fetal breech. The breech cannot move independently of the trunk. The lie is longitudinal.
	(3) Neither of the above is felt in the fundus.	**(3)** Indicates a transverse lie.
2. Second maneuver (see Figure 53-3):		
a. Continue to face the woman's head.		
b. Place your hands on both sides of the uterus about midway between the symphysis pubis and the fundus.		
c. Apply pressure with one hand against the side of the uterus, thereby pushing the fetus to the other side of the abdomen against your examining hand and stabilizing it there. Maintain this pressure while your examining hand palpates the other side of the uterus for the fetus.	**(1)** A firm, convex, continuously smooth, and resistant mass extending from the breech to the neck.	**(1)** Indicates the fetal back. The location of the back in the left or right side of the woman's abdomen determines the position in a longitudinal lie. The location of the back in the anterior, lateral, or posterior portion of the abdomen determines the variety (see Chapter 26, p. 748).
	(2) Small, knobby, irregular masses which move when pressed on or kick or hit your examining hand.	**(2)** Indicates the fetal small parts—hands, feet, knees, elbows. Should be in the side of the woman opposite from the side the fetal back is in.
	(3) Small parts all over the abdomen. The back is difficult to feel and seems to be just out of reach in the posterior portion of the abdomen.	**(3)** Indicates a posterior position.
d. Palpate the entire area with your examining hand, from the abdominal midline to the lateral side and from the symphysis pubis to the fundus. Use firm, smooth pressure and rotary movement.		
e. Reverse the procedure to examine the other side of the uterus.		

Some midwives either add or substitute another procedure for the second Leopold maneuver. Its name, "walking your fingers over the abdomen," describes the procedure, which is as follows:

1. Start on one side of the abdomen and apply deep and firm pressure with the fingers of both hands.
2. Then move (walk) your fingers across the abdomen from one lateral side to the other lateral side.

The pressure applied by your fingers will enable you to differentiate the firm back from the knobby small parts, which will ease away from your fingers as you cross over them. The art of this procedure lies in doing it so that it does not cause the woman discomfort. This requires experienced fingers and a midwife knowledgeable about what she or he is feeling. It is, therefore, not suggested for the beginner.

Procedure	Findings	Significance
3. Third maneuver (see Figure 53-3). **a.** Continue to face the woman's head. **b.** Make sure that the woman's knees are bent in order to avoid causing her discomfort during this maneuver. **c.** Grasp the portion of the lower abdomen immediately above the symphysis pubis between the thumb and middle finger of one hand. It will be necessary to press gently but firmly into the abdomen in order to feel the presenting part below and between your thumb and finger. **d.** You will feel a movable mass if the presenting part is not engaged. As in the first maneuver, palpate for shape, size, consistency, and mobility in order to differentiate if the mass you feel is the breech or head in the lower pole of the abdomen. Ask yourself: What is in the lower pole?	**(1)** The findings will be the same as for the first maneuver except they will be in the lower pole. **(2)** If the presenting part is the head, it may not be readily movable, especially if it is engaged. If the head is above the pelvic brim, it is readily movable and ballottable, as described for the first maneuver.	**(1)** Same as for first maneuver. The findings from the first and third maneuvers must be compared in order to make a final determination of the lie and presentation.

Leopold's third maneuver is also known as Pawlik's maneuver, or Pawlik's grip (see Figure 53-4). A procedure that is sometimes added to this maneuver is called the combined Pawlik grip, in which you use Pawlik's grip with one hand and grasp the fundus in the same way with the other hand at the same time. This combination enables you to compare simultaneously what is in the two poles for final determination of the fetal lie and presentation.

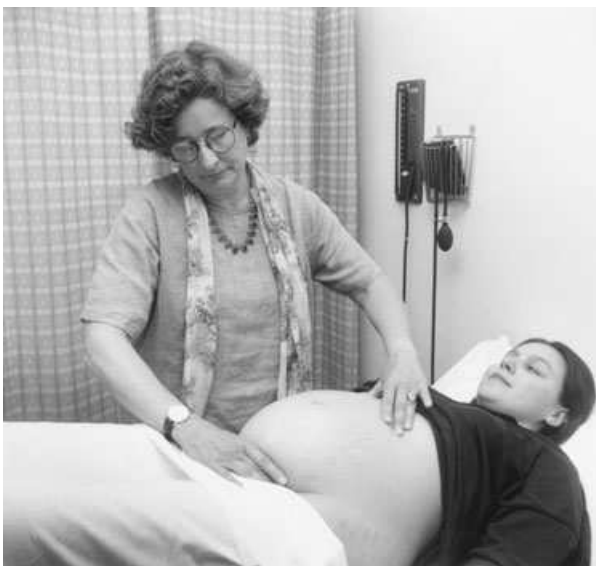


FIGURE 53-4 Combined Pawlik grip.

Procedure	Findings	Significance
4. Fourth maneuver (see Figure 53-3):		
a. Turn and face the woman's feet.		
b. Make sure that the woman's knees are bent in order to avoid causing her pain with this maneuver.		
c. Place your hands on the sides of the uterus with the palms of your hands just below the level of the umbilicus and your fingers directed toward the symphysis pubis.		
d. Press deeply with your fingertips into the lower abdomen and move them toward the pelvic inlet.		
e. In a breech presentation, or in a head presentation after you have palpated the cephalic prominence, continue to move your hands toward the pelvic inlet. Your hands will be unable to continue past the brim of the true pelvis because the symphysis pubis prevents further movement.	**(1)** If the head is the presenting part, one of the following will happen:	**(1)**
	a. One of your hands will make contact with a hard round mass while your other hand continues on in the direction of the pelvis.	**a.** The hard round mass is the cephalic prominence. If it is on the same side of the woman as the fetal back, the cephalic prominence is the occiput and indicates a face presentation because the head is extended. If the cephalic prominence is on the same side of the woman as the fetal small parts, it is the forehead and indicates a vertex presentation since the head is well flexed.
	b. Both of your hands will encounter simultaneously a hard round mass, which is equally prominent on both sides.	**b.** This indicates a sincipital (or military) presentation. Your hands are feeling the forehead and the occiput at the same time.
	(2) At the brim of the pelvis your hands will do one of two things:	**(2)**
	a. Converge around the presenting part so that the fingertips of your two hands touch in the abdominal midline. If the presenting part is the head, it will be readily movable. If the presenting part is the breech, it will have a feeling of give along with the trunk of the fetus.	**a.** The presenting part is not engaged. Rather, it is floating at or above the pelvic inlet (as determined by its position at or above the symphysis pubis).
	b. Diverge away from the presenting part and the abdominal midline. The presenting part will have no give or mobility.	**b.** The presenting part is either engaged or "dipping." When the presenting part is dipping, it has entered the pelvic inlet but has not yet descended to the point of engagement. If you are unable to feel the cephalic prominence because it is out of reach in the pelvis, the head is engaged.
5. Share your findings with the woman. Offer to help her feel and identify various parts of her baby if she would like.		

Location of Fetal Heart Tones

Abdominal palpation that determines the lie, presentation, position, and variety of the fetus enables you to locate the fetal heart tones. This is because the sound of the fetal heart is transmitted through the convex portion of the fetus closest to the anterior uterine wall. Therefore, you will be able to hear the fetal heart tones best through the back of the fetus in vertex and breech presentations and through the chest of the fetus in face presentations. Thus, if you know the position of the fetus you can readily locate the fetal heart tones, allowing for some variation depending on how far the fetus has descended into the pelvis (see Figure 53-5).

Conversely, location of the fetal heart tones is an additional piece of data that serves to either confirm or call into question your diagnosis of the fetal position. If you find the fetal heart tones loudest in a location different from where you expected to find them, then you must reconsider your findings or your interpretation of your findings from abdominal palpation.

The fetal heart tones of a full-term fetus with an unengaged presenting part are best heard in the general locations listed in Table 53-2, in relation to general presentations, positions, and varieties. Specific locations of the loudest fetal heart tones for specific fetal positions are shown in Figure 53-5.

Recording the fetal heart tones gives two pieces of information: the rate and the location of maximum intensity. The location is identified by dividing the abdomen into four quadrants with imaginary vertical and horizontal lines that bisect each other at the umbilicus, as follows:

RUQ	LUQ
RLQ	LLQ

RUQ = right upper quadrant
RLQ = right lower quadrant
LUQ = left upper quadrant
LLQ = left lower quadrant

You then chart the rate and location in one of the following three ways:

1. RLQ-140
2. 140 (RLQ)
3. X (RLQ), 140 (LUQ)

The latter can be the most informative, as the X in the quadrant can be placed in accord with the anterior, lateral, or flank position of the fetal heart tones.

TABLE 53-2 Locating Fetal Heart Tones in Various Fetal Presentations and Positional Varieties

Presentations and Positional Varieties	Location
Cephalic	Midway between umbilicus and level of anterior superior iliac spine
Breech	Level with or above umbilicus
Anterior	Close to abdominal midline
Transverse	In lateral abdominal area
Posterior	In flank area or close to abdominal midline on other side of abdomen

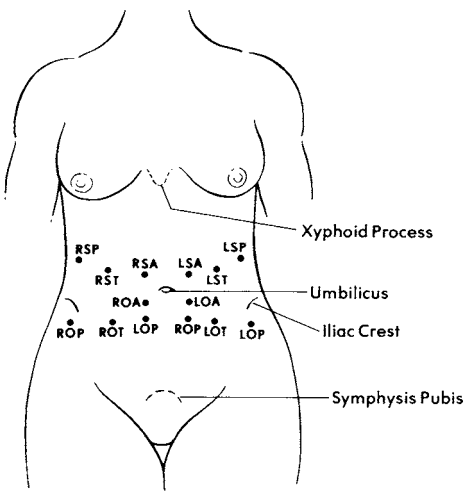


FIGURE 53-5 Location of the point of maximum intensity of the fetal heart tones for specific fetal positions.

Postpartal Abdominal Examination

The postpartal abdominal examination is done during the early postpartal period (1 hr to 5 days). It includes the following:

1. examination of the bladder
2. examination of the uterus
3. evaluation of abdominal muscle tone by determination of the degree of diastasis
4. checking for CVA tenderness (see Chapter 54)

Bladder

In examining the bladder you are looking specifically for bladder distention caused by urinary retention resulting from bladder hypotonicity because of trauma during childbirth. This condition can predispose the woman to bladder infection and be responsible for an increase in uterine bleeding. Evidence of a full bladder, therefore, should be evaluated during the abdominal examination.

Bladder distention can be seen as a bulge in the abdominal contour above the symphysis pubis extending toward the umbilicus. Sometimes the initial indication of a distended bladder is displacement of the uterus upward and to the right side. The full bladder can then be palpated in the lower abdomen.

Uterus

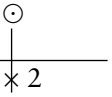
Examination of the uterus includes noting its location, size, and consistency. Determining the *location* of the uterus involves noting if the fundus is above or below the umbilicus and if it is in the abdominal midline or displaced to one side. Location and size overlap, since *size* is determined not only by palpation but also by measuring the height of the uterine fundus.

The fundal height of the postpartum uterus is measured by the number of fingerbreadths the top of the fundus is above or below the umbilicus. (See the first part of Chapter 42 and Figure 42-1 for norms.) As when measuring the pregnant uterus, it is essential to accurately identify the top of the fundus. Again, this can be done by placing your hands on the lateral sides of the uterus and ballotting it between your hands as you palpate up to the fundus. Your fingers will come together at the top of the fundus if you keep your hands on the lateral portion of the uterus, thereby avoiding ending on the anterior slope of the uterus and consequently obtaining an erroneous measurement. Within a few days it will be necessary to measure the top of the fundus in relation to the symphysis pubis rather than to the umbilicus; the fundus is not normally palpable after the tenth day postpartum above the symphysis pubis.

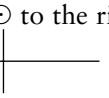
The *consistency* of the uterus is characterized as either firm or soft. *Firm* is sometimes qualified as "firms with massage" and *soft* is sometimes elaborated on as "soft and boggy." A truly firm uterus feels as hard as a rock. A soft uterus feels indentable, and you can feel it hardening beneath your fingers as you massage it. It is important to observe the perineum while feeling for the consistency of the uterus in order to evaluate the effect of uterine stimulation on the amount of lochial flow. If the uterus is firm initially, palpation will not cause an increase in the flow of lochia or expulsion of clots. If the uterus is soft initially, uterine palpation will cause contractions that will expel any accumulated blood and clots. After the uterus is emptied of this accumulation, the lochial flow normally will lessen and the uterus will become firm.

Findings obtained from examination of the uterus can be recorded in more than one way, as is illustrated in the charting of the two following sets of findings. One way, of course, is to write the findings out. The other three ways use generally accepted shorthand notations. The uterus is assumed to be in the midline unless otherwise noted. The three notation forms are presented here in the order of their frequency of use.

Findings: The fundus is firm at two fingerbreadths below the umbilicus in the midline.

1. ff @ U/2
2. ff @ 2 fb ↓ ⊙
3. ff @ ——|—— 
   2

Findings: The fundus is soft at three fingerbreadths above the umbilicus and displaced to the right side.

1. f soft @ 3/U to the right
2. f soft @ 3 fb ↑ ⊙ to the right
3. f soft @ 3 × 

Diastasis

Determination of the amount of diastasis recti is used as an objective means of evaluating abdominal muscle tone. Diastasis is the degree of separation of the abdominal rectus muscles (rectus abdominis). This separation is measured in terms of fingerbreadths when the abdominal muscles are contracted and again when they are relaxed.

Diastasis is measured in the following manner:

1. Position the woman so she is lying on her back without a pillow under her head.
2. Place the tips of the fingers of one of your hands in her abdominal midline with the tip of your index finger just below the umbilicus and your other fingers lined up longitudinally downward toward the symphysis pubis. The sides of your fingers should be touching each other.
3. Have the woman raise her head and strive to put her chin on her chest in the area between

her breasts. (Obviously this is impossible but ensures that she will tighten her abdominal muscles, which will not occur if she merely tucks her chin down on her clavicles.) Be sure she is not pressing her hands against the bed or grabbing the mattress to help herself, as this prevents use of her abdominal muscles.

4. As the woman strains to put her chin between her breasts, press your fingertips gently a short distance into her abdomen. You will feel the abdominal muscles, like two bands of rubber, approaching the midline from both sides. If the diastasis is wide, even with the muscles contracted you will need to move your fingers from side to side in order to find the muscles. If the abdominal muscles are in good enough tone to come together in the midline when tightened, you will feel them against your fingers and then underneath your fingers as they push your fingers out of the abdomen.
5. Measure the distance between the two rectus muscles while they are contracted by placing your fingers flat and parallel to the midline and filling in the space between the rectus muscles with your fingers. Note the number of fingerbreadths between the median edges of the two rectus muscles.
6. Now place the fingertips of one hand along the median edge of one abdominal rectus muscle and the fingertips of your other hand along the median edge of the other rectus abdominis muscle. When properly positioned the backs of your hands should be facing each other in the abdominal midline.
7. Ask the woman to lower her head *slowly* to its original resting position on the bed.
8. As she lowers her head, the rectus muscles will move further apart and become less distinguishable as they relax. With your fingertips follow the rectus muscles as they move apart to their respective lateral sides of the abdomen. This maneuver enables you to still be able to identify them in their relaxed state.
9. Measure the distance between the two rectus muscles while they are relaxed the same way you did when they were contracted. Note the number of fingerbreadths between the median edges of the two rectus muscles.
10. Chart your findings as a fraction in which the numerator represents the width of the diastasis in fingerbreadths when the muscles were contracted and the denominator represents the width of the diastasis in fingerbreadths when the muscles were relaxed. For example, a diastasis that measured two fingerbreadths when the muscles were contracted and five fingerbreadths when the muscles were relaxed would be charted as follows:

Diastasis = 2/5 fb.

This measurement of course can be written out:

Diastasis = 2 fb. when muscles contracted and
5 fb. when muscles relaxed

Steps 1, 3, and 7 of the procedure for measuring diastasis comprise the chin-chest abdominal muscle tightening exercise. Thus, determining the degree of diastasis also provides an ideal situation for teaching.

Unless a woman is in the habit of exercising, she will need considerable motivation to begin and to continue a program of abdominal muscle tightening exercises. She will exercise only if she experiences a need for it, so you first have to capture her interest. You can do this by having her feel "the hole in her stomach" (she's probably already noticed that her abdomen pouches out when she moves around) and then asking her if she wants to know what it is. It is the rare woman who rejects this opportunity. Have her use the same method for feeling her abdomen as you used for determining the diastasis.

You now have her attention, and you can describe how the abdominal rectus muscles normally lie side by side (although not connected) in the midline; how, as her stomach enlarged with her pregnancy, these muscles became stretched; how, after the baby was born, her muscles collapsed; and how her abdominal rectus muscles now no longer lie side by side but instead are separated and trying to get back together again, as she can feel when she tightens them.

Next, ask her if she wants to know why it is important to get her muscles back together again. Again, it is the rare woman who answers no to this question, since this concerns her body. There are two reasons for her to work at getting the abdominal muscles back together:

1. To regain her figure. This often is an insufficient motivating factor.
2. To prevent severe backache, especially during her next pregnancy. Most women will remember having some degree of backache during their pregnancy—many women are miserable with it—and do not want it to an even worse degree the next time.

The motivating factor for many women is an explanation of how the abdominal muscles support the enlarged uterus and baby and how the pregnant

uterus will sag forward without the support of the abdominal muscles and a demonstration of the effect a sagging uterus will have on the back in the form of an exaggerated lordosis, which is what causes backache during pregnancy.

Finally, ask the woman if she wants to know how to get her abdominal muscles back together again. The vast majority of women are now experiencing a need for this information. This is your entree for teaching her the postpartal abdominal tightening exercises, starting with the chin-chest exercise she has already done. Women respond positively to your reminding them that they now know how to check their own progress and that they have reached their goal when they can no longer feel the "hole in their stomach" but can instead feel their muscles lying side by side again.

References

1. Engstrom, J. L., and Sittler, C. P. Fundal height measurement: Part 1. Techniques for measuring fundal height. *J. Nurse-Midwifery* 38(1):5–16 (January/February) 1993.
2. Engstrom, J. L., et al. Fundal height measurement: Part 3. The effect of maternal position on fundal height measurements. *J. Nurse-Midwifery* 38(1):23–27 (January/February) 1993.
3. Engstrom, J. L., McFarlin, B. L., and Sittler, C. P. Fundal height measurement: Part 2. Intra- and interexaminer reliability of three measurement techniques. *J. Nurse-Midwifery* 38(1):17–22 (January/February) 1993.

Additional References

Engstrom, J. L., McFarlin, B. L., and Sampson, M. B. Fundal height measurement: Part 4. Accuracy of clinicians' identification of the uterine fundus during pregnancy. *J. Nurse-Midwifery* 38(6):319–323 (November/December) 1993.

Engstrom, J. L., Sittler, C. P., and Swift, K. E. Fundal height measurement: Part 5. The effect of clinician bias on fundal height measurements. *J. Nurse-Midwifery* 39(3):131–141 (May/June) 1994.

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CHAPTER

54

Checking for Costovertebral Angle Tenderness

Anatomy

The costovertebral angle (CVA) is formed by the junction of the twelfth, or lowermost, rib with the paravertebral muscles, which run parallel to and on both sides of the vertebral column. The kidney is posteriorly closest to the skin surface in this area and pain is transmitted through the tenth, eleventh, and twelfth thoracic nerves. Ureter pain is transmitted through the twelfth thoracic nerve and the first three lumbar nerves.

Significance and Charting

Pain elicited in the area of the costovertebral angle is indicative of renal disease. In addition to being a routine part of the physical examination, checking for costovertebral angle tenderness (CVAT) is always indicated whenever a woman gives a history suggestive of a urinary tract infection after her initial examination.

If there is no CVA tenderness, this is noted under the examination of the abdomen as "No CVAT."

If there is CVA tenderness, this is noted under the examination of the abdomen by its location: "right CVAT," "left CVAT," or "bilateral CVAT."

Procedure and Rationale for Examination

There are several methods for eliciting CVA tenderness. All involve deep pressure or a mild blow to the area. It is important that this not be too vigorous because the woman will suffer pain if you cause trauma to the area. The point is to identify already existing pain.

Procedure	Rationale
Method A	
1. Ask the woman to sit with her entire back and trunk exposed.	**1.** The sitting position exposes the area to be examined.
2. Make a fist out of your examining hand. Use the fleshy side (ulnar surface) of your fist (the side where your little finger is) to gently hit the woman's back. Forewarn her that this is what you are going to do.	**2.** The projection of the knuckle or the thumb on the thumb side of your fist would cause pain when you hit the woman.

Procedure	Rationale
3. Gently pound down one side of the woman's back from the midportion of the scapular area to the midportion of her buttock area just lateral to her paravertebral muscles. Be sure that you hit the costovertebral angle as you move down. Repeat on the other side.	**3.** When you start and end in areas other than the costovertebral angle, the woman is not conditioned to concentrate on whether she feels pain in any one area. This method also conditions her to feel slight jars or thuds so she is not jumping from being startled by the time you arrive at the costovertebral angle.
4. Note if the woman winces, jumps, or otherwise envinces pain when you hit the costovertebral angle.	
Method B	
1. Ask the woman to sit with the area of the costovertebral angle exposed.	**1.** Exposes the area to be examined.
2. Place the palm of one hand over the costovertebral angle on one side.	**2.** to **6.** This method covers less territory than Method A and involves only one hit per side, and so would be better for thin or emaciated women who would feel discomfort from wherever hit in Method A. Method B requires closer differentiation between actual pain and being startled by the blow—both of which might cause the woman to jump—since with Method B the woman is not conditioned to being jarred, as is true in Method A. Method B, however, is useful for double-checking a positive finding elicited by Method A to make sure the pain was indeed elicited at the costovertebral angle. Method A is necessarily less precise in hitting the costovertebral angle.
3. Make a fist out of your other hand. Use the ulnar surface of your fist for striking.	
4. Strike the back of the hand that is over the costovertebral angle with the fist of your other hand.	
5. Note if the woman winces, jumps, or otherwise evinces pain. If so, ascertain if she is responding to pain or to being startled by feeling a mild blow, jar, or thud in this area.	
6. Repeat for the costovertebral angle on the other side.	
Method C	
1. Ask the woman to lie down, looking up.	**1.** to **4.** Method C is particularly useful when examining a woman who is lying in bed, for example, as a routine part of the postpartal examinations in the hospital. Method C requires close differentiation between actual pain and being startled by the blow. This differentiation can be facilitated by telling the woman what you are going to do.
2. Put your hands around the woman's waist and locate by the palpation the costovertebral angles with the flat part of your index and middle fingers on each hand.	
3. Alternately strike each costovertebral angle with your fingers by a sudden, upward motion of your hand.	
4. Note if the woman winces, jumps, or otherwise evinces pain. If so, ascertain if she is responding to pain or to being startled by feeling a mild blow, jar, or thud in this area.	

A good way to double-check a positive finding elicited by any of the above methods is by deep palpation and pressure in the costovertebral angle. This may be done with the woman either sitting or lying down. Such careful palpation in the precise area aids differentiation of CVA tenderness from pain in the immediately adjacent back muscles caused by muscle spasm. Deep palpation over these muscles will elicit any existing muscle pain.

CHAPTER

55

Checking for Deep Tendon Reflexes and Clonus

Deep Tendon Reflexes

Anatomy

Deep tendon reflexes (DTRs) are also known as stretch reflexes because they are elicited by briefly stretching a muscle by tapping its tendon briskly. The brisk tap stimulates a sensory nerve impulse that travels through the reflex arc and ends with stimulation of the muscle in a brief contraction. This brief contraction causes a corresponding brief movement, or jerk, of the anatomical body part affected by the contraction of the muscle. Therefore it is necessary, for each reflex tested, to know the name and location of the tendon to tap, the muscle in which to feel the contraction, and the anatomical body part in which to observe the jerk. Table 55-1 supplies this information for the most commonly tested reflexes.

Significance and Charting

Hyperactive deep tendon reflexes are indicative of disease of the upper motor neuron or pyramidal tract. Hypoactive or absent deep tendon reflexes are indicative of a number of diseases. If you observe either condition, you should consult with a physician.

Reflexes are evaluated on a scale of 0 to 4+ as follows:

0 = absent; no response
1+ = decreased; diminished; sluggish
2+ = normal; average
3+ = brisk
4+ = very brisk; hyperactive
(usually associated with clonus)

Reflexes designated 1+ are low-normal reflexes; 3+ reflexes are more brisk than the average reflex response and indicate the possible but not absolute presence of disease; 0 and 4+ reflexes are definitely abnormal and indicate disease requiring physician consultation. Reflexes should be symmetrical for homologous muscles and symmetry should be noted in the charting.

A stick figure is frequently used to designate the reflex findings from a routine physical examination in which all five deep tendon reflexes are evaluated. The right and left sides are marked on the figure. The figure gives a visual record of the response evaluation and symmetry of each reflex by location (Figure 55-1).

If only one or two of the reflexes is evaluated bilaterally, then the charting would reflect which one. For example:

Quadriceps and biceps deep tendon reflexes (DTR)—2+ and symmetrical
or
Quadriceps DTR—3+, no clonus, symmetrical

TABLE 55-1 Anatomy of Deep Tendon Reflexes

Reflex	Tendon	Muscle	Body Part That Jerks
Quadriceps (knee-jerk)	Ligamentum patellae—from the apex of the patella to the tuberosity of the tibia	Quadriceps femoris—the anterior thigh muscles consisting of four muscles covering the front and sides of the femur and comprising the front of the thigh; the extensor muscle of the leg	Knee extension and leg jerk
Gastrocnemius-soleus (ankle-jerk)	Tendon calcaneus (Achilles tendon)—from the middle of the posterior lower leg to the heel	Gastrocnemius and soleus muscles—the posterior leg (calf) muscles	Plantar flexion of the foot at the ankle (points the toes)
Biceps	Tendon of the biceps brachii—crosses the bend of the elbow and inserts in the posterior portion of the tuberosity of the radius	Biceps brachii—the anterior muscle of the upper arm	Flexion of the elbow, arm, and forearm; supinates the hand
Triceps	Tendon of the triceps brachii—from the middle of the posterior upper arm to the elbow	Triceps brachii—the posterior muscle of the upper arm	Extension of the elbow and the forearm; adducts the arm (toward the body)
Brachioradialis	Tendon of the brachioradialis—from the middle of the forearm to the wrist, inserting in the lateral side of the base of the styloid process of the radius	Brachioradialis—the superficial muscle on the radial (thumb) side of the forearm	Flexes the elbow and the forearm

Procedure	Rationale
1. General:	**1.**
a. Symmetry is determined by comparing the reflex response on one side with the same reflex response on the other side, *not* by comparing the response of different reflexes on the same or opposite sides.	**a.** Different tendons may vary considerably in reflex amplitude, so only the same reflexes on both sides of the body can be compared.
b. In testing reflexes, you should if possible palpate the muscle of the reflex being tested while tapping its tendon.	**b.** Palpating the muscle allows you to evaluate the vigor of the muscle contraction and the time it takes for the muscle to relax after contraction. Slow relaxation of a muscle after contraction is indicative of hypothyroidism.
c. The limb to be tested should be in a flexed or semiflexed position.	**c.** This places slight tension on the muscle to be tested by mildly stretching it and aids in eliciting the reflex.

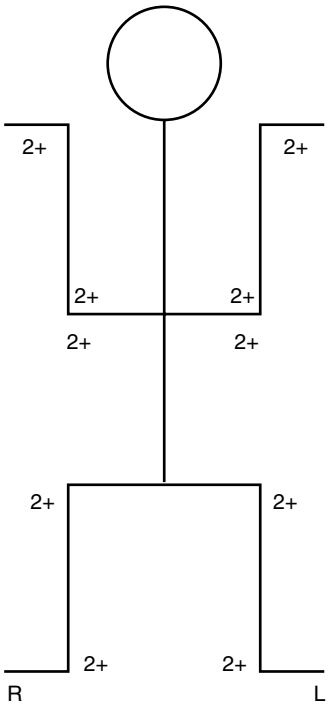

FIGURE 55-1 Stick figure for charting that all five deep tendon reflexes are normal (2+) and bilaterally symmetrical.

Procedure	Rationale
d. The woman should be as relaxed as possible. If necessary, in the event the woman's reflexes appear absent or symmetrically diminished, use the technique of reinforcement, which involves isometric contraction of muscles other than those being tested. For example, while testing leg reflexes, ask the woman to interlock her fingers and pull in opposite directions with her eyes closed; or when testing arm reflexes, have the woman clench her teeth or squeeze her thigh with the opposite hand, again with her eyes closed.	**d.** The woman must be sufficiently relaxed for a deep tendon reflex to be elicited. Reinforcement works in two ways: (1) it distracts the woman and thereby causes relaxation; (2) the deliberate contraction of different muscles from those being tested may increase reflex activity. A reflex is not considered absent unless it cannot be elicited while using the technique of reinforcement.
e. Tap the tendon briskly. A reflex hammer is most useful for this purpose. If a reflex hammer is not available the edge of your stethoscope or, for the quadriceps reflex, even the tips of your fingers suddenly striking the tendon may suffice.	**e.** A brisk tap produces a sudden additional stretch of the tendon. The reflex hammer, when held loosely and swung in an arc using wrist action, provides just the right force and briskness. Use of objects other than a reflex hammer is a makeshift way of striking the tendon that may or may not be successful, depending on a number of factors including if a woman is obese and your ability to really give a brisk tap with whatever object you are using.
f. Position the woman so her limbs are symmetrical.	**f.** This facilitates comparison of sides for each reflex.

Procedure	Rationale
2. Eliciting the biceps reflex: **a.** Feel for the tendon of the biceps brachii muscle in the bend of the elbow. This can be identified by bending the woman's arm up and down at the elbow. **b.** Place the thumb of one of your hands firmly on the tendon. **c.** Position the woman's arm so it is partially flexed at the elbow and either resting in her lap or supported on your arm (the same arm as the thumb you are using). **d.** Tap the tendon indirectly by striking your thumb with the pointed end of the reflex hammer.	
3. Eliciting the triceps reflex: **a.** Position the woman's arm so it is flexed at the elbow and resting across her chest with the palm of her hand of that arm toward her body. Lightly hold the woman's arm in this position with your hand around her wrist. **b.** Palpate for the tendon of the triceps brachii muscle on the back of her upper arm above the elbow. **c.** Directly strike the tendon just above (approximately 2 in., or about 5 cm) her elbow with either the pointed or the broad end of the reflex hammer.	
4. Eliciting the brachioradialis reflex: **a.** Position the woman's forearm so it is resting on her lap or abdomen with her arm slightly flexed at the elbow and hand slightly bent at the wrist. **b.** Palpate for the radius. Since the brachioradialis tendon inserts directly into the radius it is sufficient to strike the bone itself to elicit this reflex. **c.** Tap the radius with either the pointed or broad end of the reflex hammer approximately 1 to 2 in. (2.5 to 5 cm) above the wrist.	
5. Eliciting the quadriceps (knee-jerk) reflex: **a.** Position the woman so that her knees are somewhat flexed. If the woman is lying down, support her knees in the flexed position with your hand under her knees so her lower leg is relaxed. It is not necessary for the woman's foot to be off of the bed. If the woman is sitting, be sure that her legs dangle over the edge of the examining table or bed, that her weight is on her buttocks and thighs, and that her feet are not resting on any object or the floor.	

   b. Palpate for the patella and then identify the patellar tendon just below it.
   c. Tap the patellar tendon with the pointed end of the reflex hammer.
6. Eliciting the gastrocnemius-soleus (ankle-jerk) reflex:
   a. Position the woman's leg so it is somewhat flexed at the knee.
   b. With one hand, dorsiflex the ankle by holding the foot in a position approximating its dorsiflexion if the woman were standing.
   c. Palpate for the Achilles tendon above the woman's heel.
   d. Tap the Achilles tendon approximately 2 to 3 in. (5 to 7.5 cm) above the heel.

Clonus

Definition

Clonus is involuntary, rapid, repetitive, rhythmical contractions and relaxations of a muscle when it is sharply stretched and the stretch is maintained in either flexion or extension.

Significance and Evaluation

The midwife should always check for clonus in the presence of hyperreflexia, since extremely hyperactive reflexes are a precursor of clonus.

Clonus is indicative of upper motor neuron disease and is never present except when there is disease of the central nervous system. The presence of clonus requires that you consult with a physician.

Clonus is evaluated not only by its presence but also by counting the number of times the muscle contracts and relaxes while stretched. The sequential contractions are felt as jerks and are frequently called the number of beats. Clonus ranges from one or two beats to a sustained beating.

Procedure for Eliciting Clonus

Clonus may be elicited at a number of sites such as the wrist, knee, big toe, and ankle. The most commonly used site in obstetric care, however, is the ankle. For this reason, only the procedure for eliciting ankle clonus will be detailed here.

1. Position the woman so her knee is partially flexed. Support this position with one of your hands underneath the bend in her knee.
2. With your other hand grasping her foot, sharply dorsiflex her foot and maintain pressure to keep it in dorsiflexion.
3. You will be able to see and feel any beats of clonus, as the muscle contractions and relaxations will cause rhythmical alteration between dorsiflexion and plantar flexion. The muscles being stretched are the same as for the ankle-jerk reflex—the gastrocnemius and soleus muscles.

Bibliography

Van Wynsberghe, D., Noback, C. R., and Carola, R. *Human Anatomy and Physiology*, 3rd ed. New York: McGraw-Hill, 1995, pp. 439–445.

Williams, P. L., et al. (Eds.). *Gray's Anatomy*, 38th ed. New York: Churchill Livingstone, 1995.

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CHAPTER

56

Pelvic Examination

Procedures, Observations or Findings, and Significance

Preparatory and General Procedures

Procedure	Rationale
1. In general terms explain what you will be doing during the pelvic examination. If this is a woman's first pelvic examination, show her the equipment you will be using and explain its purpose. Ask the woman if she would like to learn about her own body. If she says yes, provide a mirror so she will be able to see her external genitalia and hymenal ring. Use the mirror and a flashlight to enable her to see her own cervix and vaginal walls during the speculum examination. Throughout the examination, keep the woman informed a step ahead of what you are doing. Forewarn her when you are about to touch her or insert the speculum or when something may be uncomfortable or painful.	**1.** An informed woman is more relaxed and cooperative than an uninformed woman. Explanations of what you are doing and the equipment you are using are in keeping with the philosophy of a woman's right to know what you are doing to her body.
2. Be sure the woman's bladder is empty before starting the examination.	**2.** Bimanual examination is extremely uncomfortable for a woman if her bladder is full. A full bladder also makes it difficult for you to palpate the pelvic organs.
3. Position the woman in the lithotomy position on an examining table. Be sure that her buttocks are slightly beyond the edge of the table. Help her to know how far to move down the table by telling her to move until she touches your hand (which is just beyond the edge of the table; see Figure 56-1). Her arms should be down beside her or across her abdomen. Place a pillow under her head. If there is no pillow but there is a thin mat on the table, roll up the mat behind her as she moves down to the end of the table and use the rolled mat as a pillow.	**3.** If the woman is not properly positioned, the edge of the table will be in the way of the handle of the speculum and you will have difficulty positioning the speculum. Many women automatically put their hands behind their heads when in the lithotomy position. Raising the arms stretches and tightens the abdominal muscles, making the bimanual examination more difficult and uncomfortable. You can avoid this by having the woman put her arms down (explain why) and putting something else under her head to increase comfort and relaxation.

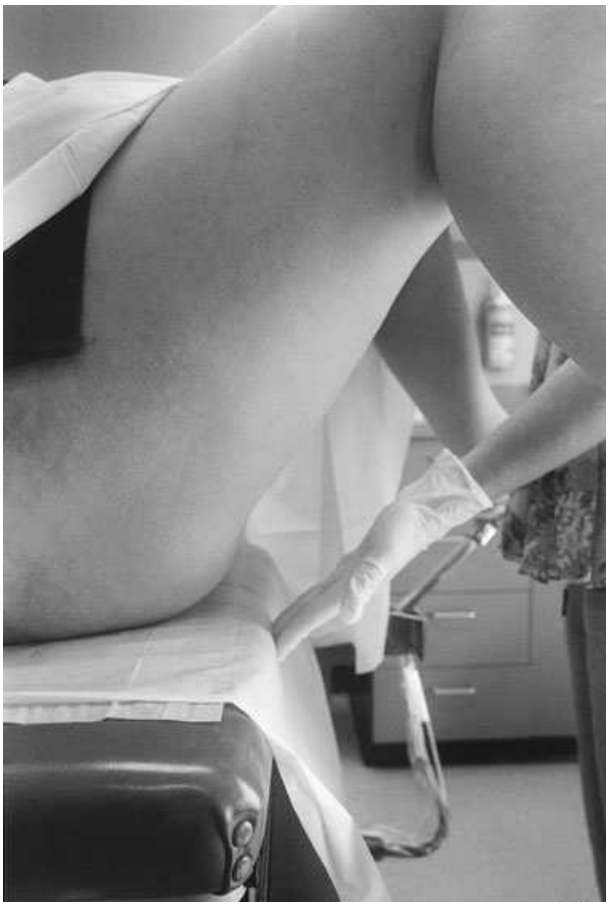

FIGURE 56-1 Positioning the woman for a pelvic examination.

Procedure	Rationale
4. Drape the woman so she feels the minimal possible exposure and so your view of her face is not blocked when you are either sitting or standing during the examination.	**4.** Protecting the woman's modesty and privacy facilitates relaxation. You must be able to see her face at all times in order to maintain personal contact and notice any facial expressions indicative of discomfort, pain, embarrassment, or fear so you can help her. In other words, you must maintain active awareness that there is a person involved above the waist.
5. Wash your hands and put on gloves.	**5.** The old "one glove or two gloves" debate ended with the advent of HIV/AIDS. Now your decision is whether to wear one *pair* or two *pairs* of gloves. (See Chapter 45, Universal Precautions.)
6. Ask the woman to separate or spread her legs. Do not try to spread the woman's legs forcibly or even gently.	**6.** Pelvic examination is an intrusive procedure and should proceed only as the woman is ready for it. Separating her legs signals her readiness and cooperation.

7. Throughout the examination help the woman to be as relaxed as possible. It is *not* helpful to just tell her to relax; you need to tell her *how* to relax:

a. If she is familiar with breathing and relaxation techniques used in labor, have her utilize these. If not, have her concentrate on slow abdominal or chest breathing—whichever she can do most easily.

b. Ask her to think of herself as a rag doll or wet washcloth or anything else you can think of that connotes the idea of limpness.

It is vital that the woman's legs remain well separated as she relaxes and that you emphasize this point and its rationale to the woman.

7. Relaxation is essential to a pelvic examination. It ensures that the woman experiences the least possible discomfort; facilitates your ability to adequately feel and evaluate the pelvic organs; and shortens the length of time of the examination by virtue of your not having difficulty in the conduct of the examination.

It is next to impossible to conduct an adequate and accurately informative pelvic examination if the woman clamps her legs around your examining hand. You simply cannot maneuver your hand in this situation to feel and evaluate the pelvic organs and structures.

8. Your approach to the woman should be super gentle, both verbally and physically. Your touch and manipulation of the speculum should be firm but gentle (i.e., firm enough not to tickle but not so firm as to traumatize).

Remember that the woman's whole attitude toward necessary future pelvic examinations, her concept of her sexuality, her sex life, and her willingness to cooperate with any therapeutic regimen you suggest may be positively or negatively influenced by the way you conduct her pelvic examination.

8. There is no excuse for a rough pelvic examination. There is considerable difference between gently doing something that may be uncomfortable or may even hurt, such as clinical pelvimetry, and being rough. The woman knows the difference.

Pelvic examination is an intrusive procedure and women are acutely alert to your attitude of respect—or lack of respect—for their bodies. They can tolerate and cope with any necessary discomfort or pain if they are forewarned and know why it is necessary, and if procedures are done in a supportive, caring manner that expresses regret for their necessity and facilitates the woman's efforts to relax throughout.

9. If the woman gets uptight, tense, or upset during your examination, immediately stop whatever you are doing. This means holding your fingers, hand, or the speculum still—do not remove your hand or the speculum. Ascertain what the problem is. If the woman complains of pain, help her differentiate between feeling discomfort as a result of pressure, feeling actual pain, and not feeling any discomfort or pain but being fearful and tense in anticipation of feeling pain. Tell the woman that you will not proceed further until she is again in control, relaxed, and ready. Help the woman with relaxation techniques and anything else she identifies that will help her cope with this procedure.

9. The rationale is the same as for 6, 7, and 8 above.

Inspection of the External Genitalia

Procedure	Observations	Significance
1. Seat yourself on a stool at the end of the examining table so you are at eye level with the woman's perineum. Your light should already be adjusted for good visualization of the woman's perineum and your gloves should be on. Tell the woman that you are going to examine her external genitalia ("privates," "the outside down here") and that she will feel your fingers touching this area.	**1. a.** Observe the mons pubis (mons veneris) for	**1. a.**
	(1) pattern of hair growth	**(1)** secondary sex characteristic
	(2) pediculosis (lice)	**(2)** if lice are present, treatment will vary, depending on whether the woman is pregnant
	b. Inspect the labia majora and perineum for	**b.**
	(1) normal size and shape	**(1)** may vary from individual to individual
	(2) localized labial swelling, edema, or small cysts	**(2)** localized labial swelling may be caused by a Bartholin's abscess or cyst; labial edema may be due to an allergic reaction; small cysts may be sebaceous cysts
	(3) inflammation, dermatitis, irritation	**(3)** may be indicative of a vaginal infection; ask the woman if she has been itching or scratching in the area
	(4) discoloration and tenderness	**(4)** traumatic bruising
	(5) varicosities	**(5)** useful information in planning birth techniques for a pregnant woman
	(6) lesions, vesicles, ulcerations, crusting	**(6)** may be syphilitic chancre, herpes
	(7) condylomata (lata or acuminata, wartlike growths)	**(7)** condylomata lata are usually syphilitic; condylomata acuminata are caused by human papillomavirus, the most common sexually transmitted virus, and exaggerated by increased vaginal secretions during pregnancy (see Chapter 15)
	(8) old episiotomy scar or scars of repaired or unrepaired perineal lacerations	**(8)** useful information in planning birth techniques for a pregnant woman

Procedure	Observations	Significance
2. Separate the labia majora and inspect the labia minora. Then separate the labia minora and inspect the clitoris, the inside of the labia minora, vestibule, urethral orifice, and vaginal introitus.	**2. a.** Inspect the labia minora and vestibule for	**2. a.**
	(1) normal size and shape	**(1)** there is considerable variation in what is normal
	(2) inflammation, dermatitis, irritation, or caking of discharge in the fold between the labia majora and the labia minora	**(2)** may indicate a vaginal infection or poor hygiene
	(3) discoloration and tenderness	**(3)** traumatic bruising
	(4) fistulas	**(4)** physician consultation required
	(5) fissures	**(5)** physician consultation required
	(6) herpetic vesicles	**(6)** culture
	(7) chancre	**(7)** scrape lesion for darkfield examination for syphilis; serologic tests
	b. Inspect the clitoris for	**b.**
	(1) adhesions with the labia minora	**(1)** ascertain if problematic or not
	(2) enlargement	**(2)** possible masculinizing condition
	c. Inspect the urethral orifice for	**c.**
	(1) growths—polyps, caruncles	**(1)** physician consultation required
	(2) irritation, dilatation	**(2)** may be indicative of repeated urinary tract infections or insertion of foreign objects; question the woman accordingly
	(3) fistulas	**(3)** physician consultation required
	d. Inspect the vaginal introitus for	**d.**
	(1) the hymen or its remnants (myrtiform caruncles)	**(1)** an intact hymen is normal unless tight and rigid or imperforate; myrtiform caruncles are also normal
	(2) vaginal discharge	**(2)** may be indicative of a vaginal infection
	(3) discoloration and tenderness	**(3)** traumatic bruising
	(4) scars of old lacerations	**(4)** useful information in planning birth techniques for pregnant women

Procedure	Observations	Significance
	(5) abnormal growths	**(5)** physician consultation required
	(6) fistulas	**(6)** physician consultation required
	(7) fissures	**(7)** physician consultation required
	(8) uterine prolapse	**(8)** physician consultation required
	(9) note if the introitus is nulliparous, parous, or gaping	**(9)** helpful in determining what size speculum to use

Examination of the Urethra and Skene's and Bartholin's Glands

Some midwives examine the urethra and Skene's and Bartholin's glands prior to the speculum examination. Other midwives examine these after the speculum examination as the first part of their bimanual examination.

The advantage of examining the urethra and Skene's and Bartholin's glands before the speculum examination is fourfold:

1. The examination can be incorporated into the total pelvic examination during the inspection of the external genitalia.
2. It allows for immediate palpation of a suspicious labial swelling, cyst, or growth.
3. The pressure of the speculum may cause discharge from the urethra or Skene's glands, which may go unnoticed during the procedure and yield a false negative result when they are stripped afterwards.
4. It allows the midwife to also identify the position of the cervix. This information is useful to have prior to insertion of the speculum.

The disadvantage of examining these structures at this time is that you cannot use lubrication (other than water) on your examining fingers as lubricating material may interfere with the Pap smear obtained during the speculum examination.

Procedure	Findings	Significance
1. Separate the labia with the thumb and index finger of one hand. Tell the woman that you are going to insert one finger into her vagina (birth canal) and that she will feel it pressing forward. With your palm up, gently insert the index finger of your examining hand into the vagina as far as the second joint. Exerting upward pressure, strip (or milk) the Skene's gland on one side of the urethra by moving your finger alongside the urethra from inside to outside. Repeat for the Skene's gland on the other side. Then strip the urethra by again inserting your index finger and exerting upward pressure directly on the urethra itself as you move your finger from inside to outside.	**1.** Identify the urethral meatus. While stripping the Skene's glands, look for discharge either from the vestibule on either side of the urethra or from the urethra itself. Sometimes the ducts of the Skene's glands open on the posterior wall of the urethra just inside the meatus. If you observe a discharge while stripping the Skene's glands or the urethra, note its color, consistency, and odor.	**1.** Discharge from the Skene's glands or urethra is indicative of an inflammation of one or all these structures (e.g., urethritis). Usually such an inflammation is due to gonorrhea. You should obtain a specimen of any discharge from the Skene's glands and urethra for immediate diagnostic testing.

Procedure	Findings	Significance
2. Tell the woman that she will now feel you pressing around the entrance to her vagina (birth canal). With your hand in the position you used in examining the Skene's glands and urethra, sweep your finger laterally, palpating between it on the inside of the vagina and your thumb on the outside of the labia majora. Palpate the entire area, paying particular attention to the posterolateral portion of the labia majora, behind which the Bartholin's glands are located. Continue to sweep your finger and thumb across the perineum and palpate the same area on the other side. Your hand will have turned 270 degrees by the time you are finished.	**2.** Palpate for **a.** tenderness **b.** swelling **c.** masses **d.** heat **e.** fluctuation Observe for any discharge from the opening of the Bartholin's gland duct just outside the posterolateral margin of the vaginal introitus on the side of the vestibule. Palpation and observation must be bilateral because each gland is separate. If there is a discharge from either Bartholin's gland, note its color, consistency, and odor; also note any erythema of the duct opening.	**2.** Painful swelling, hot to touch and fluctuant, is indicative of an abscess of the Bartholin's gland. Such an abscess usually is gonococcal in origin and contains pus. Obtain a specimen of any discharge expressed from a Bartholin's gland duct for diagnostic testing. A nontender mass of variable size is indicative of a Bartholin's cyst, which is the result of chronic inflammation of the gland. The usual, although not only, cause of bartholinitis is gonorrhea since the Bartholin's glands are a site that harbors the gonococci.

The Speculum Examination

Description of a Speculum A speculum consists of two blades and a handle. The posterior blade of the speculum is fixed. The anterior blade is hinged and movable and is controlled by a thumb-piece attached to it. A thumbscrew on the thumb-piece, when tightened, holds the anterior blade in the position desired for intravaginal visualization. When the speculum is closed, the posterior and anterior blades come together at the distal end. From this point the anterior blade slants slightly upward away from the posterior blade and curves sharply upward at the proximal end to a distance of approximately 1 in. from the posterior blade.

When the speculum is opened with the thumb-piece, a tubelike space is created between the blades. Through this tubelike space, intravaginal and cervical observations are made and instruments are passed for any intravaginal or cervical procedures. The blades may be further separated by manipulating the thumbscrew on the handle of the speculum. Ordinarily, and always during insertion, the thumbscrew is adjusted so that the two blades are in the closest possible approximation. Once the speculum is in place and opened by use of the thumb-piece and its thumbscrew, the entire anterior blade may be elevated from the posterior blade, if need be, by sliding the anterior blade away from the posterior blade and tightening it in this position with the thumbscrew on the handle.

It is important for the inexperienced examiner to practice manipulating the speculum and become intimately familiar with how it is put together and how it operates before attempting insertion into a woman. Such practice will eliminate the possibility of hurting the woman by mishandling the speculum during examination. Also, it is not uncommon for a speculum to come apart or become malaligned during storage, and the examiner should know how to get it ready for use. The plastic disposable specula work a little differently than the metal speculum described above and require more practice to operate smoothly and avoid pinching the woman. Knowing how to handle a metal speculum does not make you facile with a plastic speculum, and vice versa. The key to smooth handling of both specula is practice.

Types of Specula There are three types of metal specula (see Figure 56-2). The variations among the three enable the midwife to select a speculum that is appropriate for the individual woman.

The smallest speculum is the *virginal speculum*. It has short, narrow, flat blades. It is used in young girls and in women who have had little or no coitus.

The *Graves speculum* is both the standard and largest speculum as it comes in these two sizes. The standard size is most commonly used, since it is most

FIGURE 56-2 Types of specula. From left to right: metal Graves (large size), virginal, Pederson, Graves (standard size), and plastic (regular size).

appropriate for women who are sexually active or who have had a baby. The large size is used with women who have collapsing vaginal walls, generally grand multiparas or very obese women. The Graves speculum varies in length from $3\,^1/_2$ to 5 in. (8.75 to 12.75 cm) and in width from $^3/_4$ to $1\,^1/_4$ in. (about 2 to 3.25 cm). The blades are curved, forming a concave space between the two blades. The posterior blade is approximately $^1/_4$ in. longer than the anterior blade to conform with the longer posterior vaginal wall and aid in visualization of the cervix.

The *Pederson speculum* is as long as the Graves speculum but has more narrow blades. Also, its blades are flat rather than curved. It is used in women who may be sexually active but tight and who have never had a baby. It is also useful for a woman whose vagina may be contracted by scars, radiation, or senescence.

Plastic specula come in regular or large sizes that are approximately the same as the metal Graves standard and large sizes.

Procedure for Speculum Examination

Procedure	Rationale
1. The woman has been properly positioned, draped, and informed as to the procedure, has emptied her bladder, and has her legs apart for the examination. You have already positioned your light source, washed your hands, and put on your glove(s).	**1.** See Steps 1 through 6 under "Preparatory and General Procedures" for the pelvic examination.
2. Select the appropriate speculum for the woman on the basis of her sexual and obstetric history and your observations during inspection.	**2.** The appropriate speculum is one that will cause the woman the least discomfort while providing adequate intravaginal and cervical visualization.
3. Lubricate the speculum with water only if you plan to obtain cytologic or other studies. If no studies are planned you may lubricate the speculum with any lubricating jelly used for a vaginal examination. However, some studies that you hadn't originally planned on may be indicated after you have visualized the vaginal walls and the cervix. For this reason most clinicians never lubricate the speculum with anything but water.	**3.** Lubricating jellies or creams may interfere with cytologic or other studies, rendering them invalid.

Procedure	Rationale
4. Warm the speculum in one of four ways: **a.** Use *warm* water to lubricate it. **b.** Hold it in your hands until it is warm. **c.** Hold it under the light source until it is warm. **d.** Some examination tables are equipped with a warming drawer. If a warming drawer is not available, a heating pad set on low may be placed in the bottom of the drawer and speculums in a towel may be set on top of it.	**4.** For comfort. This has a great effect on what the woman thinks of you and about the examination. Always be aware of the temperature of the speculum, as too hot is just as bad, or worse, than too cold.
5. Touch the woman with the warmed speculum on the inner aspect of her thigh close to the external genitalia. Ask her if the temperature of the speculum is comfortable.	**5.** This reassures you and the woman that you will neither burn nor freeze her when you insert the speculum. This also involves the woman in the procedure.
6. Help the woman to relax and tell her she will feel you touching her on the outside and then will feel the speculum going inside her vagina (birth canal).	**6.** See Steps 1, 7, and 8 under "Preparatory and General Procedures" for the pelvic examination.
7. Separate the woman's labia with a gloved hand (see Figure 56-3).	**7.** Done to expose the vaginal orifice.
8. Hold the speculum in your other gloved hand with your index finger over the top of the proximal end of the anterior blade and your other fingers around the handle.	**8.** This ensures that the blades will stay closed.
9. Insert the speculum into the vagina at an oblique angle past the hymenal ring (see Figure 56-3). *Note:* An alternative method of inserting the speculum is to insert one or two fingers of one hand just inside the vagina (to the first joint on the fingers). Then gently but firmly depress the perineal body with these fingers while the other hand guides the entry of the speculum over and past your fingers.	**9.** The oblique angle avoids pressure on and trauma to the urethra and periurethral structures.

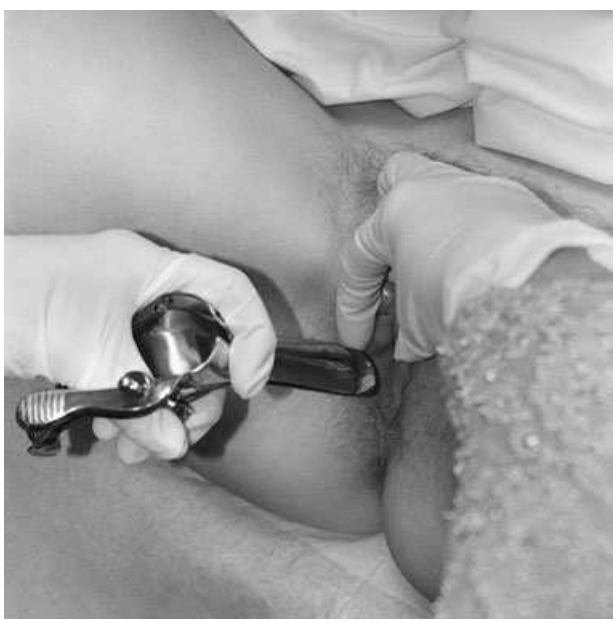

FIGURE 56-3 Inserting a speculum.

Procedure	Rationale
10. Rotate the speculum to a horizontal angle and while pressing firmly downward, insert the speculum the length of the vaginal canal, as shown in part (a) of Figure 56-4. Avoid catching pubic hair or pinching or pushing in the labia by virtue of not having spread the labia enough during this insertion procedure.	**10.** Downward pressure again avoids trauma to the urethra. The anatomical angle of the vagina when the woman is in the lithotomy position is approximately 45 degrees downward toward the lumbar area. If the speculum is inserted straight in, the anterior vaginal wall and urethra are traumatized and the woman feels pain. (See Figure 56-4[a].)
11. Maintaining downward pressure, open the speculum by pressing on the thumb-piece. Downward pressure can be maintained either by exerting downward and outward pressure on the lower end of the speculum handle or by putting your thumb or a finger on the proximal end of the posterior blade and exerting downward pressure. Adjust your light source as needed.	**11. and 12.** These steps permit intravaginal visualization. If the speculum was directed downward firmly during insertion and this position was maintained, you are assured of finding the cervix during your sweep upward, regardless of whether the cervix is located in a posterior, midline, or anterior position. This method prevents you from having to hunt for the cervix, which would entail much maneuvering of the speculum up and down and in and out, to the discomfort of the woman and the distress of both the woman and you.
12. Sweep the open speculum slowly upward from its posterior (downward) position until the cervix comes into view, as shown in part (b) of Figure 56-4.	
13. Manipulate the speculum a little further into the vagina so the cervix is well exposed between the anterior and posterior blades, as shown in part (c) of Figure 56-4.	**13.** Adequate visualization is needed for observation and exposure of the cervical os for obtaining the Papanicolaou smear and specimens for gonoccocal and chlamydia diagnostic testing.

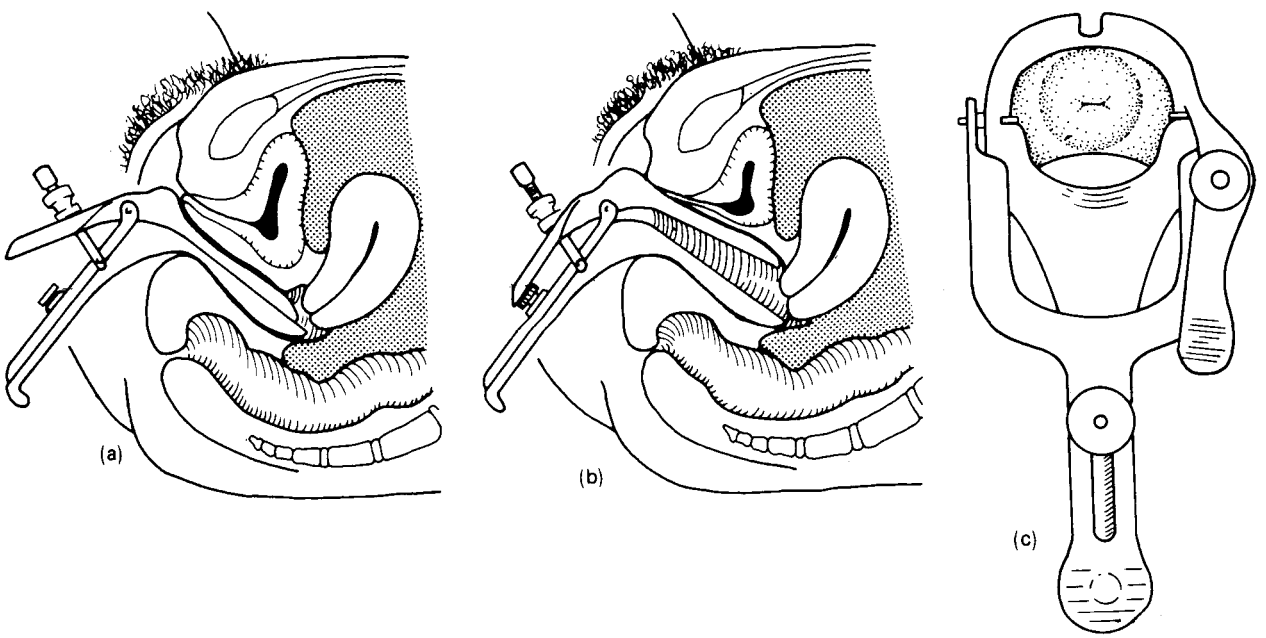

FIGURE 56-4 Placement of the speculum. (a) Speculum inserted the length of the vaginal canal; note downward angle that avoids anterior structures. (b) Open speculum positioned for visualization of the cervix. (c) View of the cervix when speculum is properly positioned.

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Procedure	Rationale
14. Tighten the thumbscrew on the thumb-piece. If further exposure is needed, elevate the anterior blade by manipulating the slide and thumbscrew located on the speculum handle. Remember the comfort of the woman and do not open the speculum any wider than is absolutely necessary.	**14.** Tightening the thumbscrew frees your hand for handling other equipment. Watch that the woman does not involuntarily push the speculum back out. This is possible even with the speculum in an open position. If it looks like this may happen keep one hand on the speculum at all times to sense and prevent this from occurring.
15. If the cervix is covered with a copious amount of discharge, put a gauze 2×2 or 4×4 on a sponge stick and blot or gently wipe off the cervix.	**15.** Too much discharge will prevent you from obtaining a Pap smear representative of the tissue being scraped. Do not use a cotton ball because the cotton fibers will interfere with the wet smear microscopic examination you will want to make of the discharge.
16. Obtain specimens for Papanicolaou smears, gonococcal and chlamydia testing, and for wet smear slides of vaginal discharge, as well any other indicated tests or treatments. The procedures for obtaining these specimens are discussed in Chapters 57, 58, and 59.	
17. Before removing the speculum, gently rotate it 90 degrees while again exerting downward pressure on it. This will most likely be uncomfortable for the woman, so forewarn her of this manipulation before doing it.	**17.** This allows you to visualize the anterior and posterior walls of the vagina as well as the lateral vaginal walls.
18. Return the speculum to its horizontal position. Release the thumbscrew on the thumb-piece (and on the speculum handle, if used). While holding the blades apart with pressure on the thumb-piece, begin withdrawing the speculum until the cervix is released from between the blades of the speculum.	**18.** Avoid pinching or pulling on the cervix during removal of the speculum.
19. Release your pressure on the thumb-piece, thereby closing the blades. Avoid pinching the vaginal mucosa or catching pubic hair when the blades close. Again avoid pressure on or trauma to the urethra and periurethral structures by exerting downward pressure, rotating the speculum to the oblique angle, and making sure the blades are closed by hooking your index finger over the anterior blade as the speculum is withdrawn. Some midwives ask the woman to bear down to ease the speculum out and only guide its removal.	**19.** For the woman's comfort
20. Note the odor of any vaginal discharge pooled in the posterior blade and obtain a specimen for making a wet smear if indicated and a specimen was not already obtained.	
21. Deposit the speculum in the proper container.	**21.** For protection of yourself and others
22. Wipe any discharge from the woman's genitalia and perineum if you do not plan to do a bimanual examination.	**22.** For the woman's comfort

Observations

1. Observe cervix for
   - **a.** color
   - **b.** growth, nodules, masses
   - **c.** polyps
   - **d.** lesions, erosions, ulcerations
   - **e.** position
   - **f.** size (hypertrophy, atrophy) and shape
   - **g.** edema
   - **h.** nabothian cysts
   - **i.** inflammation (cervicitis)
   - **j.** discharge—color, amount, character, consistency, odor
   - **k.** friability (bleeding)
   - **l.** eversion
   - **m.** ectopy
   - **n.** size and shape of os and any lacerations
   - **o.** patulousness and dilatation

Significance

1. *Color* is significant in aiding in clinical diagnosis of pregnancy. A bluish color is due to increased vascularity to the cervix and is known as Chadwick's sign, a presumptive sign of pregnancy. A nonpregnant cervix is pink.

   Growths, *nodules*, *masses*, *polyps*, *lesions*, *erosions*, *ulcerations*, and *infected nabothian cysts* are all abnormal findings requiring physician consultation.

   It is useful to note the *position of the cervix* based on where you locate it with the speculum. This information serves to identify or confirm the position of the uterus during the bimanual examination. A cervix located anteriorly is indicative of a retroverted uterus; a posterior cervix indicates an anteverted uterus; a cervix in the horizontal midline indicates a uterus in midposition. Deviations of the cervix to the right or left of the vertical midline indicate the possibility of pelvic masses or uterine adhesions; these need to be carefully ruled out during the bimanual examination.

   Variations in the *size* and *shape* of the cervix give different information. The normal cervix in a woman of childbearing age is 2 to 3 cm (about $^{3}/_{4}$ to $1^{1}/_{4}$ in.) in diameter, with the exception of the larger patulous cervix of the grand multipara. A *small cervix* is seen in the postmenopausal woman and is concomitant with the endometrial and myometrial atrophy of the rest of the uterus. Normal cervical size should match the size of the nonpregnant uterus. A *hypertrophied*, *large*, or *edematous cervix* is generally an indication of cervical infection and may be observed along with the other signs of *cervicitis*. An *irregularly shaped cervix* may indicate the presence of an *infected nabothian cyst* swollen with fluid.

   Nabothian cysts may be observed as white or yellow pinpoints (1–3 mm in diameter) on the cervix. *Infected nabothian cysts* distort the shape of a portion of the cervix since they are swollen with fluid. Nabothian cysts are retention cysts arising from the occlusion of the ducts of endocervical glands extending near the surface of the vaginal portion of the cervix. They most frequently occur in the presence of chronic cervicitis.

   Cervicitis is an inflammation of the cervix usually caused by an infection (e.g., *Trichomonas vaginalis*, chlamydia, gonorrhea) but which may also be caused by irritation from injury, obstetric lacerations, mechanical devices, foreign objects, or allergic reactions.

   Note carefully whether any *discharge* is merely a continuation of a vaginal infection de-

Observations	Significance
	posited on the cervix (e.g., the plaques of a *Candida* [monilial] infection) or originates from the endocervix itself (for example, the pus of gonorrhea exuding from the external cervical os).
	Friability of the cervix, as evidenced by its bleeding easily after obtaining the Pap smear or sponging for purposes of observation, frequently accompanies cervicitis.
	Eversion of the cervix, caused by too much pressure in the vaginal fornices by the tips of the blades of the speculum, exposes the rougher and redder looking columnar epithelium of the cervical canal. Usually eversion is circumoral, showing the line of demarcation between the continuation of the stratified squamous epithelium of the vagina, which covers the vaginal portion of the cervix and extends a short distance into the cervical canal, and the columnar epithelium. Eversion is differentiated from erosions or ectopy by simply withdrawing the speculum slightly and watching the columnar epithelium disappear from view as the cervical canal returns to its correct, noneverted position.
	Ectopy, from the Greek word meaning "out of place," occurs when the columnar epithelium of the cervical canal has grown downward and outward and competes for territorial space with the squamous epithelium on the vaginal surface of the cervix. Again, the rougher, redder-looking columnar epithelium is visible. Unlike the columnar epithelium visible in eversion, however, it may be quite irregular in its line of demarcation with the squamous epithelium. Ectopy is sometimes observed in the multiparous cervix, especially if the cervix has been lacerated. Usually ectopy is also present in women who use oral contraceptives.
	Size and shape of the os largely depend on the woman's childbearing experience. A nulligravid os is small and round or oval; the typical parous os is a horizontal slit. Trauma incurred during induced abortion results in a change in the shape of the external os. Trauma incurred during difficult removal of an intrauterine contraceptive may change the shape of a nulligravid os to a slit. *Cervical lacerations* resulting from trauma during childbirth are clearly observable. Severe cervical lacerations may result in subsequent difficulty in carrying a pregnancy to term due to an incompetent cervix (see Chapter 24). Observation of the shape of the os is important in confirming the woman's obstetric history. Infrequently, a woman will attempt to conceal a previous pregnancy. In so doing she unknowingly also conceals information vital to the management

Observations	Significance
	of another pregnancy. If you observe that a woman's os does not match her obstetric history or family planning history, you should ask her for an explanation. The nulligravid cervix is closed, whereas the multiparous os is *patulous*, the degree depending on the woman's parity. The higher the parity, the more patulous the os which may be permanently open 2 to 3 cm at the external os. *Dilatation* of the os is also observable upon speculum examination; the fetal membranes may be visible when examining a pregnant woman, if they have not ruptured. The amount of dilatation is determined by manual vaginal examination.
2. Observe vagina for **a.** color **b.** inflammation/vaginitis **c.** discharge—color, odor, character, consistency, amount **d.** plaques **e.** bleeding/friability **f.** lesions and ulcerations **g.** growths or masses **h.** cysts **i.** fistulas **j.** vaginal wall muscle tone	**2.** The *color* of the vagina has the same significance as the color of the cervix. The nonpregnant vagina is pink; the vagina of pregnancy is bluish. Again, this color change in pregnancy is known as Chadwick's sign. *Growths*, *masses*, *lesions*, *ulcerations*, *cysts*, and *fistulas* are all abnormal findings requiring physician consultation. *Inflammation* and *discharge* go hand in hand as signs of *vaginitis*. Vaginitis caused by *Trichomonas vaginalis* additionally may cause red petechiae. Vaginitis due to candidiasis (monilial infection) also exhibits whitish or grayish patches, or *plaques*, which adhere to the vaginal wall and may *bleed* when scraped off. Severe vaginitis causes *friability* of the vaginal mucosa. *Blood* in the vagina must always be investigated for its source. If bleeding is not obviously caused by menstruation, a friable cervix or vagina, or trauma in these areas, physician consultation is required.

The Bimanual Examination

When clinical pelvimetry is indicated, midwives include it while doing the bimanual examination. The procedure and findings for clinical pelvimetry are described in Chapter 61. Whether or not clinical pelvimetry is performed during the bimanual examination, it is important that the midwife develop a procedure for doing the bimanual examination that (1) is the same each time, as a routine aids in not forgetting any part of it and (2) moves smoothly *once* from outside to inside and back out again, which is most comfortable for the woman (as opposed to going back and forth repeatedly). (If clinical pelvimetry is included it should be incorporated into the routine established for the combined skills.)

The woman is already properly positioned, draped, and informed as to the procedure and has her bladder empty and her legs apart for the examination. You have already positioned your light source, washed your hands, and put on your gloves. If you have done a speculum examination, it is not necessary to rewash your hands or change your gloves.

Be sure that the woman's arms are down by her sides or across her abdomen to aid relaxation of her abdominal muscles. Remember to use a firm but gentle touch and to be alert throughout the examination to any indication from the woman of discomfort or tenseness that might cause her to tighten up or move away from you. See Steps 1 through 9 under "Preparatory and General Procedures."

Procedure and Rationale	Observations and Findings	Significance
1. Lubricate the index and middle fingers of your examining hand generously.		
2. Separate the labia and insert your lubricated fingers gently into the vagina at least to their second joint, palm side down, pressing downward as you insert your fingers as you did with the speculum to avoid the anterior urethral and periurethral structures. If the introitus is small, insert only one finger.		
3. Sitting so you can easily visualize the vagina, firmly exert pressure with your fingers posteriorly against the vaginal musculature. Ask the woman to bear down or cough. (It is wise to first ask the woman if she ever urinates accidentally when she laughs, coughs, or sneezes unexpectedly. If so, position yourself accordingly.)	**3. a.** Observe the anterior vaginal wall for evidence of a cystocele or urethrocele. A urethrocele will evidence itself as the distal (vulvar) end of the anterior vaginal wall bulging downward into the vagina and outward toward the introitus. Observe for involuntary loss of urine (stress incontinence) while the woman is bearing down or coughing. A cystocele is evidenced by bulging of the upper (cervical) end of the anterior vaginal wall.	**3. a.** A first degree cystocele is evidenced by bulging of the anterior vaginal wall. In second degree cystocele the bulging reaches the vaginal orifice or introitus. A third degree cystocele is present when the bulging extends beyond the introitus. Nearly every woman who has borne a child has a first degree cystocele. It is so common that if it is not accompanied by stress incontinence it is considered a normal finding. A first degree cystocele only is significant when selecting the type of diaphragm to prescribe for a woman if she desires this method of family planning. A second degree cystocele without stress incontinence and not causing any sexual difficulties is considered asymptomatic and nothing is done except to note it. A symptomatic second degree cystocele, a third degree cystocele, or a urethrocele requires physician consultation/referral for evaluation and possible surgical repair.
	b. Observe for descensus of the uterus (uterine prolapse).	**b.** Frequently, a cystocele accompanies uterine prolapse. A first degree uterine prolapse is any minor degree of descent with the cervix remaining inside the vagina. In second degree uterine

Procedure and Rationale	Observations and Findings	Significance
		prolapse the cervix protrudes through the vaginal introitus. A third degree uterine prolapse comprises prolapse of the entire uterus outside the vulva. A second or third degree uterine prolapse or symptomatic first degree uterine prolapse requires physician consultation.
4. Continuing to press posteriorly with your fingers, now spread your fingers and again ask the woman to bear down.	**4.** Observe the posterior vaginal wall for rectocele or enterocele. A rectocele evidences itself at the lower (vulvar) end of the posterior vaginal wall by bulging upward into the vagina and outward toward the introitus. If the rectocele is severe (second or third degree) ask the woman if she has difficulty in bowel elimination, necessitating holding back the rectocele with her fingers. An enterocele is evidenced by prolapse of the upper (cervical) end of the posterior vaginal wall.	**4.** A severe rectocele requires physician consultation/referral. Rectoceles are graded in the same degrees as cystoceles are. An enterocele is almost always associated with herniation of the cul-de-sac of Douglas, which will probably contain loops of bowel. Physician consultation/referral is required.
5. Put your fingers together again and ask the woman to tighten her muscles around your fingers.	**5.** Assess the tone of the perineal muscles. Now is a good time to teach the woman perineal tightening (Kegels) exercise.	**5.** Muscle tone may affect the length of the second stage of labor, sexual satisfaction, urinary continence, and support of the pelvic organs.
6. Sweep the vagina with your fingers as you insert them the full length of the woman's vagina.	**6.** Feel for cysts, nodules, masses, or growths.	**6.** All are abnormal findings requiring physician consultation.

Note: Be careful where your thumb is during the bimanual examination. Some authorities suggest that it be tucked into the palm of your hand with your fourth and fifth fingers. However, this will cut down on the distance you can insert the length of your index finger. The principle to remember is to keep your thumb off the woman's clitoris; pressure on the clitoris is most uncomfortable.

7. Locate the cervix with your fingers and run your fingers around it circumferentially and across its vaginal end.	**7.** Feel for **a.** size (length and width)and shape	**7.** **a.** The *size* of the nonpregnant cervix should correspond with the size of the nonpregnant uterus. The *length* of the cervix is important in assessing effacement during labor. See discussion of the significance of the size and shape of the cervix under "The Speculum Examination," above.

Procedure and Rationale	Observations and Findings	Significance
	b. consistency	**b.** The *consistency* of the cervix is noticeably different when the woman is not pregnant (firm—often its consistency is compared to the tip of a nose) from when she is pregnant (soft—the consistency is more like that of the lips). A ripe cervix, a sign of approaching labor, is softer still—more like pudding.
	c. smoothness	**c.** Normally the cervix is *smooth*. The *roughness* of ectopy or erosions and bumps caused by nabothian cysts can be felt. Since roughness may be an indication of abnormality, be sure to do a speculum examination (if you have not already done one) after completing the bimanual and rectovaginal examination to visualize the cause of the roughness.
	d. position	**d.** The significance of the *position* of the cervix is discussed earlier under "The Speculum Examination." The position of the cervix is also important when evaluating the possibility that a woman is in labor.
	e. dilatation of the os	**e.** Dilatation of the os generally is a phenomenon of labor and is discussed in Chapter 26. Painless dilatation of the os without bleeding during the second trimester may indicate an incompetent cervix. The os also dilates with inevitable abortion (see Chapter 24).
8. Grasp the cervix gently between your fingers and move it from side to side.	**8.** Observe the woman for any reaction that might indicate pain or tenderness with movement of the cervix.	**8.** Pain on movement of the cervix or cervical motion tenderness (CMT; also sometimes called chandelier sign) is indicative of a pelvic inflammatory process such as acute PID (pelvic inflammatory disease). It is also a sign of a ruptured tubal pregnancy.

Procedure and Rationale	Observations and Findings	Significance
9. Palpate the uterus in the following manner: **(1)** Place your abdominal hand midway between the umbilicus and the symphysis pubis. Use the flats of the palmar surface of the first joints of your fingers to press downward and forward toward the symphysis pubis and your vaginal fingers. **(2)** With your palm upward place your two vaginal examining fingers on either side of the cervix. Bring them together on top of the cervix as you push downward on the cervix with the back of your fingers and in and upward with the tips of your fingers toward your abdominal hand. It should feel like you are trying to bring your hands together as you push down on the cervix. If the uterus is anterior or anteflexed, it will slip between the fingers of your two hands as they come toward each other. **(3)** If you do not feel the uterus with the maneuver described above, return your fingers to having one finger on each side of the cervix. Place your abdominal hand immediately above the symphysis pubis and press firmly downward. Palm up, bring your vaginal examining fingers together under the cervix, press up against the cervix and follow it inward wherever it leads. If the uterus is retroverted or retroflexed you will feel it with this maneuver. **(4)** If you still are unable to feel the uterus with either of the maneuvers above, then return your fingers to either side of the cervix. Maintaining contact with	**9.** Palpate the uterus for **a.** size, shape, and contour **b.** location	**9.** **a.** The *size* of the nonpregnant uterus in a woman of childbearing age varies according to parity. A multiparous uterus is larger in all dimensions than the nulliparous uterus, being from 1 to 4 cm (about $^1/_2$ to $1\,^1/_2$ in.) longer, 1.5 to 2.5 cm (about $^2/_3$ to 1 in.) wider, and .5 to 1.5 cm (about $^1/_4$ to $^2/_3$ in.) thicker. The normal nulliparous uterus ranges in size from 5.5 to 8 cm (about 2 to 3 in.) long, 3.5 to 4 cm (about $1\,^1/_2$ in.) wide, and 2 to 2.5 cm (about 1 in.) thick. The uterus decreases in size with the menopause, during which there is atrophy of the endometrium and the myometrium. The dimensions of the uterus give it its *shape*, which is frequently compared with a somewhat flattened pear. A uterus larger than expected in a woman of childbearing age is indicative of pregnancy or benign or malignant tumors. As the pregnant uterus enlarges, its shape changes, becoming first globular and then an ovoid of increasingly larger size. The normally smooth and symmetrical *contour* of the uterus is disrupted in the presence of a growth or a mass. Uterine myomata are felt as irregular masses on the surface of the uterus. Piskacek's sign of early pregnancy is felt as an irregularity in one of the cornual areas, causing uterine asymmetry. **b.** The *location* of the uterus is normally in the midline. Deviation of the entire corpus of the uterus to the right or left is indicative of possible adhesions or pelvic masses.

Procedure and Rationale	Observations and Findings	Significance
the cervix, press straight inward and feel as far as you can. Then slide your fingers around the uterus until one finger is on top of the cervix and one finger is underneath the cervix. Continue your inward pressure while moving your fingers in order to feel as much of the uterus as possible when it is in the middle (military) position.	**c.** position (see Figure 56-5) **(1)** military (midposition/midline) **(2)** anteverted **(3)** anteflexed **(4)** retroverted **(5)** retroflexed The prefixes *ante-* and *retro-* mean *forward* and *backward*, respectively. The suffix *-verted* indicates that the entire uterus *tilts*, either forward or backward. The suffix *-flexed* means that the uterus *bends at the isthmus* (at the level of the internal os) forward or backward. In	**c.** Knowing the *position* of the uterus is imperative prior to inserting an intrauterine contraceptive device or performing any other intrauterine procedure. The position of the uterus may be a cause of dyspareunia unless its position is compensated for by appropriate positions during sexual intercourse. The uterus is usually in a position of slight anteflexion, and the variations of anteversion, retroversion, and retroflexion are all considered normal. Slight retroversion of the

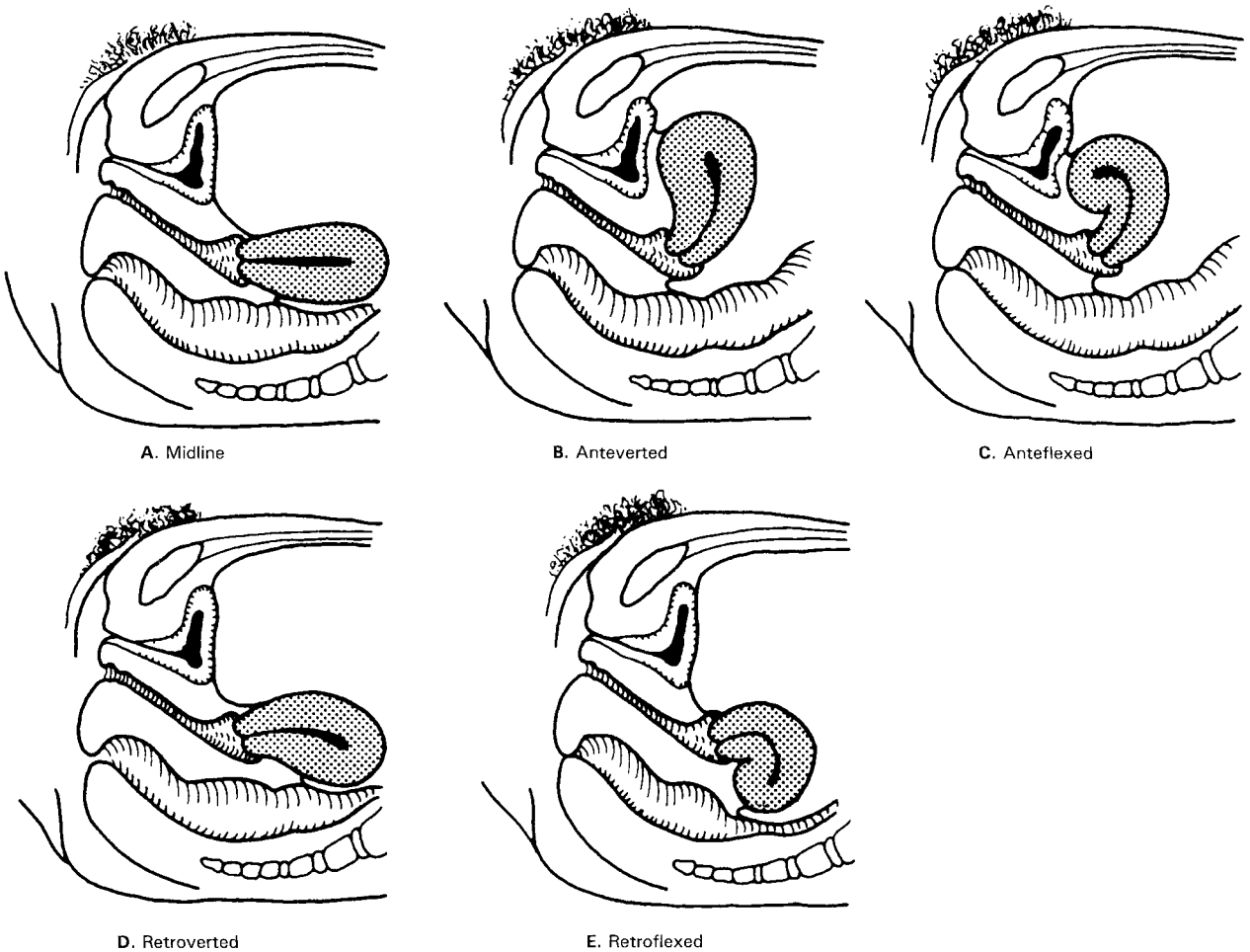

FIGURE 56-5 Uterine positions.

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Procedure and Rationale	Observations and Findings	Significance
	the *military position* the uterus is perfectly straight in midposition, neither tilting nor bending forward or backward.	uterus and the so-called military position place the fundus out of reach for palpation by many examiners.
	d. consistency	**d.** The normal nonpregnant uterus is firm in *consistency*. It is somewhat softer during early pregnancy and postpartal involution when it is a pelvic organ. Hegar's sign of early pregnancy is a marked softening of the isthmus of the uterus.
	e. mobility	**e.** The normal uterus is *mobile* above the cervix in the anteroposterior plane. It is held in place laterally by the broad, uterosacral, and cardinal ligaments. Lack of anteroposterior mobility indicates adhesions, possibly resulting from infection or previous surgery.
	f. tenderness or pain	**f.** *Tenderness* or *pain* on movement of the uterus is indicative of a pelvic inflammatory process in the nonpregnant woman and of endometritis or other puerperal infections in the postpartum woman.
10. Examine the adnexal areas in the following way: **(1)** Place your abdominal hand in the area between the iliac crest of the innominate bone (hip) and the abdominal midline midway between the level of the umbilicus and the symphysis pubis. Use the flats of the palmar surface of the first joints of your fingers to press deeply downward and obliquely toward the symphysis pubis and your vaginal fingers. **(2)** With your palm facing upward, place both of your vaginal examining fingers in the lateral vaginal fornix corresponding to the side (right or left) that your abdominal hand is	**10.** Palpate the adnexal areas for **a.** size, shape, and any tenderness or pain in the adnexae	**10.** **a.** The *size* of the normal ovary during the childbearing years ranges from 2.5 to 5 cm (1 to 2 in.) long, 1.5 to 3 cm (about $^{2}/_{3}$ to $1\,^{1}/_{4}$ in.) wide, and .5 to 1.5 cm ($^{1}/_{4}$ to $^{2}/_{3}$ in.) thick. This gives it the *shape* of a small almond, with which it is often compared. The size of the ovaries diminishes markedly after menopause, frequently reducing to a mere .5 cm (less than $^{1}/_{4}$ in.) in any of the aforementioned diameters. The normal ovary is *tender* when touched, which aids in identifying the ovary when you palpate it. Normal fallopian tubes can rarely be felt because they are so narrow (from 2 to 3 mm at the most narrow portion to 5 to 8 mm at the widest portion).

Procedure and Rationale	Observations and Findings	Significance
positioned to examine. Press your fingers deeply inward and upward toward your abdominal hand as far as possible. **(3)** Palpate the entire area between the uterus and the walls of the hip bone with a sliding, gentle but firm pressing together of your two hands as they synchronously move together from the highest to the lowest level as visualized abdominally. **(4)** Reverse and repeat the manuevers in the three steps above for examination of the other adnexal area. **(5)** It helps to have formed a mental picture of the location of the adnexae in relationship to the position of the uterus before starting this part of the examination. **11.** Withdraw your vaginal examining fingers to just inside the introitus in preparation for the rectovaginal examination if you are doing one. If not, smoothly withdraw your fingers from the woman's vagina. **12.** If this ends your pelvic examination, proceed with Steps 12 through 16 under "The Rectovaginal Examination," which follows.	**b.** consistency, size, shape, and tenderness or pain of any adnexal masses The adnexae are frequently difficult to feel, even for an experienced midwife, depending on the position of the uterus and concomitant location of the adnexae and the amount of adipose tissue. If you are unable to feel anything in the adnexal areas after thorough palpation, you can assume normality in the absence of any clinical signs and symptoms. This portion of the examination is charted as "not felt." Always palpate the adnexal areas in doing a pelvic examination on a nonpregnant woman. The adnexal areas are also palpated during the initial prenatal examination if this takes place during the first trimester. However, as the pregnant uterus becomes an abdominal organ, it is futile to palpate for the adnexae. By virtue of their location and attachment in the broad ligament, the adnexae also enter the abdominal cavity along with the uterine fundus as pregnancy progresses.	**b.** Any *adnexal masses* are abnormal and require physician consultation. Their size, shape, location, consistency, and any areas of pain should be noted. Ovarian cysts and tumors usually are not tender. Generalized pain in the adnexal area may prohibit you from outlining an adnexal mass and is indicative of pelvic inflammatory disease when bilateral. If pain is unilateral, a ruptured tubal pregnancy is a possibility. In either case, such findings require physician consultation.

The Rectovaginal Examination

The rectovaginal examination is an inherent part of the total pelvic examination. The only time it is eliminated is when only a partial pelvic examination is being done for a specific reason (e.g., speculum examination for checking the strings of an intrauterine contraceptive device, vaginal examinations for evaluating labor status, speculum examination for evaluation of treatment of a vaginal infection).

Because it is an uncomfortable examination for many women, it is not uncommon for a woman to ask you to skip it. The answer is no—followed by an appropriate explanation of why not. The request usually stems from the woman's lack of understanding that there is more to the rectovaginal examination than just confirming the findings of the vaginal bimanual examination. Rectovaginal examination enables many examiners to reach almost 1 in. higher into the pelvis, an invaluable aid in evaluating pelvic organs and structures.

Procedure and Rationale	Observations and Findings	Significance
1. The bimanual vaginal examination ended with the withdrawal of your examining fingers to just inside the vaginal introitus. Keep your index finger inside the woman's vagina and remove your middle examining finger completely.		

Note: If you have observed any indication of gonorrhea during the vaginal examination, you will need to remove your examining fingers completely and change your gloves. Some midwives routinely change gloves anyway to avoid the possibility of spreading asymptomatic gonorrhea of the urinary or genital tracts to the rectum. Other midwives wash their gloves before proceeding with the rectal examination. Still others will proceed as outlined in Steps 1 and 2 in this procedure.

2. Generously relubricate your middle examining finger to allow it to slide gently into the rectum.		
3. Tell the woman that the examination may be uncomfortable and that she might feel as though she is having a bowel movement. Assure her that she will not pass stool and help her with breathing techniques to relax. Tightening her sphincter, rectum, and buttocks will make the examination more uncomfortable and will hinder your ability to examine her.		
4. After observing the anus, place your middle examining finger against the anus and ask the woman to bear down and push against your finger. As she does this, slide the tip of your finger into the rectum just past the sphincter.	**4.** Observe the anus for **a.** external hemorrhoids **b.** anorectal fistula **c.** sentinel tag or anal fissure **d.** rectal prolapse **e.** lesions	**4.** *Thrombosed external hemorrhoids*, *anorectal fistula*, *anal fissures*, *lesions*, and *rectal prolapse* are all abnormalities requiring physician consultation/referral.
5. Palpate the area of the anorectal junction and just above it. Ask the woman to tighten and relax her rectal sphincter.	**5.** Palpate for **a.** internal hemorrhoids	**5.** **a.** *Internal hemorrhoids* are difficult to feel because they are soft. History of problems with constipation, straining with bowel movements, and impactions is important. Consultation with a physician is indicated if the problem is severe. Otherwise, the woman should be instructed in measures for preventing constipation. Prescription of a laxative may be indicated.

Procedure and Rationale	Observations and Findings	Significance
	b. sphincter tone	**b.** An extremely tight sphincter may be indicative of spasticity caused by a fissure, lesion, or inflammatory process; may be caused by scarring; or may be due to extreme anxiety about the examination. A lax sphincter, unless attributable to frequent anal intercourse, may indicate neurological disease requiring physician consultation. An absent sphincter may be the result of an unrepaired or improperly repaired third degree perineal laceration most likely occurring during childbirth. A history of fecal incontinence should have alerted you to the possibility of this finding. Physician consultation is required.
6. (1) As you slide both your vaginal and rectal examining fingers as far as they will reach, palpate half of the rectal wall, sweeping your finger back and forth as you methodically cover the distance. (Decide which half you will cover as a routine based on the face of a clock—for example, between 6 and 12 o'clock or between 3 and 9 o'clock. Slightly extend the halfclock you choose so no area is missed in dividing it up, e.g., 5:30 to 12:30.) You will examine the remainder of the rectal wall as you remove your finger. **(2)** Ask the woman to bear down when you have reached as far as you can, as this will bring an additional centimeter or so within your reach.	**6.** Palpate for **a.** polyps/masses	**6.** **a.** Polyps, if felt, may be benign or malignant. *Masses* may be polyps, bowel herniation, or pelvic masses such as ovarian cysts or tumors, adnexal masses, and so forth located more posteriorly and not felt during the vaginal bimanual examination. Physician consultation is required for any of these conditions.
	b. nodules/irregularities	**b.** *Nodules* and *irregularities* may indicate the presence of an ulcerated malignancy. Physician consultation is required.
	c. strictures	**c.** *Strictures* that are causing problems with bowel evacuation require physician consultation.
	d. rectovaginal musculature	**d.** Evaluation of the thickness and tone of the *rectovaginal musculature* provides useful information in anticipating difficulties during the second stage of labor. A woman may experience problems if the musculature is too thin or if it is too thick and muscularly overdeveloped (as may be found in some female athletes).

Procedure and Rationale	Observations and Findings	Significance
7. Your abdominal hand is pressing firmly and deeply downward just above the symphysis pubis and your vaginal examining finger is located in the posterior vaginal fornix and pressing strongly upward against the posterior side of the cervix (this will move the uterus posteriorly). Palpate as much of the posterior side of the uterus as possible with your rectal examining finger. This is particularly useful in evaluating a retroverted uterus.	**7.** Palpate for confirmation of vaginal findings regarding the size, location, position, consistency, shape, contour, and any tenderness or pain of the uterus.	**7.** See Step 9 under "The Bimanual Examination."
8. If you were unable to evaluate the adnexal areas thoroughly or had any questionable findings in this area during the vaginal bimanual examination, then palpate the adnexal areas using the same maneuvers as in Step 10 of "The Bimanual Examination."	**8.** See Step 10 of "The Bimanual Examination."	**8.** See Step 10 of "The Bimanual Examination."

9. If you are doing clinical pelvimetry during your pelvic examination, you may wish to reevaluate the shape of the sacrum, the ischial spines, the sacrospinous ligaments, the sacroiliac notch, and the coccyx during your rectovaginal examination, as these structures may be more readily felt through the rectum. See the procedure for clinical pelvimetry in Chapter 61.

10. As you remove your fingers, repeat the maneuver described in Step 6 (1) above covering the remaining half of the rectal wall. For example, if you covered between 5:30 and 12:30 o'clock on your way in, you will cover the area between 11:30 and 6:30 o'clock on your way out.	**10.** Same as for 6 (a), (b), and (c) above.	**10.** Same as for 6 (a), (b), and (c) above.

11. Gently remove your examining fingers.

12. Wipe off any secretions, discharge, and lubricating jelly from the woman's perineum and external genitalia. Use a single front-to-back motion and use fresh tissue for each front-to-back stroke in order to avoid contamination from the rectum.

13. Remove your gloves and discard the tissues/wipes and gloves in a hazardous biological waste receptacle.

14. Be sure to help the woman back up on the table and into a sitting position. Some women (usually either young women having their first pelvic examination or older women) may need to sit several minutes to regain their equilibrium and composure.

15. Be sure to give the woman a sanitary pad if she is menstruating or spotting from any procedure so she will not soil her clothes; if the woman may not be expecting any bleeding, tell her to expect it, for how long, and why there is spotting.

16. If you haven't already done so, share your findings from the examination with the woman either now or after she is dressed.

• • • Bibliography

Bickley, L. S., and Szilagyi, P. *Bate's Guide to Physical Examination and History Taking*, 8th ed. Philadelphia: J. B. Lippincott, 2002.

Copeland, L. J. *Textbook of Gynecology*, 2nd ed. Philadelphia: W. B. Saunders, 2000. ch. 2.

Lichtman, R., and Papera, S. *Gynecology: Well-Woman Care*. Norwalk, CT: Appleton and Lange, 1990.

Williams, P. L., et al. *Gray's Anatomy*, 38th ed. New York: Churchill Livingstone, 1995, pp. 1861–1877.

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CHAPTER

57

Obtaining a Specimen for Papanicolaou (Pap) Diagnostic Evaluation

There are two methods of specimen collection for Papanicolaou (Pap) screening for cancer: (1) the conventional Pap smear, in which a slide is made directly from the specimen collected at the cervix, and (2) the ThinPrep Pap Test, in which the specimen collected at the cervix is first processed in the laboratory to reduce blood, mucus, other debris, and obscuring artifacts and then a slide is made of the remaining cellular material. This material can also be used for human papillomavirus (HPV) testing. Both methods involve a speculum examination but there are variations in the collection and disposition of the specimen. The following procedure details both the commonalities and the variations in the two methods of obtaining a specimen for Papanicolaou microscopic analysis.

Procedure	Rationale
1. Before starting the procedure be sure that the specimen container label is filled out. If you are doing a Pap smear, be sure that the slide is labeled *in pencil* with the date and the woman's name and number.	**1.** Labeling before the procedure helps make sure the specimen is properly labeled with the woman's name and the date and reduces the risk in a busy office or clinic of specimens from different women getting mixed up. Ink may smear or wash off during fixation of the slide, thus making it difficult to read. The fixative also makes it difficult to label the slide after it has been sprayed.
2. Put on gloves.	**2.** Universal precaution to protect you from exposure to any body fluid/discharge or bloodborne pathogens.
3. Insert the appropriate size speculum, visualize the cervix, and fix the speculum for appropriate exposure. (See "Preparatory and General Procedures" and "The Speculum Examination" in Chapter 56.) Be sure to *gently* remove any material that obscures visualization of the cervix or may interfere with the cytological study (e.g., mucus, discharge, blood) with a 2 × 2 or 4 × 4 gauze on a sponge stick.	**3.** If a total pelvic examination is being done, inspect the external genitalia and check the urethra and the Bartholin's and Skene's glands prior to the speculum examination. The bimanual examination follows the speculum examination. It is imperative that no lubricating material except water be used prior to obtaining the Pap smear because lubricant may render this cytological study invalid. Cleaning the cervix too vigorously will remove the epithelium.

Collection and Disposition of the Specimen for a Pap Smear

4. One of four methods of specimen collection for a Pap smear may be used.

a. Place the longer portion of the slightly notched end of a wooden spatula or plastic scraper against and into the external os of the cervix and press. Scrape the cervical canal by turning the spatula firmly in a full circle. Be sure that if the squamocolumnar junction is visible, you include it and scrape it throughout the full circle.

b. Lightly moisten the cotton end of a cotton-tipped applicator with normal saline, insert the applicator into the cervical canal 2 cm, and roll the applicator between your thumb and index finger 360 degrees.

c. Insert a cervical brush 1 to 2 cm into the cervical canal and rotate it 90 to 180 degrees.

d. Use a combination of methods to include the spatula method.

5. Spread the cells on the labeled slide. If the cells were collected on a wooden spatula, place one flat side next to the label on the top half of the slide and stroke once to the end of the slide. Then turn the spatula over and place the other flat side next to the label on the bottom half of the slide and stroke once to the end of the slide. Do not stir in circles, stroke repeatedly, or stroke one side of the spatula on top of cells already spread from the other side of the spatula. If the specimen is too thick, then take the edge of the spatula and, with a single light stroke down the slide, remove the excess.

If the cells were collected on a cotton-tipped applicator or on a cervical brush, gently roll the cotton tip or the brush down the upper half of the slide from the label to the end of the slide. Repeat, rolling the cotton tip or the cervical brush down the lower half of the slide. Do not stir in circles or rub back and forth.

6. Immediately spray the slide generously with the fixative or place it in a jar of fixative solution. Speed is of the essence. Avoid waving the slide in the air or placing it under a lighted lamp prior to its being fixed.

4.

a. Pressing inserts the tip of the spatula a short distance into the cervical canal; how far depends on the patulousness of the cervix. Cells from the squamocolumnar junction should be included for cytological study because cervical cancer most frequently begins at the squamocolumnar junction.

b. Moistening the cotton-tipped applicator with saline prevents the cotton from absorbing endocervical secretions and prevents the cotton fibers from getting on the slide.

This method is often used with pregnant women to decrease the risk of bleeding resulting from increased friability of the cervix.

c. The cervical brush increases endocervical cell retrieval, expecially in women who are pregnant, postmenopausal, who have cervical stenosis, or who have had cervical procedures [1]. In women wth any of these conditions, the squamocolumnar junction has retreated within the cervical canal. Cells from this area must be retrieved for a valid Pap smear.

Rotating the cervical brush only 90 to 180° decreases bleeding, which can obscure the endocervical cells from examination.

d. A combination of methods is used if you feel the need to sample the ectocervix as well as the endocervix.

5. This procedure for spreading the cells is designed to avoid breaking and destroying the cells, which would render the Pap smear useless.

6. Drying the cells in air or with a light distorts the cells.

Collection and Disposition of the Specimen for a ThinPrep Pap Test

4. One of two methods may be used.	**4.**
a. Place the long central portion of the cervical broom into the cervical canal and press against the external cervical os. Turn the cervical broom a full circle.	**a.** Pressing inserts the cervical broom a short distance into the cervical canal; how far depends on the patulousness of the cervix. Cells from the squamocolumnar junction should be included for cytological study because cervical cancer most frequently begins at this junction.
b. Use a wooden spatula or cervical brush, as described in 4 (a) and (c) above for collection and disposition of the specimen for a Pap smear.	
5. Rinse the cervical broom (or cervical brush or wooden spatula) in the small container of liquid transport medium by gently stirring it in the solution.	**5.** Removes the specimen from the collection device into the liquid transport medium.
6. Immediately cap the container.	**6.** Prevents accidental spilling while completing the examination.
7. Proceed with the remainder of the speculum examination, making the necessary observations. Remove the speculum and deposit it in the proper container.	
8. Dispose of the spatula, cotton-tipped applicator, cervical brush or cervical broom, and your gloves in a hazardous biological waste receptacle.	

There are individual and institutional variations in the procedure for obtaining a Papanicolaou smear. The variations relate to the number of slides made with specimens from the different locations. Some protocols require two slides: one made from a specimen taken with the wooden spatula swept circumferentially at the os, and the second made from a specimen taken with the cotton-tipped applicator or cervical brush inserted into the cervical canal. Still other protocols require the examiner to make a third slide from a specimen taken from the posterior vaginal fornix or vaginal vault either by aspiration or with a cotton-tipped applicator, or with the blunt end of a wooden spatula.

Reference

1. Bauman, B. J. Use of a cervical brush for Papanicolaou smear collection: A meta-analysis. *J. Nurse-Midwifery* 38(5):267–275 (September/October) 1993.

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CHAPTER

58

Obtaining a Specimen for Gonococcal (GC) and Chlamydia Diagnostic Testing

There are systems that collect cervical specimens for diagnosis of either or both gonorrhea and chlamydia by culture or by DNA direct probe or by DNA amplification. These systems have commonalities in the collection of the specimen but vary in the transport container, medium, or culture.

Procedure	Rationale
1. Put on gloves.	**1.** This is a universal precaution to protect yourself from any possible body fluid/discharge or bloodborne pathogens.
2. Insert the appropriate size speculum, visualize the cervix, and fix the speculum for appropriate exposure. (See "Preparatory and General Procedures" and "The Speculum Examination" in Chapter 56.)	**2.** The cervical canal is considered the best site to culture for diagnosis of gonorrhea and chlamydia. Eighty-five percent of cases of gonorrhea in the female are harbored at this site. Endocervical cells are needed for proper growth of chlamydia.
3. Gently remove any material (mucus, blood, discharge) obscuring the cervix with a sponge stick, Procto-swab, an applicator from the kit you are using, or a 2×2 or 4×4 gauze on a ring forceps.	**3.** Mucus can interfere with the growth of chlamydia.
4. Insert a sterile applicator (swab) 1–2 cm into the cervical canal. If you are collecting a specimen for chlamydia only or for both chlamydia and gonorrhea together, use a Dacron-tipped swab only. These swabs are usually provided in a specimen collection kit. If you are collecting a specimen for gonorrhea only, then you can use a cotton-tipped applicator (swab).	**4.** Natural fibers such as cotton and wood interfere with the growth of chlamydia. Synthetic fibers are thus necessary for collection of this specimen. The organisms are absorbed on the cotton-tipped applicator (swab).
5. Gently rotate the swab, being sure to move it against the sides of the cervical canal. Leave the swab in place for approximately 30 sec.	**5.** It takes time for the organisms to be absorbed on the swab.
6. Withdraw the swab carefully; avoid any contact with the vaginal mucosa.	**6.** Mucus interferes with growth of chlamydia.

Procedure	Rationale
7. The next step depends on the collection system being used.	
a. If you are using a transport system for DNA direct probe or DNA amplification, follow the directions supplied with the kit.	
b. If you are using a culturette or culture tube into which the swab is inserted, handle the specimen according to directions provided with that system.	
c. If you are using a slide method, roll the swab down the slide to place the specimen. Do not stir the swab in circles or rub back and forth, as this will damage cells. Follow directions on the specimen collection kit for fixing the specimen on a slide.	
d. If you are using a Thayer-Martin (T-M) medium culture plate to streak a culture for gonorrhea, use the following procedure:	
(1) Streak the T-M culture plate by rolling the cotton swab on the medium in a large Z pattern that covers at least three-quarters of the plate.	**(1)** T-M medium contains several antibiotics that discourage growth of the many other organisms found in the vagina and cervix, which would otherwise overgrow the *Neisseria gonorrhoeae*. Rolling the cotton swab in a large Z pattern allows the swab to be adequately exposed to the culture for maximum transfer of organisms. This pattern also allows for easier morphological study by spacing out the colonies.
(2) Cover the culture plate with its cover and turn it upside down.	**(2)** Turning the plate upside down prevents contamination by airborne organisms.
(3) The culture plate should be prepared for transport to the laboratory according to laboratory or facility protocols, i.e., use of a candle jar, jar with carbon dioxide insert, carbon dioxide bag, or Bio-bag. If a candle jar is used, place the culture plate upside down, light the candle, and replace the lid on the jar.	**(3)** The candle jar, carbon dioxide jar insert, and carbon dioxide bag all provide an atmosphere of 3 percent carbon dioxide, which is favorable for the partially anaerobic *N. gonorrhoeae*. When using only the Bio-bag it is crucial to transport the culture to the laboratory within 30 min to enhance proper growth of the organisms.
8. Properly label the transport container or T-M culture plate with the woman's name, identification number, specimen site, and date.	
9. A gonococcal and chlamydia specimen should always be obtained of any discharge elicited during examination of the urethra and Bartholin's and Skene's glands or in the event of redness and discharge from the eyes, pharyngeal soreness, or rectal pain. Specimens should also be obtained from the rectum and the throat if indicated by history or clinical symptoms. Use separate kits or T-M medium culture plates (gonorrhea only) for each site and clearly mark the site of each specimen.	
10. The indications for collecting a specimen for diagnostic testing for gonorrhea or chlamydia are the same; if a test for one is indicated, a test for both should be done.	
11. All disposables should be discarded in a hazardous biological waste receptacle.	

CHAPTER

59

Making a Wet Smear Slide of Vaginal Secretions

Procedure	Rationale
1. Put on gloves.	**1.** This is a universal precaution to protect yourself from any possible body fluid/discharge or bloodborne pathogens.
2. Obtain the specimen of vaginal discharge during the speculum examination.	**2.** The vaginal discharge in the concave posterior blade of the speculum is a good source for a specimen. Plaques of *Candida* on the vaginal walls are exposed during the speculum examination and are a good specimen source.
3. Do one of the following: **a.** Put one drop of normal saline on the middle of a clean microscope slide. **b.** Put one drop of normal saline on the left third of a clean microscope slide and one drop of potassium hydroxide (KOH) on the right third of the slide. **c.** Use two clean microscope slides and put one drop of normal saline on the middle of one slide and one drop of potassium hydroxide on the middle of the second slide.	**3.** *Candida* (monilia), *Trichomonas*, and bacterial vaginosis can all be identified microscopically when mixed with a drop of normal saline. Normal saline is used for detection of motile trichomonads. Use of potassium hydroxide facilitates identification of *Candida* because potassium hydroxide dissolves trichomonads, white blood cells, bacteria, and foreign objects. Some clinicians prefer to start with Step 3(a) and, after evaluating the slide for trichomonads and the clue cells of bacterial vaginosis, add a drop of potassium hydroxide at the edge of the coverslip. This diffuses under the coverslip, destroys the other organisms, and facilitates identification of *Candida*.
4. Roll the plain wooden end of a cotton-tipped applicator in the specimen of vaginal discharge.	**4.** Do *not* use the cotton-tipped end, as cotton filaments may be added to the specimen and be confused with or misidentified as *Candida*.
5. Mix the sample of vaginal discharge on the wooden end of the cotton-tipped applicator with the drop of normal saline on the slide. Repeat Step 4 and mix the sample with the drop of potassium hydroxide if both solutions are being used. Use both a rolling and a stirring motion to mix the vaginal discharge with the drop of solution.	**5.** Microscopic evaluation of the slide is facilitated if the sample of vaginal discharge is well mixed throughout the drop of solution, thereby avoiding thick areas of sample.

Procedure	Rationale
6. Cover the mixture of specimen sample and solution with a coverglass (coverslip) by sliding the coverslip onto and over the specimen. This is accomplished by putting the edge of one side of the coverslip into the mixed specimen/solution and drawing it to the longitudinal edge of the slide. When the specimen/solution is under the entire edge of the side of the coverslip, slide the coverslip over the rest of the mixed specimen/solution on the slide.	**6.** If the coverslip is simply dropped onto the specimen, air bubbles will be trapped between the coverslip and the specimen/solution on the slide, making microscopic evaluation difficult.
7. The wet smear slide of vaginal secretion is now ready for microscopic evaluation. (See Chapter 60, Using a Microscope.)	

CHAPTER

60

Using a Microscope

Procedure	Rationale
1. Put on gloves.	**1.** This is a universal precaution to protect yourself from any possible body fluid/discharge or bloodborne pathogens.
2. Place the slide on the stage of the microscope so that the specimen is over the opening in the stage. Secure the slide in place with the stage clips.	**2.** This properly locates the slide for viewing of the specimen.
3. Turn on the light source for the microscope and adjust the light so it reflects evenly throughout the microscopic field.	**3.** Good visualization depends on adequate lighting.
4. Do either of the following: **a.** Select the low-power objective (10×) and place it over the specimen, making sure it clicks into place. **b.** Select the high-power objective (40×) and place it over the specimen, making sure it clicks into place.	**4. a. or b.** Some midwives find it is easier to locate the proper plane of visualization by starting with the low-power objective. Other midwives prefer to start with the low-power objective because they believe it is easier to scan an entire slide under low power and then switch to high power for confirmation of findings (*Candida*, trichomonads, clue cells) and identification of clue cells, if present. Still other midwives feel that it saves time to start with the high-power objective.
5. Move the objective and the slide as close to each other as possible with the coarse adjustment knob. Watch from the side so you can see if and when the objective touches the slide. Note which way you are turning the coarse adjustment knob.	**5.** This provides a starting point for locating the proper plane of visualization without breaking the slide in the process. Watching from the side allows you to see when the objective and the slide touch and stop turning the knob. (The objective and the slide usually do not touch when starting with the low-power objective.) Noting which way you are turning the coarse adjustment knob ensures that you know which way to turn it (the opposite direction) when you are looking through the eyepiece in order to visualize the specimen and to prevent further pressure of the objective on the slide, which would break the slide.

Procedure	Rationale
6. Look through the eyepiece of the microscope and *slowly* turn the coarse objective knob in the other direction until you can see something.	**6.** If you turn the coarse adjustment knob too quickly, you will pass through the proper plane of visualization without noticing it.
7. Check to make sure you are in the right plane of visualization by moving the slide while you look through the eyepiece. Note whether what you are looking at changes position or if you see more of the specimen. If so, you are in the proper plane. If not, you are not in the proper plane and should continue with or repeat Step 6 above.	**7.** It is easy to confuse dirt, lint, and grime on the objective and eyepiece for the specimen. Such objects of vision will not change position when you move the slide.
8. When the specimen is in the proper plane of visualization, turn the fine adjustment knob back and forth while you look through the eyepiece.	**8.** The fine adjustment knob brings the specimen into sharper focus.
9. a. If you started with the high-power objective (40×), proceed with Step 11 below.	**9.**
b. If you started with the low-power objective (10×), switch now to the high-power objective. Watch from the side while changing the objective.	**b.** Switching to the high-power objective after having located the specimen in the proper plane of visualization will further magnify the specimen for ease in identification and diagnosis. If you watch from the side while changing the objective you are assured that you will not hit the slide with the objective. This might either break the slide or knock it out of position.
10. Turn the fine adjustment knob back and forth while you look through the eyepiece. Do not use the coarse adjustment knob.	**10.** Fine adjustment brings the specimen into sharper focus under the high-power objective. If you turn the coarse adjustment knob, you will lose the plane of visualization you located using the lower-power objective.
11. Systematically move the slide until you have seen the specimen in its entirety or sufficiently to make a diagnosis.	**11.** Evidence of what you are seeking may not appear in all areas of the slide. Therefore, the entire slide must be evaluated.
12. When finished with your microscopic evaluation of the slide, turn off the light source for the microscope and remove the slide from the stage.	
13. Dispose of the slide(s) and your gloves in a hazardous biological waste receptacle.	
Care of a Microscope	
1. Keep the microscope covered when not in use.	**1.** Prevents dirt and lint from collecting in and on the microscope.
2. Routinely clean the microscope of dust and lint and wipe the eyepiece and objectives with optical paper.	**2.** Facilitates proper functioning of the microscope and a clearer view of specimens.
3. Carry the microscope with two hands in an upright position or on a movable cart or table.	**3.** The microscope is a delicate instrument, which must be handled carefully if it is to function properly. It must be kept upright to prevent pieces from falling off or out.

CHAPTER

61

Anatomy of the Pelvis, Pelvic Types, Evaluation of the Bony Pelvis, and Clinical Pelvimetry

Anatomy

Pelvimetry refers to measurement of diameters of the pelvis. These diameters are most accurately measured by roentgenographic study, or x-ray pelvimetry. However, x-ray pelvimetry is rarely done today, in order not to expose the mother and baby to the potential hazards of radiation unless absolutely necessary. It is possible to measure some of the critical diameters clinically using either your hands or a pelvimeter such as Thom's pelvimeter. In addition, it is possible to evaluate the general structure (size and shape) of the pelvis by feeling certain bony landmarks. The information on pelvic diameters and structure obtained clinically is compared with the estimated size of the baby. You can then evaluate the adequacy of the pelvis for passage of a particular baby or (if you are doing the pelvimetry earlier in pregnancy) of a certain-sized baby. Generally, with cephalic presentations, a trial of labor has replaced x-ray pelvimetry when there is a question of the adequacy of the pelvis, which may indicate the need for cesarean section because of cephalopelvic or fetopelvic disproportion. Many physicians, however, will perform x-ray or computed tomographic (CT) pelvimetry on women who are primigravidas in labor with a breech presentation who plan to deliver vaginally, in order to confirm their clinical impressions of the adequacy of the pelvis, especially the inlet. X-ray or CT pelvimetry is not performed until labor has begun and the pelvis has been evaluated in relationship to the estimated actual size of the baby about to be born.

A thorough knowledge of the anatomy of the bony pelvis is an essential prerequisite not only to the performance of clinical pelvimetry and accurate interpretation of these findings but also for evaluation of the total pelvis and its adequacy to accommodate the passage of the baby.

The pelvis is comprised of four bones: two innominate bones, the sacrum, and the coccyx (see Figure 61-1). Each *innominate bone* has three parts: the pubis, the ischium, and the ilium. The *ilium* is the posterior and upper portion of the innominate bone. The two ilia form the false pelvis, share with the sacrum the important bony landmark of the sacroiliac notch, and join the sacrum at either side at the *sacroiliac synchondroses*. The *ischium* is the medial and lower portion of the innominate bone and has such important bony landmarks as the ischial spine, the ischial tuberosity, and the pelvic side-wall. The *pubis* is the anterior portion of the innominate bone. The two pubic bones join each other in the front at the *symphysis pubis* and their inferior angles from the descending rami form the important bony landmark of the pubic arch.

The sacrum and the coccyx form the posterior portion of the pelvis. The *sacrum* is formed by the fusion of the five sacral vertebrae, includes the important bony landmark of the *sacral promontory*, and joins the coccyx at the *sacrococcygeal symphysis*. The *coccyx* is formed by the fusion of four (some-

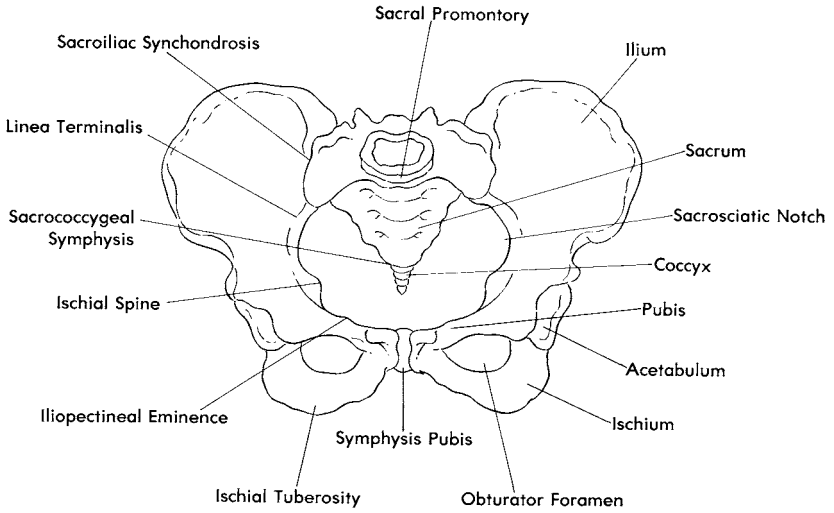

FIGURE 61-1 Bones of the pelvis.

times three or five) rudimentary vertebrae, is usually movable, and is itself an important bony landmark.

The sacrococcygeal symphysis, symphysis pubis, and the two sacroiliac synchondroses (or sacroiliac articulations) are all amphiarthrodial *joints* consisting of a network of cartilage and ligaments that join the bones of the pelvis.

The pelvis is divided by the linea terminalis into the false pelvis above this demarcation and the true pelvis below it (Figure 61-2). The *false pelvis* has little obstetric significance relevant to the passage of the fetus through the pelvis. The *true pelvis* constitutes the bony passageway through which the fetus must maneuver to be born vaginally. Therefore, its construction, planes, and diameters are of utmost obstetric importance.

The true pelvis has five boundaries:

1. *Superiorly:* the sacral promontory, linea terminalis, the upper margins of the pubic bones.
2. *Inferiorly:* the inferior margins of the ischial tuberosities and the tip of the coccyx.
3. *Posteriorly:* the anterior surface of the sacrum and coccyx.
4. *Laterally:* the sacroiliac notches and ligaments and the inner surface of the ischial bones.
5. *Anteriorly:* the obturator foramina, and the posterior surfaces of the symphysis pubis, pubic bones, and ascending rami of the ischial bones.

The *true pelvis* has three planes of obstetric significance: the inlet, the midplane, and the outlet. For each plane there are theoretically six diameters. However, not all diameters are used in measuring or discussing each of the planes or in discussion of pelvic types. Table 61-1 shows which diameters are pertinent to which planes. Those with an asterisk are considered critical to evaluation of pelvic adequacy. The sagittals (anterior and posterior) measure the distance from the midpoint of the transverse diameter to the points used in measuring the anteroposterior diameter.

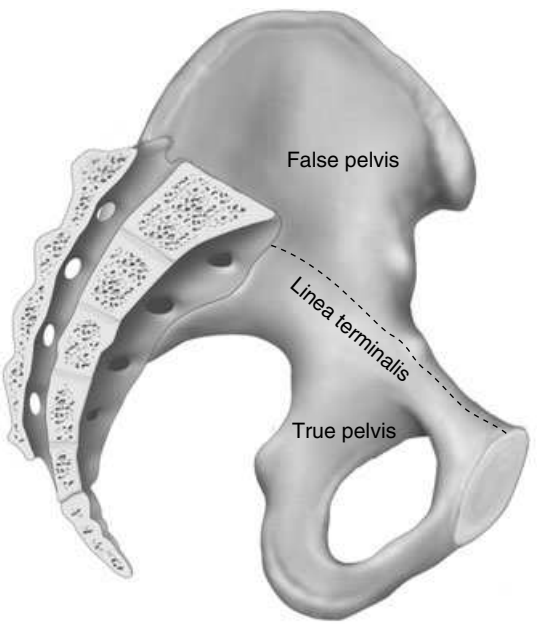

FIGURE 61-2 False and true pelvis.

TABLE 61-1	Diameters of the Three Pelvic Planes of Obstetric Significance		
Diameters	**Inlet**	**Midplane**	**Outlet**
Anteroposterior	X*	X*	X*
Right oblique	X		
Left oblique	X		
Transverse	X*	X*	X*
Anterior sagittal	X		
Posterior sagittal	X	X*	X*

* Critical to evaluation of pelvic adequacy.

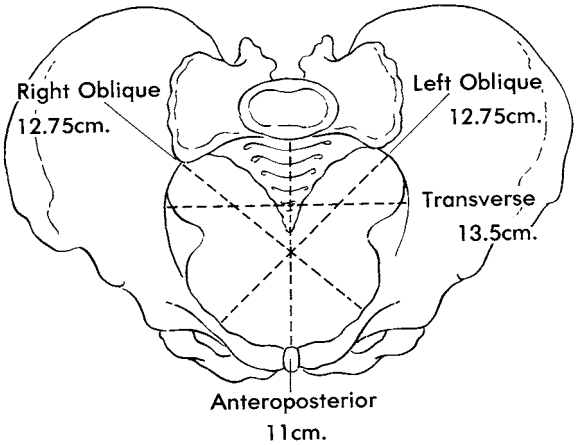

FIGURE 61-3 Diameters of the pelvic inlet.

The pelvic *inlet* (superior strait) is the upper entry into the true pelvis. Its boundaries are the sacral promontory posteriorly, the linea terminalis laterally, and the upper portion of the symphysis pubis and horizontal rami of the pubic bones anteriorly. The diameters of the inlet that are frequently referred to are discussed below (see Figures 61-3 and 61-4):

There are three *anteroposterior diameters* of the inlet:

1. *Conjugata vera:* the true conjugate of the inlet; extends from the middle of the sacral promontory to the middle of the upper margin of the symphysis pubis; normally measures 11 cm or more.
2. *Obstetric conjugate of the inlet:* extends from the middle of the sacral promontory to the middle dle of the symphysis pubis on its inner surface a short distance (several millimeters) below its upper margin. The minimum measurement of this diameter before the pelvis is considered contracted is 10 cm. This is the shortest antero-

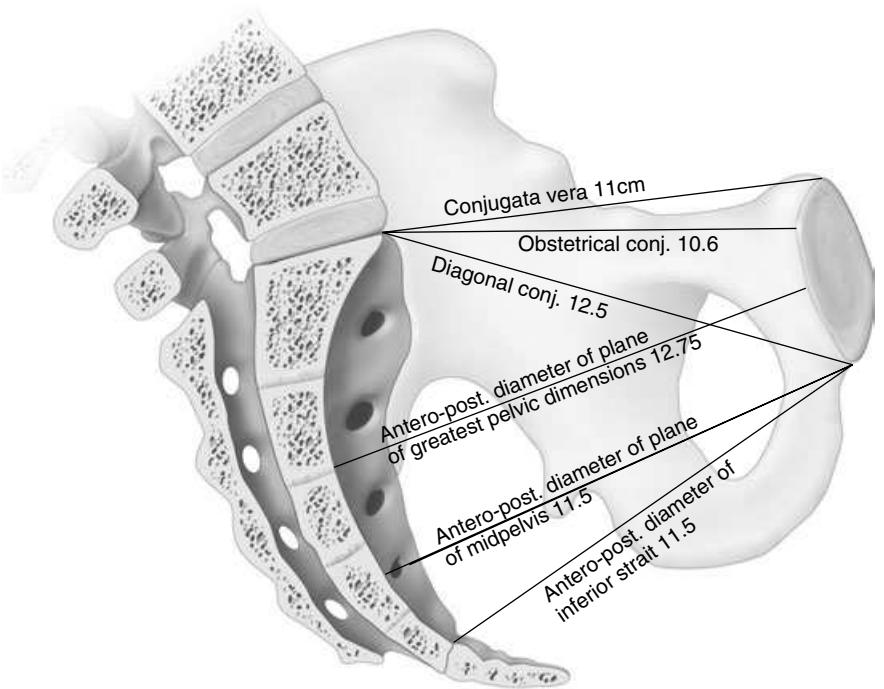

FIGURE 61-4 Diameters and planes of the pelvis.

posterior diameter because the symphysis pubis is slightly thicker at this point than at its upper or lower margin.

3. *Diagonal conjugate of the inlet:* extends from the middle of the sacral promontory to the middle of the inferior (lower) margin of the symphysis pubis. The diagonal conjugate is the only diameter of the pelvic inlet that can be measured clinically. A normal clinical measurement is considered to be at least 11.5 cm.

The *transverse diameter of the pelvic inlet* measures the greatest distance between the linea terminalis on either side of the pelvis; this distance is approximately 13.5 cm or a little less, depending on the shape of the pelvis.

The *oblique diameters of the pelvic inlet* measure the distance between the sacroiliac synchondrosis on one side of the pelvis and the iliopectineal eminence on the opposite side of the pelvis. The sacroiliac synchondrosis on the right or left of the pelvis determines whether the diameter is the right oblique diameter or the left oblique diameter. For example, if the diameter extends from the right sacroiliac synchondrosis to the left iliopectineal eminence, it is the right oblique diameter. The oblique diameters average slightly under 13 (12.75) cm each.

The *midplane* of the pelvis is the plane of least dimensions. The transverse diameter measures the distance between the ischial spines. Called the *interspinous diameter*, it normally measures about 10 cm. This measurement is critical, as it is the smallest diameter of the pelvis to which the fetus has to accommodate itself. If the ischial spines are prominent or sharp or the sidewalls converge so that the ischial spines protrude to the extent of encroaching on the space of the pelvic cavity, the interspinous measurement is diminished and pelvic adequacy for vaginal delivery of an average-sized baby is highly questionable. A contracted midplane is very often associated with a contracted outlet.

The anteroposterior diameter extends from the middle of the inferior margin of the symphysis pubis through the middle of the transverse diameter to the point on the sacrum dictated by this angle. This diameter normally measures a minimum of 11.5 cm. The posterior sagittal diameter of the midplane is usually a minimum of 4.5 cm.

It is not clinically feasible to measure the diameters of the midplane. However, its adequacy may be estimated by noting whether the ischial spines are prominent or encroaching rather than blunt, the sidewalls are convergent rather than straight, the sacrum is flat or shallow rather than hollow, and the outlet is contracted rather than measuring within normal limits.

The pelvic *outlet* can be thought of as composed of two triangles, with the transverse diameter of the outlet serving as the common base of these two triangles. The transverse diameter of the outlet is the distance between the inner aspect of the lowermost part of the ischial tuberosities (the *intertuberous*, or *biischial*, *diameter*), which usually measures approximately 10 cm. The posterior triangle has the tip of the sacrum as its apex and the anterior triangle has the middle of the inferior margin of the symphysis pubis as its apex. The anteroposterior diameter of the outlet extends from the middle of the inferior margin of the symphysis pubis to the tip of the sacrum. Unlike the anteroposterior diameter of the midplane, it does not transect the transverse diameter. It generally measures 11.5 cm. The posterior sagittal diameter of the outlet usually measures 7.5 cm. When these measurements are done clinically, a rule of thumb is that the sum of the transverse diameter and the posterior sagittal measurements must equal at least 15 cm for pelvic adequacy of the outlet.

Other anatomical features of the pelvis considered in evaluation of pelvic adequacy include the following:

Inclination of the symphysis pubis (Figure 61-5): The longitudinal axis of the symphysis pubis is normally parallel to the longitudinal axis of the sacrum. If the symphysis pubis is not at least approximately parallel to the sacrum, the anteroposterior diameters of the inlet and the outlet can be changed significantly. Tilting of the superior margin of the symphysis pubis toward the sacral promontory and of the inferior margin away from the sacrum is called *anterior inclination*. Tilting of the inferior margin of the symphysis pubis toward the sacrum and the superior margin away from the sacral promontory is called *posterior inclination*.

Angle of the pubic arch: The descending rami of the pubic bones and the inferior margin of the symphysis pubis form what is known as the *pubic arch*. The angle of this arch should be at least 90° as determined just below the symphysis pubis. An arch that is 90° a few centimeters below the symphysis pubis but narrow above that (just below the symphysis pubis) decreases the available space in the anteroposterior diameter and may indicate an inadequate outlet.

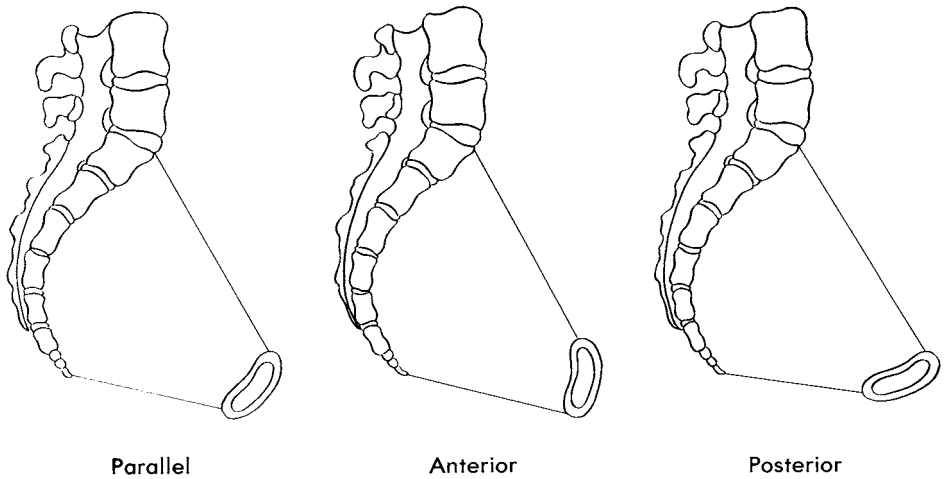

FIGURE 61-5 Inclination of the symphysis pubis.

General structure of the forepelvis: The inner aspect of the forepelvis (the anterior portion of the pelvis) should be rounded. A forepelvis that is not rounded but instead angles sharply toward the lateral portion of the pelvis decreases the oblique diameters of the inlet.

Angle of the pelvic sidewalls: The pelvic sidewalls extend from the upper anterior angle of the sacrosciatic notch at the point of the widest transverse diameter of the pelvic inlet in a downward and forward line to the ischial tuberosities at the point of the widest transverse diameter of the pelvic outlet. They are normally slightly convergent in that, if the lines of their angles were extended beyond the pelvis, they would meet at about the level of the knees. However, when felt on pelvic examination they feel generally straight. Their importance is in whether the width of the pelvis at the inlet remains the same throughout the pelvis. Divergence or convergence is based on whether the point of origin at the inlet and the ending point at the ischial tuberosities are essentially equidistant from the anteroposterior diameter of the pelvis. Convergent sidewalls usually decrease the angle of the pubic arch and may be accompanied by more prominent ischial spines. Divergent sidewalls always indicate a very wide angle of the pubic arch.

Sacrosciatic notch: The shape and width of the sacrosciatic notch are important because they affect the posterior sagittal diameter of the inlet, which combines with the shape and rotation of the sacrum to determine the amount of room in the posterior portion of the pelvis for passage of the fetus.

Types of Pelves

There are four basic pelvic types according to the Caldwell-Moloy classification: (1) gynecoid, (2) android, (3) anthropoid, and (4) platypelloid (Figure 61-6). These are determined by certain characteristics of the pelvis and classified in accord with the characteristics of the posterior segment of the inlet. Anatomical portions of the pelvis used in evaluation of pelvic types are the inlet, sacrum, sacrosciatic notch, sidewalls, ischial spines, and pubic arch.

Many pelves are not pure types but, rather, a mixture of types. For example, a gynecoid pelvis may be said to have an android tendency. This means that the posterior segment is gynecoid and the anterior segment is android or that the pelvis has certain android characteristics.

The importance of being familiar with pelvic types lies in the fact that many of the characteristics used in determining pelvic types affect the obstetric capacity of the pelvis—that is, the adequacy of the pelvis for accommodating passage of the baby. So although a pelvic type, in and of itself, may not seem too important, knowledge of the characteristics of the pelvis that are being evaluated—especially the inlet, sacrum, ischial spines, and pubic arch—is extremely valuable when combined with clinical pelvimetry for evaluation of pelvic adequacy.

Gynecoid Pelvis

The gynecoid pelvis is commonly known as the "female pelvis" because it is the type that occurs most frequently in women; 41 to 42 percent of women's

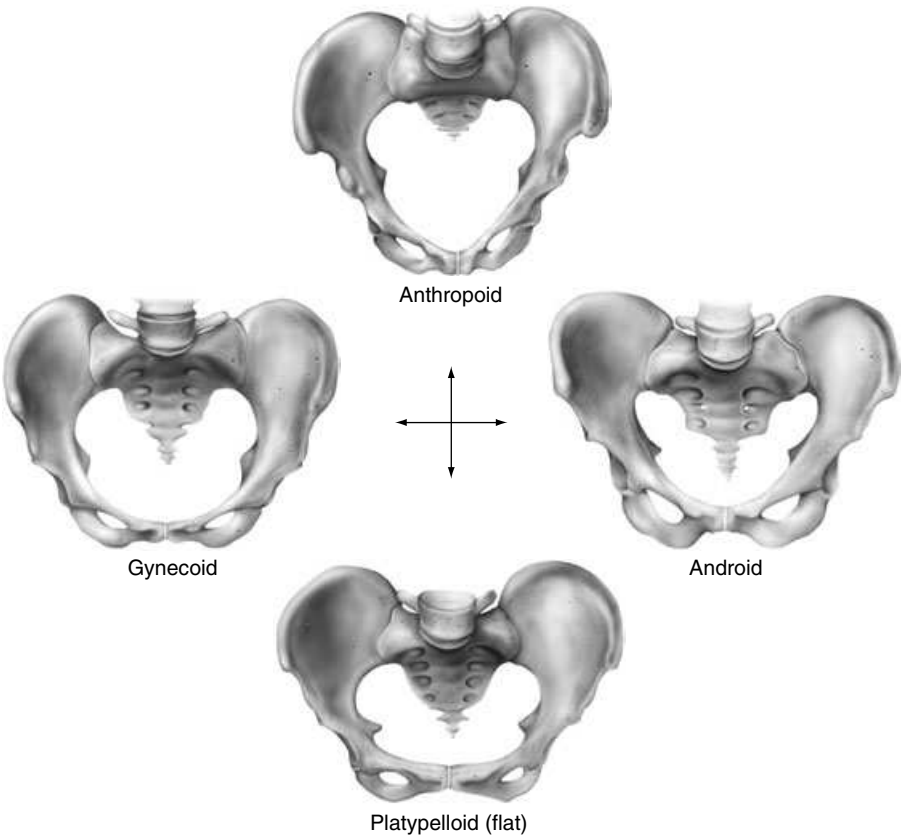

FIGURE 61-6 Four basic pelvic types. Caldwell-Moloy classification.

pelves are gynecoid. This shape is ideal for childbearing. Its identifying characteristics are as follows:

Inlet: Well-rounded anterior, lateral, and posterior segments of the pelvis, with the transverse diameter about the same or slightly greater than the anteroposterior diameter. The posterior sagittal diameter is only a little shorter than the anterior sagittal diameter.

Sacrum: Parallel with the symphysis pubis.

Sacrosciatic notch: Well rounded with an approximate distance of $2\,^1/_2$ to 3 fingerbreadths along the sacrospinous ligament, which runs between the ischial spine and the sacrum.

Sidewalls: Straight pelvic sidewalls.

Ischial spines: Blunt and neither prominent nor encroaching.

Pubic arch: A wide arch (90 degree angle or more).

Android Pelvis

The android pelvis is commonly known as the "male pelvis" because it occurs more frequently in men. However, it does occur in 32.5 percent of white women and in 15.7 percent of nonwhite women. The android pelvis is a heavy pelvis, which poses difficulty for vaginal delivery and increases the incidence of posterior position, forceps delivery, and stillbirth. The midplane and outlet contracture of the android pelvis increases the incidence of fetopelvic disproportion and cesarean sections. Characteristics of the android pelvis are as follows:

Inlet: Often referred to as heart-shaped; the posterior segment is wedge-shaped and the anterior segment (forepelvis) is narrow and triangular. The posterior sagittal diameter is quite short in comparison to the anterior sagittal diameter. This means that there is very limited space in the posterior portion of the pelvis for accommodating the fetal head.

Sacrum: Anteriorly inclined and flat, thereby contributing to the shortness of the posterior sagittal diameters throughout the pelvis.

Sacrosciatic notch: Highly arched and narrow, with an approximate distance of $1\,^1/_2$ to 2 fingerbreadths along the sacrospinous ligament between the ischial spine and the sacrum.

Sidewalls: Pelvic sidewalls that are usually convergent.

Ischial spines: Usually prominent and frequently encroaching, thereby decreasing the transverse (interspinous) diameter of the midplane.

Pubic arch: Narrow, with an acute angle of much less than 90 degrees.

Anthropoid Pelvis

The anthropoid pelvis is most common in the nonwhite races, occurring in 40.5 percent of nonwhite women as compared to 23.5 percent of white women. The shape of the anthropoid pelvis favors a posterior position of the fetus. It is adequate for vaginal delivery if it is on the large size.

Inlet: Characteristically oval with an anteroposterior diameter much larger than the transverse diameter. The anterior segment of the pelvis (forepelvis) is somewhat pointed and narrower than the posterior segment.

Sacrum: Posteriorly inclined, so, although flat, the posterior sagittals are long throughout the pelvis. Therefore, there is more space in the posterior portion of the pelvis for accommodating the fetal head. The anthropoid pelvis has the longest sacrum of the four types of pelves, and hence, is the deepest pelvis.

Sacrosciatic notch: Of average height but quite wide; has an approximate distance of 4 fingerbreadths along the sacrospinous ligament between the ischial spine and the sacrum.

Sidewalls: Frequently somewhat convergent.

Ischial spines: Usually prominent but not encroaching, so the transverse (interspinous) diameter of the midplane is generally less than that of the gynecoid pelvis but not as contracted as the android pelvis.

Pubic arch: May be somewhat narrow, but the potential problem of outlet contracture generally is counterbalanced by the lengthy anteroposterior diameter's having a long posterior sagittal, thus providing room in the posterior portion of the pelvis for the baby.

Platypelloid Pelvis

Fortunately the platypelloid pelvis is rare, because it is not particularly conducive to vaginal delivery. It occurs less than 3 percent of the time in both white and nonwhite women.

Inlet: Has been likened to a flat gynecoid pelvis. It is the opposite of the anthropoid pelvis, having instead a short anteroposterior diameter and a wide transverse diameter. The anterior segment of the pelvis (forepelvis) is quite wide.

Sacrum: Inclined posteriorly and quite hollow, thereby creating a short sacrum and shallow pelvis.

Sacrosciatic notch: Wide and flat with an acute angle between the ischial spines and the sacrum.

Sidewalls: Slightly convergent.

Ischial spines: The ischial spines are somewhat prominent but, because of the flattened character of the pelvis and wide transverse diameters throughout the pelvis, this prominence has no effect. The transverse diameter of the midplane of a platypelloid pelvis is the widest of all the pelves.

Pubic arch: Quite wide; this pelvis is the widest of all the pelvic types.

Procedure, Rationale, and Description of Findings

Before doing clinical pelvimetry it is important that you measure your fingers and your fist because they will become your instruments of measurement. Specifically, you should measure the length of the reach of your examining fingers—that is, from the tip of your longest finger to the juncture of your first finger (palm) and your thumb. This length should be measured both with the measurer just resting against this juncture and with the measurer pressed into this junction with the same degree of force you use against the perineum when reaching for the diagonal conjugate. Pressing usually adds 0.5 to 1 cm to your reach.

Even if you have access in your setting to a Thom's pelvimeter for measuring the diameters of the outlet, it is wise to have measured your fist, as not many settings have a Thom's pelvimeter. Measure your fist from the outer (ulnar) aspect to the outer (radial) aspect of the tops of the knuckles of your fingers where they attach to your hand. If this does not measure at least 8 cm, then position your thumb in a way that you will position it each time and add the joint or knuckle of your thumb into the measurement.

Clinical evaluation of the pelvis and pelvimetry are usually included as part of the initial antepartal examination and, depending on circumstances, repeated again either late in the third trimester or at the time of the initial intrapartal bimanual pelvic examination. (See "The Bimanual Examination" in Chapter 56.) It is important to develop a routine procedure for performing clinical evaluation of the

bony pelvis so that you will remember and include all aspects and so the procedure progresses as smoothly and comfortably for the woman as possible.

The woman is prepared for this procedure as for the pelvic examination: empty bladder, lithotomy position, careful draping, and instruction about both the procedure and relaxation techniques to help her cope with the examination. (See "Preparatory and General Procedures" in Chapter 56.)

One useful way to explain to the woman how it will feel to have you pressing against her pelvic bones is to hold one of her arms and press firmly with your thumb against her wrist bone while explaining that any discomfort she will feel will be like this and will be due to pressure.

Procedure and Rationale	Description of Findings
1. Put on gloves.	**1.** This is a universal precaution to protect you from any possible body fluid/discharge or bloodborne pathogens.
2. Insert your two vaginal examining fingers, palmar surface up, just inside the woman's vagina. Slightly separate your fingers and gently palpate the inner surface of the symphysis pubis. Separating your fingers places them on either side of the urethra, thus sparing it any trauma and the woman any additional discomfort while you are palpating.	**2.** Note any abnormal thickening of the symphysis pubis that would decrease the obstetric conjugate diameter of the pelvic inlet. Note if there is any separation of the symphysis pubis. Also note the position of the symphysis pubis so that after palpating the sacrum you can determine if the symphysis pubis is parallel with the sacrum or if it has either anterior or posterior inclination.
3. Move your fingers to either side of the symphysis pubis, palpating the horizontal rami of the pubic bones toward the lateral portion of the pelvis.	**3.** Evaluate the curvature of the upper portion of the forepelvis for round and roomy or angular structure, which would decrease the oblique diameters of the inlet.
4. Follow the horizontal rami of the pubic bone on one side of the pelvis to the lateral portion of the pelvic inlet. Then palpate down the pelvic sidewall to the ischial spine. Be sure to get to the lateral portion of the pelvis before beginning your descent from the inlet to the midpelvis. Otherwise, by starting your descent too early, you will end up at the ischial tuberosity rather than at the ischial spine. This maneuver is used not only for evaluation of the pelvic sidewalls but also as a means of locating the ischial spine.	**4.** Evaluate the pelvic sidewall and determine if it is straight, convergent, or divergent.
5. Palpate the ischial spine.	**5.** Evaluate the ischial spine for its protuberance and determine if it is blunt (or flat), prominent (or sharp), or encroaching.
6. Sweep your fingers across the pelvic cavity to the ischial spine on the opposite side of the pelvis, palpate it, and sweep your fingers back to the first spine.	**6.** This is done to estimate the distance between the ischial spines. While the interspinous (transverse) diameter cannot be clinically measured, you can get an impression of its adequacy. This impression improves in accuracy with experience, comparing clinical findings with x-ray or CT pelvimetry whenever circumstances provide this opportunity, and practicing on objects whose diameters you can measure.
7. Starting at the ischial spine, outline the sacrosciatic notch and return to the ischial spine.	**7.** Note the shape and height of the sacrosciatic notch.
8. Now palpate across the sacrosciatic notch, following the sacrospinous ligament from the ischial spine to the sacrum.	**8.** Measure the width of the sacrosciatic notch, which is the same as the length of the sacrospinous ligament, in terms of fingerbreadths.

Procedure and Rationale	Description of Findings
9. From where you ended on the sacrum after following the sacrospinous ligament over, move down the sacrum to the coccyx. Press firmly on the coccyx. (See Step 18 if you are not sure of mobility.)	**9.** Note whether the coccyx is mobile. The coccyx is described as movable or fixed.
10. Now walk your fingers up the sacrum (palpating its width as you go) as far as you can reach.	**10.** Determine whether the sacrum is hollow, flat (or straight), or J-shaped (Figure 61-7). Note if the sacrum is in alignment with the sacral promontory or instead is either anteriorly or posteriorly inclined. Also note the longitudinal axis of the sacrum and correlate it with the position of the symphysis pubis you have already felt in order to determine if the symphysis is parallel with or has either anterior or posterior inclination in relation to the sacrum.
11. The diagonal conjugate is measured next. You can reach the sacral promontory in one of two ways. The first is a continuation of the preceding step in which you walk your fingers up the sacrum to the sacral promontory. However, if the sacrum is hollow it is possible that you might lose contact with the sacrum as it may become too far away for you to reach. It is possible to extend the normal reach of your fingers by depressing the perineum by exerting pressure against it. This also exerts pressure on the juncture of your first finger (palm) with your thumb, which additionally extends your reach. You can exert maximal pressure against the perineum by supporting the elbow of your examining hand against either your hip or your thigh (which is elevated horizontally by placing your foot on a stool) and using this as a brace to further exert pressure against the perineum. Reaching for the sacral promontory involves having your examining hand at the proper angle and in the proper location. It helps to visualize mentally where the sacral promontory is in relation to the vaginal introitus. The tips of your examining fingers should be in the posterior fornix of the vagina. Then drop your wrist (it helps to lower your elbow) and press against the perineal body with the knuckles of your last two fingers. Dropping your wrist changes the direction of your fingers from horizontal to angled upward. This angle needs to be approximately 45 degrees. If you feel the sacral promontory, maintain contact with it while raising your wrist until your hand touches the inferior margin of the symphysis pubis. With your other hand, mark on your examining hand the point that is touching the symphysis pubis. After removing your hand from the vagina, measure the distance from the tip of the finger that was touching the sacral promontory to the mark indicating where your hand was touching the symphysis pubis.	**11.** If you felt the sacral promontory, then you can chart whatever measurement you obtain for the diagonal conjugate. If you did not feel the sacral promontory, then chart the diagonal conjugate as greater than whatever you have measured the length of your examining fingers to be.

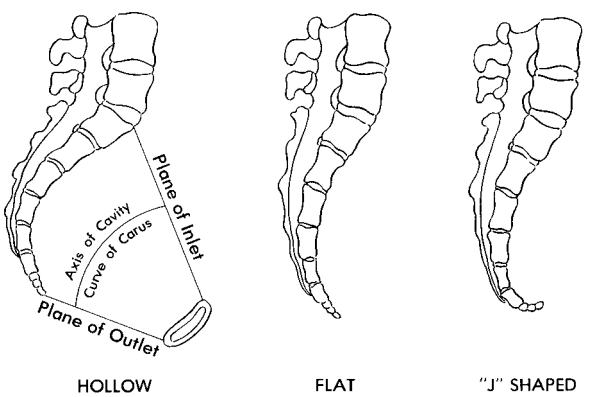

FIGURE 61-7 Sacral shapes.

Procedure and Rationale	Description of Findings
If you are unable to feel the sacral promontory, you know that the diagonal conjugate is greater than the length of your examining fingers, which you have already measured. Measurement of the diagonal conjugate is the last of the internal evaluations of the bony pelvis to be done, as it is the most uncomfortable. The woman should be forewarned that this maneuver may be uncomfortable for her.	
12. As you withdraw your fingers from the woman's vagina, turn them so that they are horizontal and place them against the inferior margin of the symphysis pubis.	**12.** If your fingers fit comfortably in this location, the pubic arch is probably at least a 90 degree angle. If you cannot fit your two fingers in this location, the pubic arch is probably less than a 90 degree angle.
13. With the thumbs of both of your hands palpate the pubic arch by following it down the descending rami of the pubic bones.	**13.** The arch should become progressively wider from a rounded apex. Visualize the angle of the arch immediately below the symphysis pubis as you palpate and combine these findings with those of Step 12 to finalize your determination of the angle of the pubic arch.
14. Continue your palpation down the pubic rami to the ischial tuberosities. Measure the transverse diameter of the outlet (intertuberous diameter; biischial diameter) either by using a Thom's pelvimeter or by placing your premeasured fist between the tuberosities.	**14.** Chart your measurement of the intertuberous diameter either as what it measured if you used a Thom's pelvimeter or as greater or lesser than the measured width of your fist. If you use your fist, it is important to recognize that the thickness of the tissue between your bones and the woman's bones will make the actual bony measurement approximately 1 cm greater. This centimeter, however, is not added to your measurement but should be considered in evaluating the adequacy of the intertuberous diameter.
15. If you have a Thom's pelvimeter, measure the posterior sagittal diameter. The anterior sagittal diameter is not generally measured. It is not possible to measure either of these diameters with your hands.	**15.** The posterior sagittal diameter of the pelvic outlet should measure 7.5 cm.
16. It is possible, although not usually done, to measure the anteroposterior diameter of the pelvic outlet with your hands. If this measurement is done, it should be done after doing the diagonal conjugate and before removing your examining hand from the vagina. Simply come down the sacrum from the promontory until you locate the tip of the sacrum and place the tip of one of your examining fingers on the tip of the sacrum (at the sacrococcygeal junction); then raise your examining hand until it touches the inferior margin of the symphysis pubis, while maintaining contact with the tip of the sacrum with the tip of your finger. With your other hand, mark on your examining hand the point that is touching the symphysis pubis and measure the distance between that point and the tip of the finger that was on the tip of the sacrum.	
17. If you have had difficulty evaluating middle and lower pelvic structures vaginally, end your examination of the pelvis during the rectovaginal examination to confirm your vaginal findings, as it is easier to feel these structures through the rectum. This includes palpation of the coccyx, ischial spines, sacrospinous ligament, and the lower sacrum.	
18. If you are unsure of coccyx mobility, test for it during the rectovaginal examination by holding the coccyx between your rectal finger and your thumb, which is positioned externally. Now attempt to move it back and forth between your finger and your thumb.	
19. Some midwives believe that it is necessary to palpate and evaluate completely both sides of the bony pelvis. Other midwives believe that, with the exception of sweeping across the pelvic cavity to feel the opposite ischial spine and estimate the transverse diameter of the midplane, it is sufficient to actually feel	

only one side of the bony pelvis, unless an obvious pelvic deformity is observed during the physical examination from the woman's posture, stance, and position of the lower spinal column. In such rare cases both sides of the bony pelvis should be evaluated. Otherwise, you can assume that the two sides of the pelvis are equilateral and thus reduce the amount of discomfort to the woman by palpating only one side.

The procedure described above is in accord with the latter viewpoint. Those who believe in complete examination of both sides of the pelvis can do so either by turning their examining hand over or by switching hands for palpation of the second side.

20. If evaluation of the bony pelvis was incorporated as part of the total pelvic examination, you now proceed with the remainder of the pelvic examination. If clinical pelvimetry was done as an isolated procedure, then the procedure ends with giving the woman wipes with which to clean off, disposing of the wipes and your gloves in a hazardous biological waste receptacle, and sharing your findings with her as outlined in Steps 12 to 16 in "The Rectovaginal Examination" in Chapter 56.

Evaluation of Findings

The following is a listing of generally accepted findings from clinical evaluation of the bony pelvis that indicate pelvic adequacy:

forepelvis: rounded
sidewalls: straight
ischial spines: blunt
sacrospinous ligament: $2\,^1/_2$ to 3 fingerbreadths
coccyx: movable
sacrum: hollow
diagonal conjugate: 11.5 cm or greater
pubic arch: 90 degrees or greater (2 fingerbreadths)
intertuberous diameter: 8 cm or greater

Variations of the above findings in and of themselves would not indicate pelvic inadequacy. It is well to remember that these rather precise findings must be combined with the other findings regarding inclination of the symphysis pubis, depth and angle of the sacrosciatic notch, alignment of the sacrum, and roominess of the posterior portion of the pelvis. The sum of all these findings gives a composite mental image of the total pelvis and its general type.

The individual pelvic architecture is then weighed against the estimated size of the fetus at term, the type of presenting part, and its position. A determination of pelvic adequacy is made from these findings. Often when evaluation of the bony pelvis is done early in pregnancy, the pelvis is deemed adequate for a certain size baby. This specificity is helpful if there is a question of adequacy when the baby ends gestation larger than that size. For example, charting may include a summary statement such as "adequate for a $7\,^1/_2$-pound baby"; if the estimated fetal weight at term is 8 pounds, the midwife is alerted to a potential problem requiring reevaluation of the pelvis and evaluation of labor status.

Bibliography

Hamlin, R. H. J. *Stepping Stones to Labour Ward Diagnosis*. Adelaide, Australia: Rigby Limited, 1959.

Pritchard, J. A., and MacDonald, P. C. *Williams Obstetrics*, 15th ed. New York: Appleton-Century-Crofts, 1976.

Steer, C. M. *Moloy's Evaluation of the Pelvis in Obstetrics*, 3rd ed. New York: Plenum Medical Book Company, 1975.

Thoms, H. *Pelvimetry*. New York: Hoeber-Harper, 1956.

Ullery, J. C., and Castallo, M. A. *Obstetric Mechanisms and Their Management*. Philadelphia, PA: F. A. Davis Company, 1957. Chapter 1.

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CHAPTER

62

Breast Massage, Manual Expression, and Nipple Rolling

Breast massage, manual expression, and nipple rolling are skills a mother can use while initiating breastfeeding and during the entire period she breastfeeds her baby. These skills also increase the woman's familiarity with her breasts and comfort and naturalness in touching and caring for them.

Breast massage and manual expression initially promote the flow of breast milk by clearing the lactiferous sinuses and ducts of the early viscid colostrum and establishing the free flow of the later, less viscid, colostrum. They also are used for relieving engorgement, helping the baby latch on, and collecting breast milk for bottle feeding (e.g., of preterm babies or when the mother will not be available).

Nipple rolling strengthens the erector muscles of the nipples, thereby providing an erect nipple for the baby to latch on to. If a woman has flat or inverted nipples, it should be remembered that how the nipple looks is not predictive of how well it will function if it is placed well back in the baby's mouth [1].

Breast massage and manual expression should not be done prior to delivery for two reasons:

1. Antepartal breast stimulation may cause the release of oxytocin, which may in turn cause the initiation of preterm labor.
2. The viscid colostrum serves as a barrier to bacteria antepartally. Removing colostrum would leave the breasts susceptible to possible infection.

Nipple rolling, along with breast foreplay and sexual intercourse, should be prohibited if the woman has a history or any signs and symptoms of preterm labor.

Breast massage and manual expression are done in that order, because massage increases circulation and facilitates the flow of milk through the ductal system of the lactiferous sinuses. Manual expression then expresses the milk out of the sinuses and through the ducts in the nipple to the surface of the nipple. The application of warmth to the breasts prior to massage increases the circulation and the flow of milk.

Instruct the woman to first do the following before starting breast massage and manual expression or nipple rolling:

1. Wash your hands.
2. Be comfortably seated.
3. Remove clothing covering your breasts.
4. Protect other clothes by covering them; cover your lap with a bath towel.
5. Lubricate your hands with some form of lubricant—e.g., hand lotion or cream, mineral oil, baby oil, or cocoa butter for the breast massage; and baby-safe lubricant or nipple cream for manual expression and nipple rolling.

Procedure for Breast Massage

The following is the procedure for breast massage:

1. Visualizing the breast as the face of a clock, place one hand, palmar side down, at 12 o'clock just above the upper margin of the breast. Place the other hand, palmar side down, on top of the first hand.

2. Apply firm, even pressure while drawing the two hands apart laterally so that one hand goes down each side of the breast.
3. As the hands go down the sides of the breast, keep the thumbs on the upper portion of the breast as the fingers again meet and cover each other under the breast, thereby cupping the breast.
4. Continuing the firm, even pressure, draw the breast upward and forward as the fingers press up toward the areolae and nipple and the thumbs press down toward the areolae and nipple.
5. Without touching the areolae and nipple, allow the breast to slip between the fingers and thumbs as they slide off of the breast.
6. Repeat steps 1 to 5 in sequence 10 to 15 times, relubricating the hands as needed.

Procedure for Manual Expression

The following steps are used for manual expression:

1. Support a breast with one hand.
2. Use the thumb and index or middle finger of the other hand and place them across from each other on opposite sides of the nipple at the outer margin of the areola. (The lactiferous sinuses are located in the area beneath the outer edge of the areola.)
3. a. Using a milking motion, press backward (away from the areola), then inward (down into the tissue), then forward (toward the nipple), and then release the pressure.
   b. Apply gentle yet firm pressure. Undue pressure could traumatize the tissue, yet the pressure must be firm enough to actually compress the sinuses.
4. Observe for beads of colostrum or milk on the nipple surface where the duct openings are. A mother may not observe beads of colostrum or milk when first doing manual expression. However, with repeated expression, all of the ducts will soon become free-flowing, and not only will she see colostrum or milk, but she will observe little squirts or streams with each milking motion.
5. Gently wipe or blot the colostrum or milk off the nipple surface with a clean washcloth.
6. Methodically move the thumb and finger around the areola, repeating steps 2 to 5 for each location. There are 15 to 20 lactiferous sinuses, all of which should be emptied. This means that the entire process will involve eight to ten thumb and finger placements, with the thumb having covered one half of the areola and the finger the other half of the areola by the end of all the placements.
7. When first doing manual expression, perform the milking motion no more than twice for each location in order not to traumatize tissue while the technique is being learned. After all ducts have become free-flowing and the woman has become adept with the technique, manual expression can be done until the flow of colostrum or milk ceases.

Procedure for Nipple Rolling

The following procedure can be used for nipple rolling:

1. Support a breast with one hand.
2. Place the nipple between the thumb and the index finger of the other hand. Proper placement of the thumb and index finger on the nipple avoids the nipple surface (end) where the ducts open and includes the entire side of the nipple down onto the adjacent aspect of the areola.
3. Apply gentle pressure and roll the nipple back and forth as far as it will go between the thumb and finger without moving the placement of either on the nipple.
4. Roll the nipple for approximately 30 sec.
5. Repeat steps 1 to 4 for the other breast.
6. Avoid skin friction with light lubrication on the thumb and index finger, yet not so much lubrication that the nipple becomes too slippery to manipulate.

Reference

1. Riordan, J., and Auerbach, K. G. *Breastfeeding and Human Lactation*. Boston, MA: Jones and Bartlett, 1993, pp. 379–380.

Additional Reference

Wiedenbach, E. *Family-Centered Maternity Care*, 2nd ed. New York: G. P. Putnam, 1967, pp. 209–214.

CHAPTER

63

Injection of Intradermal Sterile Water Papules for Relief of Low Back Pain in Labor

SARASWATHI VEDAM, CNM, MSN

Back pain in labor, especially when caused by an occiput posterior position, is one of the most challenging conditions for the midwife to treat effectively. The tension caused by this pain has been associated with prolonged labor, increased need for pain medication, and prevention of the spontaneous rotation of the vertex to an anterior position. Several techniques have been reported to be helpful, including massage, counterpressure, applied heat or ice, transcutaneous electrical nerve stimulation (TENS), and hydrotherapy. However, most of these offer only partial relief with constant application by another person.

Methods of counter–irritation, acupuncture, and sterile water or saline injections have been used for many years to effectively treat back pain associated with renal colic, sacral pain, and whiplash injuries [1–6]. These techniques have been recently adapted for use in labor. A few controlled studies of intradermal sterile water injections have reported significant analgesic effects lasting 2 to 3 hours in 85 to 90 percent of women [7–11]. This technique offers the advantages of needing minimal, readily available equipment, adaptability to any setting, simplicity of application, and nearly immediate relief with lasting effects. The main disadvantage is the sensation of intense burning or stinging at time of application. This effect lasts 30 to 90 seconds.

The onset of relief occurs within 2 minutes of injection and usually lasts 2 to 3 hours. The technique may be repeated up to three times, but some women will decline reapplication because of the initial burning. Some women will experience no relief or only partial relief. The exact location of the injected papules can influence the effectiveness. Hence, prior to injection, the midwife should assess both fetal position and individual preferred focal points for pressure.

Method

1. Explain procedure to woman and support persons, including benefits, risk, expected onset of relief, and side effect of burning at site for 30 to 90 seconds. Prepare woman and support persons with methods of maintaining an immobile position and coping with discomfort during procedure.

Rationale

1. Informed consent is recommended for any obstetrical procedure. Prior understanding of the method may facilitate acceptance and tolerance of side effect as well as ease of application.

Method	Rationale
2. Place woman in a sitting, kneeling, or standing position, stabilizing herself with her arms and hands as she leans forward slightly. Expose her lower back enough to visualize the sacral dimples which correspond to the dorsal sacral foramina.	**2.** The injection sites in the sacral area will be more visible when the woman leans forward and flattens her back. She is most capable of providing an immobile surface when she supports herself.
3. Place and press the pads of your index fingers and thumbs into the sacral dimples so that your fingertips touch the corners of a trapezoid (see Figure 63-1). Move them very slightly laterally and vertically until the woman indicates the points of greatest relief.	**3.** The degree of relief provided by this pressure can indicate the best location for injection sites.
4. Have an assistant draw a half-circle around your fingertips while they remain in place. If you are alone you can ask a support person for help or use your own hands alternately.	**4.** The injection site must be exactly over the points of pressure that bring the woman relief. When you remove your fingers you may not be able to recognize the points without a landmark.

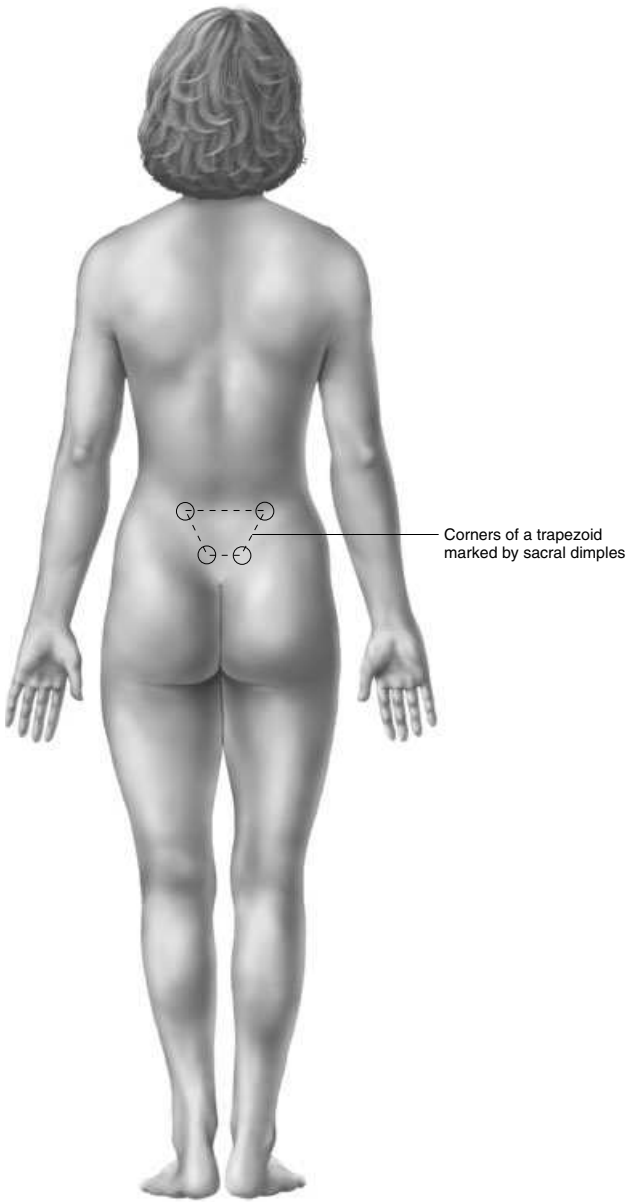

FIGURE 63-1 Injection sites for sterile water papules.

Method	Rationale
5. Draw up or have an assistant prepare a 1-cc syringe with 0.6 mL of sterile water and a 25-gauge needle.	**5.** You will create a papule with 0.1 to 0.15 mL of injected sterile water at each of 4 sites.
6. Remind the woman that she will feel temporary burning and stinging as you place the papules.	**6.** Preparation may enhance her ability to keep still for the procedure.
7. Clean the sites with an alcohol swab, taking care not to erase the marks. Inject 0.1 to 0.15 mL intradermally in each of the 4 points you have delineated (within the half-circle mark) until the distended skin forms a blanched 1-cm bleb or papule. If you have an assistant, two papules may be injected simultaneously to reduce the burning episodes by half.	**7.** The papules will provide the pressure or counter-irritation analgesia. Simultaneous injection may enhance the woman's willingness to repeat the procedure if necessary.
8. The onset of relief should occur within 2 minutes. If the relief is uneven the woman can usually tell you which side needs to be replaced. Once the effects have worn off (in 1 to 3 hours depending on the woman and the baby's position and station), the papules may be replaced with the woman's consent. More than three applications may not be advisable.	**8.** If the relief is uneven, the area of less analgesia is often consistent with a bleb that is noted to absorb too quickly, is misplaced, or was injected too deeply. Replacing the papule slightly laterally or vertically often achieves the desired effect. The cumulative local irritation may make the reapplication more uncomfortable and the available sites for injection will be reduced with successive applications.
9. Dispose of the needle(s) and syringe(s) in a biological hazardous waste disposal receptacle.	**9.** Protect yourself and others from needle injury or bloodborne pathogens.

References

1. Gammon, G. D., and Starr, I. Studies on the relief of pain by counterirritation. *J. Clin. Invest.* 20, 13–20, 1941.

2. Melzack, R. Prolonged relief of pain by brief, intense transcutaneous somatic stimulation. *Pain* 1(4):357–373 (December) 1975.

3. Fox, E. J., and Melzack, R. Transcutaneous electrical stimulation and acupuncture: comparison of treatment for low-back pain. *Pain* 2(2):141–148 (June) 1976.

4. Byrn, C., Olsson, I., Falkheden, L., et al. Subcutaneous sterile water injections for chronic neck and shoulder pain following whiplash injuries. *Lancet* 341:449–452 (February) 1993.

5. Garvy, T., Marks, M., and Wiesel, S. A prospective, randomized double-blind evaluation of trigger-point injection therapy for low-back pain. *Spine* 14:962–964, 1989.

6. Trolle, B., Moller, M., Kronborg, H., and Thomsen, S. The effect of sterile water block on low back labor pain. *Am. J. Obstet. Gynecol.* 164(5, pt. 1):1277–1281 (May) 1991.

7. Ader, L., Hansson, B., and Wallin, G. Parturition pain treated by intracutaneous injections of sterile water. *Pain* 41(2):133–138 (May) 1990.

8. Reynolds, J. L. Intracutaneous sterile water for back pain in labour. *Can. Fam. Physician* 40:1785–1788, 1791–1792 (October) 1994.

9. Lytzen, T., Cederberg, L., and Moller-Nielsen, J. Relief of low back pain in labor by using intracutaneous nerve stimulation (INS) with sterile water papules. *Acta Obstet. Gynecol. Scand.* 68(4):341–343, 1989.

10. Martenson, L., and Wallin, G. Sterile water: labor pain treated with cutaneous injections of sterile water: a randomized controlled trial. *Br. J. Obstet. Gynaecol.* 106:633–637, 1999.

11. Labrecque, M., Nouwen, A., Gergeron, M., and Rancourt, J. F. A randomised controlled trial of nonpharmacologic approaches for relief of low back pain during labor. *J. Fam. Pract.* 48:259–253, 1999.

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CHAPTER

64

Inserting an Intrauterine Pressure Catheter; Amnioinfusion

The intrauterine pressure catheter (IUPC) is used for two different purposes: internal monitoring of the contractions for evaluation of the fetal heart, and amnioinfusion. Use of an intrauterine pressure catheter requires that there be an indication for an invasive procedure, spontaneous or artificial rupture of the membranes, and at least 1- to 2-centimeters cervical dilatation.

You need to become familiar with the type of internal monitoring device used in your practice or institution, as there are many different makes and models. Some of the newer catheters are made of a firmer plastic, do not require fluid filling or a guide, and may be zeroed while inserted. The procedure for insertion of these newer catheters is the same as the procedure described here except the catheter acts as its own guide and there is nothing to remove after insertion.

Most catheters have built-in ports for amnioinfusion, which allow for simultaneous instillation of fluid and monitoring. You will need an assistant to help you with this procedure, especially if using a fluid-filled catheter.

Procedure	Rationale
1. Explain to the woman why you wish to place an intrauterine pressure catheter. Discuss the information you hope to gather from the use of the monitor, what the woman will feel during and after insertion of the catheter, and the benefits and risks of internal monitoring, and answer any questions the woman or her partner or support person may have. Get the woman's consent for the procedure and chart the content of this discussion and her agreement to the procedure.	**1.** Your goal is to elicit cooperation and make the woman a participant in her health care decisions. Informed consent ensures that she understands and agrees to the procedure. Charting your discussion and her agreement is good risk management for you.
2. Gather all necessary equipment and ensure it is in working order. You will need the following: **a.** the catheter **b.** sterile gloves **c.** adhesive tape **d.** an electronic fetal monitor with the capability for internal monitoring **e.** if the catheter is fluid-filled, you will also need the following:	**2.** Gathering all equipment before you begin allows you to proceed smoothly and ensure that sterility is maintained.

Procedure	Rationale
(1) sterile normal saline or bacteriostatic water	**(1)** used to flush and fill the catheter
(2) 10-mL syringe	
(3) appropriate connecting devices	**(3)** see manufacturer's instructions for details on assembling the particular catheter you will be inserting
3. See steps 2 through 9 under "Preparatory and General Procedures" for the pelvic examination (Chapter 56, pages 1169–1171).	**3.** Following these steps makes the procedure as comfortable as possible and protects the woman's privacy and modesty.
4. Place the woman in a supine position with the head of the bed slightly elevated and a small pillow or rolled towel under her right hip.	**4.** The pillow or towel provides a left tilt to relieve pressure on the aorta and inferior vena cava and avoid supine hypotension [1].
5. Have the woman separate her knees and let her legs drop to the sides as far as comfortable/possible.	**5.** This signals her readiness for the procedure and makes the examination and procedure easier for both of you.
6. Position yourself for comfort and maintenance of sterility.	**6.** A sterile insertion is essential to prevent infection.
7. Put on sterile gloves.	**7.** This is a sterile procedure to prevent intrauterine infection.
8. Establish a sterile field. Have sterile equipment unwrapped and placed on the field. If the catheter you will be inserting is fluid-filled, hand the end to an assistant to be flushed and filled with sterile normal saline or bacteriostatic water. The assistant then continues to hold the now nonsterile end of the catheter so it does not contaminate the sterile field.	**8.** This will maintain sterility of the procedure.
9. Perform a sterile vaginal examination, placing the fingers of your examining hand inside the internal os of the cervix. Note cervical effacement and dilatation and station of the presenting part.	**9.** Assessing the cervical status at the same time you are inserting the intrauterine pressure catheter decreases the number of vaginal examinations. Insertion of your fingers through the internal os, when possible, facilitates correct direction and proper placement of the catheter.
10. Place the catheter inside the guide and insert the guide into the cervical os. Be careful not to extend the tip of the guide beyond the tips of your examining fingers (see Figure 64-1).	**10.** Placing the catheter no further than the tips of your examining fingers ensures that the rigid guide, which is made of firm plastic, will not cause injury to the fetus, uterus, or placenta.
11. Hold the guide in place and advance the flexible catheter approximately 18 inches into the uterine cavity. You will know the catheter is in 18 inches when a mark on the catheter reaches the vaginal introitus.	**11.** Inserting 18 inches of catheter ensures that the catheter will reach the contractile uterine fundus.
12. The catheter should advance smoothly and easily with firm pressure. If you encounter resistance, *STOP*. Redirect the catheter by either changing the angle of the guide or moving the guide and the catheter 90° to a different cervical location [2]. Try again.	**12.** Resistance to the advance of the catheter may be due to fetal parts, the uterine wall, or the placenta. Use of excessive force could result in fetal injury, placental separation, or uterine rupture.
13. When the catheter is in place, hold it with your fingers while sliding the guide out of the vagina.	**13.** Holding the catheter prevents it from being pulled out with the guide.

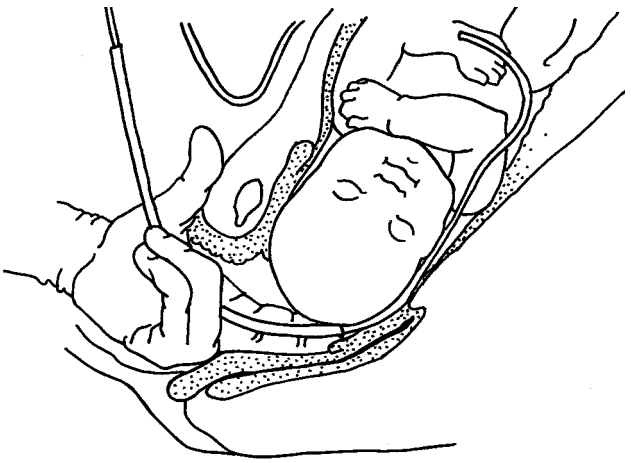

FIGURE 64-1 Insertion of intrauterine pressure catheter.

Source: From Freeman, R. K., Garite, T. J., and Nageotte, M. P. *Fetal Heart Rate Monitoring*, 2nd ed. Baltimore, MD: Williams and Wilkins, 1991, p. 47. Reprinted by permission.

Procedure	Rationale
14. Observe for return flow of amniotic fluid. If no fluid flows from the catheter, reevaluate placement.	**14.** Intraamniotic placement of the catheter will return at least a small amount of fluid. If no fluid return occurs, the catheter may be placed outside of the amniotic sac [3].
15. Flush the catheter and connect it to the monitor in accord with the manufacturer's directions.	
16. Tape the catheter to the woman's leg.	**16.** Prevents the catheter from being dislodged with maternal movement
17. Help the woman clean up and assist her into a comfortable position.	
18. Discard all materials, your gloves, and the guide in a hazardous biological waste receptacle.	
19. Evaluate the findings obtained by the intrauterine pressure catheter, readjust the monitor if necessary, then explain the results to the woman.	

• • • References

1. Snell, B. J. The use of amnioinfusion in nurse-midwifery practice. *J. Nurse-Midwifery* 38 (2 suppl.):67S (March/April) 1993.

2. Freeman, R. K., Garite, T. J., and Nageotte, M. P. *Fetal Monitoring*, 2nd ed. Baltimore, MD: Williams and Wilkins, 1991, p. 47.

3. Lind, B. K. Complications caused by extramembranous placement of intrauterine pressure catheters. *Am. J. Obstet. Gynecol.* 180(4):1034–1035 (April) 1999.

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CHAPTER

65

Attaching a Fetal Scalp Electrode

Use of a fetal scalp electrode requires that there be an indication for an invasive procedure, spontaneous or artificial rupture of the membranes, and at least 1- to 2-centimeters cervical dilatation.

Because the tip of the electrode penetrates the fetal scalp, there is the possibility of trauma, bleeding, and infection. Attaching a fetal scalp electrode thus should be avoided, if possible, with unknown fetal presentations or presenting parts, with face presentations, or in the presence of a known vaginal infection (e.g., herpes, gonorrhea, chlamydia, HIV) or unexplained bleeding (may be placenta previa) [1–3]. Attachment of a fetal scalp electrode is always done under aseptic conditions to prevent both infection of the fetal scalp and intrauterine infection.

Procedure	Rationale
1. Explain to the woman why you wish to place a fetal scalp electrode. Discuss the information you hope to gather, what the woman will feel during and after the procedure, and the benefits and risks of fetal scalp monitoring, and answer any questions the woman or her partner or support person may have. Get the woman's consent for the procedure and chart the content of this discussion and her agreement to the procedure.	**1.** Your goal is to elicit cooperation and make the woman a participant in her health care decisions. Informed consent ensures that she understands and agrees to the procedure. Charting your discussion and her agreement is good risk management for you.
2. Gather all necessary equipment and ensure it is in working order. You will need the following: **a.** the fetal scalp electrode assembly **b.** sterile gloves **c.** an electronic fetal monitor with the capability for internal monitoring **d.** leg plate with Velcro strap or adhesive patches and cable to fetal monitor **e.** conductive jelly	**2.** Gathering all equipment before you begin allows you to proceed smoothly and ensure that sterility is maintained.
3. Attach the leg plate to the woman's thigh.	**3.** The leg plate is now ready for you to attach the wires from the spiral electrode.
4. See steps 2 through 9 under "Preparatory and General Procedures" for the pelvic examination (Chapter 56, pp. 1169–1171).	**4.** Following these steps makes the procedure as comfortable as possible and protects the woman's privacy and modesty.

Procedure	Rationale
5. Place the woman in a supine position with the head of the bed slightly elevated and a small pillow or rolled towel under her right hip.	**5.** The pillow or towel provides a left tilt to relieve pressure on the aorta and inferior vena cava and avoid supine hypotension [1].
6. Have the woman separate her knees and let her legs drop to the sides as far as comfortable/possible.	**6.** This signals her readiness for the procedure and makes the examination and procedure easier for both of you.
7. Position yourself for comfort and maintenance of sterility.	**7.** A sterile insertion is essential to prevent infection.
8. Put on sterile gloves.	**8.** This is a sterile procedure to prevent fetal scalp and intrauterine infection.
9. Perform a sterile vaginal examination.	**9.** A sterile exam is necessary to prevent infection.
a. Note cervical effacement and dilatation, and station of the presenting part.	**a.** Assessing the cervical status at the same time you are attaching a fetal scalp electrode decreases the number of vaginal examinations.
b. Identify the presenting part. If the presenting part is vertex, locate the suture lines and fontanels. If the presenting part is the breech, assess for location of the genitalia.	**b.** The electrode should be attached over cranial bones, not on suture lines or fontanels. In a breech presentation, the electrode may be attached to the fetal buttocks but not on the genitals.
10. Advance the guide tube between your examining fingers. Be sure the spiral end of the electrode within the drive tube is withdrawn 1 inch inside the guide tube (see Figure 65-1).	**10.** Advancing the tube between your fingers avoids injury to maternal tissue by the guide tube and by the spiral electrode during insertion through the vaginal and cervical canals. This technique also ensures that the spiral electrode that is to be inserted into the fetal scalp remains sterile.
11. Place the guide tube firmly against the fetal presenting part where you are going to attach the fetal scalp electrode at a right angle.	**11.** and **12.** This ensures firm and complete attachment of the spiral electrode into the fetal presenting part.
12. Stabilize the guide tube between your two internal examining fingers. Grasp the drive tube with your external hand. Advance the drive tube containing the fetal scalp electrode until the drive tube and electrode reach the presenting part.	
13. Rotate the drive tube clockwise one full turn until you feel mild resistance and the drive tube recoils. One full turn (360°) is enough.	**13.** Rotating the drive tube causes the tip of the spiral electrode to penetrate the fetal scalp and be attached. Turning the drive tube more than 360° may cause tissue injury [1]. The electrode penetrates the presenting part 1.5 millimeters [3].

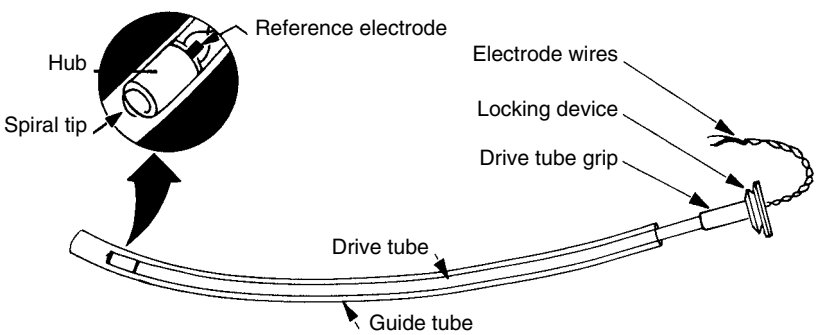

FIGURE 65-1 Fetal monitoring spiral electrode assembly.

Source: Adapted from *Disposable Spiral Electrode for Fetal Monitoring: Instructions for Use*. Andover, MA: Hewlett Packard. Reprinted by permission.

Procedure	Rationale
14. Release the locking device on the drive tube.	**14.** This will free the electrode from the drive tube.
15. Carefully remove the drive and guide tubes so as not to disturb the attachment of the electrode.	**15.** This will free the electrode wires so they can be attached to the leg plate and allows for disposal of the drive and guide tubes.
16. Attach the electrode wires to the leg plate and the cable from the leg plate to the fetal monitor.	**16.** This allows for direct monitoring of the fetal heart tones.
17. Help the woman clean up and assist her into a comfortable position.	
18. Discard all materials, your gloves, and the guides in a hazardous biological waste receptacle.	
19. Evaluate the findings obtained by the spiral electrode, then explain the results to the woman.	

References

1. Freeman, R. K., Garite, T. J., and Nageotte, M. P. *Fetal Monitoring*, 2nd ed. Baltimore, MD: Williams and Wilkins, 1991, pp. 49–50.

2. *Disposable Spiral Electrode for Fetal Monitoring: Instructions for Use*. Andover, MA: Hewlett Packard.

3. Tucker, S. M. *Pocket Guide to Fetal Monitoring*, 2nd ed. St. Louis, MO: Mosby Year Book, 1992, pp. 39–41.

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CHAPTER

66

Perineal Prep (Cleaning)

The perineal cleansing prep is a procedure for making the perineum and surrounding region as clean as possible. The same basic procedure is followed regardless of when it is done for whatever reason (e.g., birth, sterile vaginal examination).

This procedure follows the principle of going from inside to outside (from a central point to the periphery), with inside being the area that requires cleaning and outside being the periphery or adjoining region. The inside therefore becomes the point of emphasis for both cleansing and avoiding contamination.

The purpose of this procedure is to clean, and merely passing lightly over the skin surface with cotton balls or 4 × 4s thwarts this purpose. Scrubbing—not so vigorous as to be painful but vigorous enough to cleanse—is called for.

The solutions used for the perineal cleansing prep vary, and therefore this discussion will not elaborate on them; rather, it will deal only with the mechanics of the actual cleaning itself. The use of cotton balls or gauze 4 × 4s also varies from setting to setting. This discussion will refer to 4 × 4s, with the understanding that cotton balls can be used instead.

The procedure is actually a series of steps to be gone through in the sequence presented. The sequence is important in order to avoid contamination of the perineal area. Dry 4 × 4s are held over the introitus during the first three series of scrubbing strokes.

1. The first series of scrubbing strokes begins at the level of the clitoris and moves back and forth across the mons pubis upward onto the lower abdomen (see Figure 66-1).
2. The second series of scrubbing strokes begins in the crease of the groin between the thigh and the lateral edge of the labia majora on one side and moves back and forth across the width of the inner thigh to midway up to the knee.
3. The third series of scrubbing strokes is the same as the second series only on the opposite side.

These first three series of scrubbing strokes direct any excess cleansing fluid to the outside and also ensure that contamination from the outside is not brought to the inside.

4. With very short back-and-forth motions (approximately 1 inch in length), scrub the labia majora on one side from the level of the clitoris downward past the level of the anus to the level of the bed or table.
5. Do the same on the opposite side.
6. With a single downward motion from front to back (or top to bottom) cleanse the vulva, perineum, and anus.

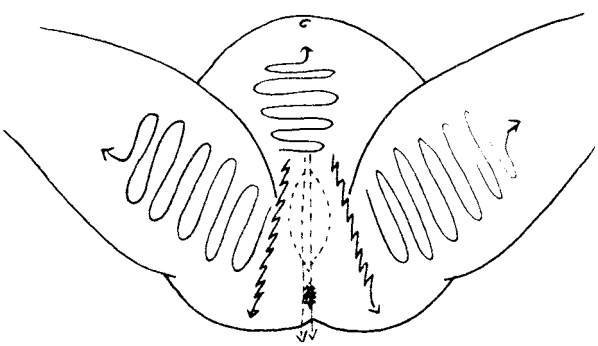

FIGURE 66-1 Cleaning the perineal area.

7. Repeat step 6 with a fresh 4 × 4. This is the one area cleansed twice.

Steps 4, 5, 6, and 7 are designed to avoid any contamination of the perineum or vulva from the anal area. In all of the above steps more than one 4 × 4 may be used at a time but none is reused. They are used once for a step and then discarded.

8. If any remaining solution is poured over the area it should be poured at the level of the vulva downward in order to avoid the contamination that would occur if the solution were poured higher over surrounding skin surfaces.
9. The wet underpad beneath the woman is removed and replaced with a dry sterile underpad.

CHAPTER

67

Second Stage Pushing

There are three reasons why it is important that a woman know how to push effectively during the second stage of labor. First, although maternal pushing effort is normally a natural response to a reflex mechanism, it is at times necessary for the woman to push without the benefit of the stimulating reflex mechanism. Second, a woman may feel like pushing but pushes so ineffectually that progress is inhibited. Third, a woman with epidural analgesia/anesthesia, which blunts the natural urge to push, will need assistance with pushing.

A number of techniques can enhance the maternal pushing effort and can change ineffectual pushing into effective maternal pushing.

Breath Control

The woman should be told either to push while exhaling, or to push after expiration as a forced exhalation, for short periods of time (5 to 6 seconds). This latter type of pushing often will be accompanied by a grunt. In such an effort the glottis is at least partially open, the abdominal muscles are shortened and contracted against the uterus, and the intrathoracic pressure doesn't increase to interfere with the venous return to the heart and produce its resulting effect on cardiac output and arterial pressure.

In contrast, the closed glottis type of pushing occurs when a woman is instructed to take a deep breath and hold it while she pushes for as long as she can—usually to a count of 10. However, it is possible that this kind of breath holding combined with prolonged bearing down may produce fetal hypoxia and acidosis, because holding her breath closes the mother's glottis and bearing down increases the intrathoracic pressure. This combination results in a drop in arterial pressure caused by decreased cardiac output due to diminished venous return to the heart. Decreased arterial pressure has two effects: it decreases blood flow to the placenta and decreases oxygen content in the blood that does circulate to the placenta. Fetal hypoxia may be prevented if the woman is given the open glottis pushing instructions.

Body Position

A woman can push in any position—on her back, on her side, on her hands and knees, kneeling, standing, or squatting. Her position depends on her preference and on the baby's and her own condition or situation. Squatting has the advantage of adding the effect of gravity to the bearing down effort. Upright positions (squatting, sitting, standing) may shorten the total length of labor. Second stage is facilitated because of the increased pressure of the fetal head on the pelvic floor and the improved alignment of the fetus with the pelvis (see Chapter 28).

Several techniques for effective pushing can be instituted best or only when the woman is in an elevated (reclining) position on her back. The following instructions are to be used when the woman is on her back. All of them must be done in order to enhance pushing effectiveness. Using one alone will not accomplish the desired effect.

When the woman starts her breathing for pushing, she brings her legs up and apart. She raises up

and curves her back, tucks her chin down onto her chest, and grasps either her knees or behind her thighs with her hands. Pillows, backrests designed for this purpose, or an arm placed underneath her shoulders help her get into the raised, curved-back position. In out-of-hospital settings the woman's partner or a support person may sit behind the woman. The importance of this position is that it directs the woman's pushing effort in the right direction. Many women arch their backs rather than curving their backs. This wastes their pushing effort because it decreases the force they could get behind the push if they were properly positioned.

Many women spoil their effort by letting their heads hang back. This posture diverts some of the pushing effort to the throat; in addition, it is distracting, since this is an uncomfortable position. If the woman starts a contraction with her head back and is unable to change and tuck her chin onto her chest, lift and support her head with a hand behind her head.

Grasping either her knees or behind her thighs with her hands serves two purposes: it helps her get into and maintain the curved position of her back and it provides her with something to pull back on as she pushes down. Another option to counterbalance her push, when in a standing or squatting position, is to pull down on an overhead rope or bar or press down on supportive arms.

Arm Position and Action

The maternal pushing effort is greatly facilitated if the woman has something to pull back on while she pushes down; this gives her a counterforce to push against. If grasping her knees or behind her thighs is not feasible, there are other means of providing a counterforce. In the hospital, the handlebars on the delivery room table serve this purpose, as do the bars on the side rails of her hospital bed. The best alternative in all settings is to have two people stand or sit on the bed on either side of the woman, below the level of her hips, facing her, and each extend a hand to her underneath her leg to grasp. As she pulls against these hands the two people also pull sufficiently to maintain their position and provide a counterbalance to her pulling.

How the woman pulls back is also important. Pulling straight back tends to throw her body out of its curved position and may cause her to arch her back. Therefore, her elbows should be bent and out from her sides as though she were rowing a boat. This will maintain her proper body position.

Pubic Pressure

This technique is done by someone other than the woman. It is used if the woman seems to be having some difficulty in pushing in the right place. The admonition to "bear down as if you were having a bowel movement" not only lacks in aesthetic quality but also misdirects the pushing effort more posteriorly than is optimal.

With the edge of your slightly cupped hand, apply mild pressure immediately above the symphysis pubis and instruct the woman to push against your hand. This directs her pushing effort more properly anteriorly and involves the maximum use of her abdominal muscles. The woman's bladder should be empty.

Vaginal Stimulation

This technique is also done by someone other than the woman. In instances when it is mandatory for the woman to push but she does not feel the urge to push, it is possible to stimulate the perineal floor reflex mechanism by simulating the pressure of the presenting part with your fingers. As the woman pushes, you insert two or three fingers into her vagina and firmly press down on the posterior vaginal wall. In keeping with the philosophy of nonintervention in normal processes and the principle of as little vaginal manipulation and examination as possible in order to reduce the possible introduction of infection, this technique is used only when absolutely indicated. Generally it is quite effective.

CHAPTER

68

Pudendal Block

Pudendal block is a regional anesthesia in which the pudendal nerve is blocked, or anesthetized. Pudendal block has these advantages:

1. It anesthetizes the perineum and vulva including the clitoris, labia majora, labia minora, perineal body, and rectal area.
2. It has no effect on the uterus or its contractions.
3. It poses minimal potential danger to the mother, provided the proper medication is used in proper amounts and is not inadvertently given intravenously.
4. It poses minimal potential danger to the baby if care is taken not to inadvertently give the anesthetic agent intravenously.

With the exception of local infiltration of the perineal body, as described in Chapter 69, pudendal block is by far the safest obstetric anesthesia known.

The anesthetic agent usually used in pudendal block is 1% lidocaine hydrochloride (Xylocaine), 10 mg/mL, although a number of other local anesthetics can be used. The length of effect of the anesthesia depends on the success of the pudendal block and on the medication. An effective block with lidocaine will last approximately $1\frac{1}{2}$ hours. Lidocaine has the advantage of being fast-acting. The amount used is 10 mL (100 mg) per side. The maximum safe total dosage of lidocaine is 500 mg. If you use 200 mg for the pudendal block, you will be able to use another 100 mg for a quick local infiltration of the perineal body if the pudendal block failed, and have some remaining, if needed, for further local infiltration for repair of the episiotomy or lacerations.

The pudendal nerve arises from the pudendal plexus, which is formed by branches of the second, third, and fourth sacral nerves. The pudendal nerve is the largest branch of the pudendal plexus and leaves it as a single nerve trunk. The pudendal nerve passes across the posterior surface of the sacrospinous ligament just as this ligament attaches to, or within 0.5 to 1.0 centimeters of, the ischial spine as the nerve momentarily leaves the pelvic cavity from the greater sciatic foramen and reenters the pelvic cavity in the lesser sciatic foramen (Figure 68-1). It is helpful to remember that it is the projection of the ischial spine that divides these two foramina. As the pudendal nerve enters the lesser sciatic foramen, it enters Alcock's canal, which directs the pudendal nerve anteriorly to the inferior ramus of the ischium and pubis. As it courses through Alcock's canal, the pudendal nerve divides into three main branches: (1) the inferior hemorrhoidal nerve, (2) the perineal nerve, and (3) the dorsal nerve of the clitoris. Each of these branches further subdivides to become the primary nerve supply of the perineum.

Thus the art of successfully performing a pudendal block lies in three things:

1. Knowing the pertinent anatomy
2. Identifying accurately, by palpation, the ischial spine and also, ideally, the sacrospinous ligament
3. Placing the anesthetic agent properly in relation to the ischial spine

The technique of pudendal block described here is the transvaginal route. A long, 12- to 15-centimeter (5- to 6-inch) 20- or 22-gauge needle is used, with or

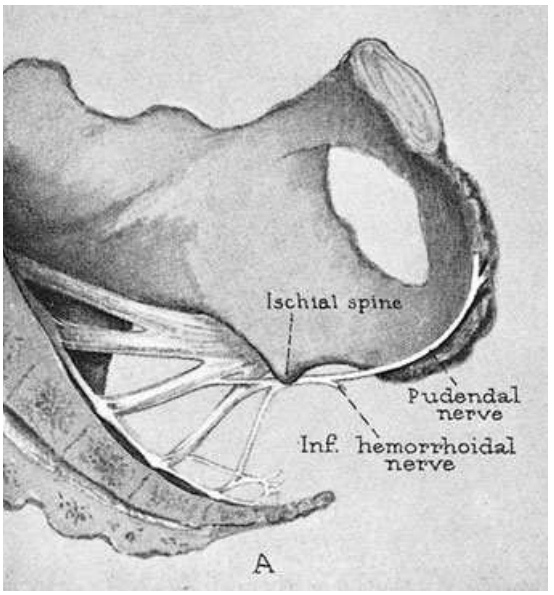

FIGURE 68-1 Relationship between the pudendal nerve and the bones of the pelvis.

Source: From Bonica, J. J. *Principles and Practice of Obstetric Analgesia and Anesthesia*, Vol. 1. Philadelphia, PA: Davis, 1967, p. 491. Reproduced by permission.

without a needle guide (see Figure 68-2). A needle guide is usually used if one is available; the most commonly used guide is an Iowa trumpet. Whatever is used, the needle guide should allow for the needle to protrude 1.5 centimeter beyond the end of the needle guide. A 10-mL syringe with a Luer-Lok attachment completes the necessary equipment in addition to the medication (poured into a medicine glass).

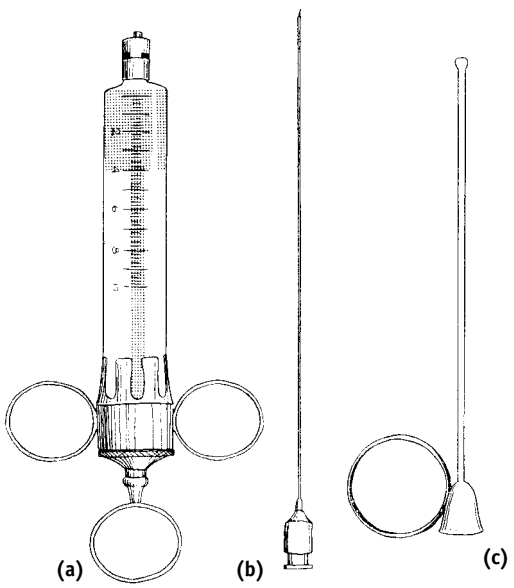

FIGURE 68-2 Equipment used for pudendal block: (a) 10-mL syringe; (b) 6-inch, 20-gauge needle; and (c) Iowa trumpet needle guide.

Source: From Bonica, J. J. *Principles and Practice of Obstetric Analgesia and Anesthesia*, Vol. 1. Philadelphia, PA: Davis, 1967, p. 495. Reproduced by permission.

If there is no needle guide, you can prevent the needle point from catching on the vaginal mucosa during insertion by holding the needle parallel in the groove between your two examining fingers with the point between your fingertips. If an Iowa trumpet is used, it is inserted first once your examining fingers have located the ischial spine, positioned, and then the needle with the syringe attached is inserted through this needle guide.

First you palpate the ischial spine. Use your left hand as the vaginal hand when palpating the woman's left ischial spine and your right hand as the vaginal hand when palpating the woman's right ischial spine. Then you insert the needle guide and position the end of it immediately beneath and medial to the inferior, medial border of the ischial spine (see Figure 68-3). Palpate the sacrospinous ligament. The protrusion of the needle is then inserted posterior to the ischial spine, through the sacrospinous ligament to the space occupied by the pudendal nerve and vessels. You will feel a slight give as the needle exits from the sacrospinous ligament and enters this space. This is a distance of approximately 1 to 1.5 centimeters (around $^1/_2$ inch) from the end of the needle guide.

Aspirate. Turn the needle 180° and aspirate again in order to assure yourself that the needle is not in a blood vessel and that the lack of blood return on the first aspiration was not merely caused by the bevel of the needle being snug against the inner wall of the vessel. This careful aspiration is a safeguard to ensure the safety of the procedure and must be performed deliberately as part of the procedure. This precaution is necessary because the internal pudendal artery and internal pudendal vein are immediately adjacent to the pudendal nerve, with the pudendal nerve actually lying between the posterior surface of the sacrospinous ligament and the internal pudendal vessels.

Intravenous injection of any of the local anesthetics will most probably cause maternal toxic reactions (possibly including respiratory depression, convulsions, and death) and fetal distress or neonatal depression. Great care must be taken to prevent inadvertent intravenous administration of the local anesthetic while performing a pudendal block. After assuring yourself that you do not have the needle point in a blood vessel, inject 10 mL of 1% lidocaine (100 mg).

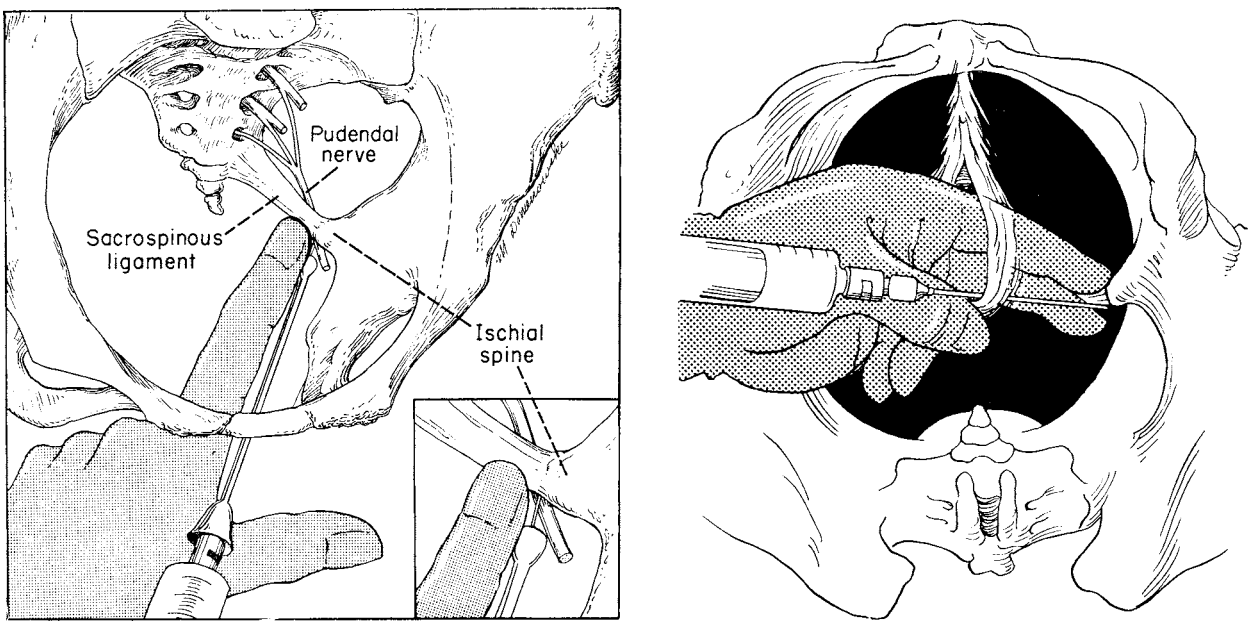

FIGURE 68-3 Position of the needle for pudendal nerve block using the transvaginal approach. (a) Superior view of the pelvis showing how the index finger is used to direct the needle point as it approaches the ischial spine. The figure illustrates the use of the Iowa trumpet guide. (b) The syringe is directed downward and laterally to pierce the vagina just below the projection of the ischial spine. In the final position the needle is parallel with the mother's longitudinal axis.

Source: From Bonica, J. J. *Principles and Practice of Obstetric Analgesia and Anesthesia*, Vol. 1. Philadelphia, PA: Davis, 1967, pp. 494, 495. Reproduced by permission.

Repeat the entire procedure for the other side. After injecting both sides and waiting a few minutes, test the effectiveness of the block by using a sharp object, such as a needle, to scratch along each side of the perineal area (both sides need to be evaluated). Confirmation of effectiveness for each side is from two sources: (1) the woman's lack of verbal complaint even when asked and (2) visual observation of a lack of anal sphincter or vaginal orifice contraction.

If the pudendal block is ineffective and you plan to cut an episiotomy, do a local infiltration as described in Chapter 69.

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CHAPTER

69

Local Infiltration

Perineal local infiltration before birth is done to anesthetize the area to be cut for an episiotomy and its subsequent repair. Local infiltration done after birth but before or during repair of an episiotomy or lacerations is to anesthetize the area to be repaired. At times the effects of a local infiltration done before birth may last throughout any repair work. At other times the effects may have worn off before the repair is completed or even begun, or the laceration may extend beyond the area originally anesthetized. Local infiltration of the unanesthetized area is then necessary.

Local Infiltration Before Birth

Local infiltration prior to birth is usually chosen as the method of anesthetizing the perineal body in the following circumstances:

1. When administration of a pudendal block has failed
2. When second stage has been so rapid as not to allow time for performance of a pudendal block
3. When the decision to perform an episiotomy is a last-minute decision, reversing an earlier decision not to do an episiotomy, and the fetal head is too low to do a pudendal block
4. When the woman has stated a preference for this mode of anesthesia if any anesthetic is indicated at all

Local infiltration is a second choice; a pudendal block is preferable. The primary reason is that a pudendal block anesthetizes a larger area (including the lower vaginal tract as well as the perineum) and provides anesthesia that does not distort the tissues for repair.

There are two techniques for local infiltration of the perineal body. Both techniques use a 22-gauge, $1\,^1/_2$-inch (4-centimeter) needle attached to a syringe that holds at least 10 mL. Longer needles and larger syringes can be used but the gauge should not be any larger. The medication is usually 1% lidocaine hydrochloride (Xylocaine), 10 mg/mL, although a number of other local anesthetics can be used.

The standard (but not necessarily always the most efficacious) technique is to insert the needle point at the center of the fourchet and then fan the injection centrally, to both sides of center, and in both the anterior and the posterior planes of the perineal body. The disadvantage of this technique, when compared with the other possible technique, is that it takes more time to perform, is more awkward for learners, and entails considerable relocating of the needle, which involves much backing up and repositioning of the needle and can increase the need for multiple sticks.

The second technique is simply to insert the needle at the center of the fourchet and direct the needle straight down the midplane toward the rectum without puncturing into that orifice. Then, after aspirating, up to a maximum of 10 mL (100 mg) of lidocaine is injected as the needle is slowly withdrawn. The desired effect is to create a large, visible, and palpable perpendicular wheal approximately $^3/_4$ to 1 inch wide and extending from top to bottom in the center of the perineal body (see Figure 69-1). If the plan is to cut a mediolateral episiotomy, then the direction of the needle and resultant wheal are in accord with the path this cut will

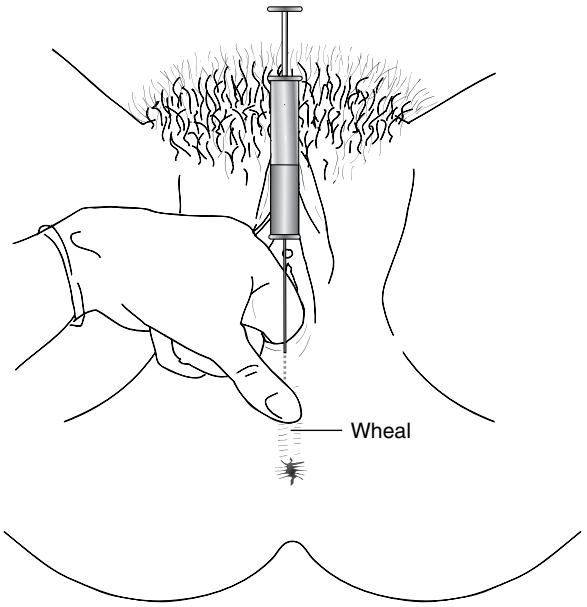

FIGURE 69-1 Local infiltration: central wheal.

take. This technique is very quickly performed and involves just one needle thrust.

The second technique is ideal because in the majority of cases when local infiltration is used it is done just shortly before birth, when the perineal body has thinned and flattened considerably. This allows for ready development of a broad wheal since there is little anteroposterior tissue and only one plane. In fact, this poses the one difficulty with performing a local infiltration: The perineal body is so flattened that it is easy to pierce the posterior wall and insert the local anesthetic uselessly into the vagina. This problem can be avoided by observing carefully and positioning a finger posterior to the insertion line to detect if this happens. To rectify the problem, merely withdraw the point of the needle until it is again within tissue and redirect it so it will stay within the tissue of the perineal body.

Local Infiltration for Repair After Birth

Local infiltration is used when anesthesia is needed for repair of a laceration or episiotomy and either (1) predelivery anesthesia has worn off, (2) a postdelivery pudendal block has failed, or (3) local infiltration is the mode of choice. The primary disadvantage of local infiltration for repair is that it distorts the tissue, thereby making tissue approximation and judgment of the tightness of the sutures more difficult.

The gauge and length of the needle and the amount of anesthetic agent used depend on the laceration. A 22-gauge, $1\,^1/_2$-inch needle is fine for infiltrating an episiotomy cut, a lacerated extension of one, or a vaginal sulcus tear. However, a smaller gauge needle should be used for smaller lacerations in more sensitive areas. For example, a 25-gauge, 1-inch needle would be the needle of choice for anesthetizing a clitoral laceration. The midwife must exercise judgment in making this selection.

The technique of local infiltration is to insert the needle point at the end or corner of the laceration or cut and run it the length of the wound along the line where the suture needle will be either entering or exiting. Then, after aspirating, the anesthetic agent is injected as the needle is withdrawn to the point of insertion. Injection of the medication is stopped while the needle is redirected along another line of projected suturing, and the process is repeated until the entire area of possible pain is anesthetized.

CHAPTER

70

Hand Maneuvers for Birth with the Mother in Lithotomy or Modified Lithotomy Position

The most comprehensive and precise hand maneuvers are for birth of the baby in the birth position of occiput anterior (OA) when the mother is in lithotomy position or a modified lithotomy semi-sitting position with the labor/delivery table/bed broken or at the edge of a bed (end or side) with her feet on chairs. These hand maneuvers are designed to (1) effect a safe, atraumatic birth for the baby, (2) facilitate the mother's efforts in giving birth to her baby with minimum possible trauma to herself, and (3) give you a feeling of absolute security and control in handling the baby, confidence in what you are doing, and free you from fears of the baby slipping out of your hands.

The following pages and Figure 70-1 describe in detail what to do with your hands every moment of the actual birth of the baby. It is strongly suggested that before you help a mother give birth to her a baby, you practice these hand maneuvers until you are comfortable with them, can readily adjust them to whichever way the baby's head rotates during restitution and external rotation, and can use them smoothly no matter how fast the baby might come. For practice you need someone else to serve as the power to manipulate a doll through a pelvis or anything with a hole large enough to simulate a pelvis and accommodate the doll. Have this person vary the rate of speed of birth and the direction of restitution and external rotation.

These same hand maneuvers are applicable for babies who birth in the occiput posterior position, with the exception of the direction of pressure exerted for control of the birth of the head. This is also true for babies who birth with a face presentation; once the head is out, the remaining hand maneuvers are the same.

The hand maneuvers differ after birth of the baby's head if the mother is in a dorsal position. The dorsal position hand maneuvers are detailed in Chapter 71. Knowing the comprehensive hand maneuvers for the lithotomy or modified lithotomy position and for the dorsal position enables you to adapt them to facilitate the birth of babies with mothers in side-lying, hands and knees (see Chapter 72), squatting (see Chapter 73), or any other position.

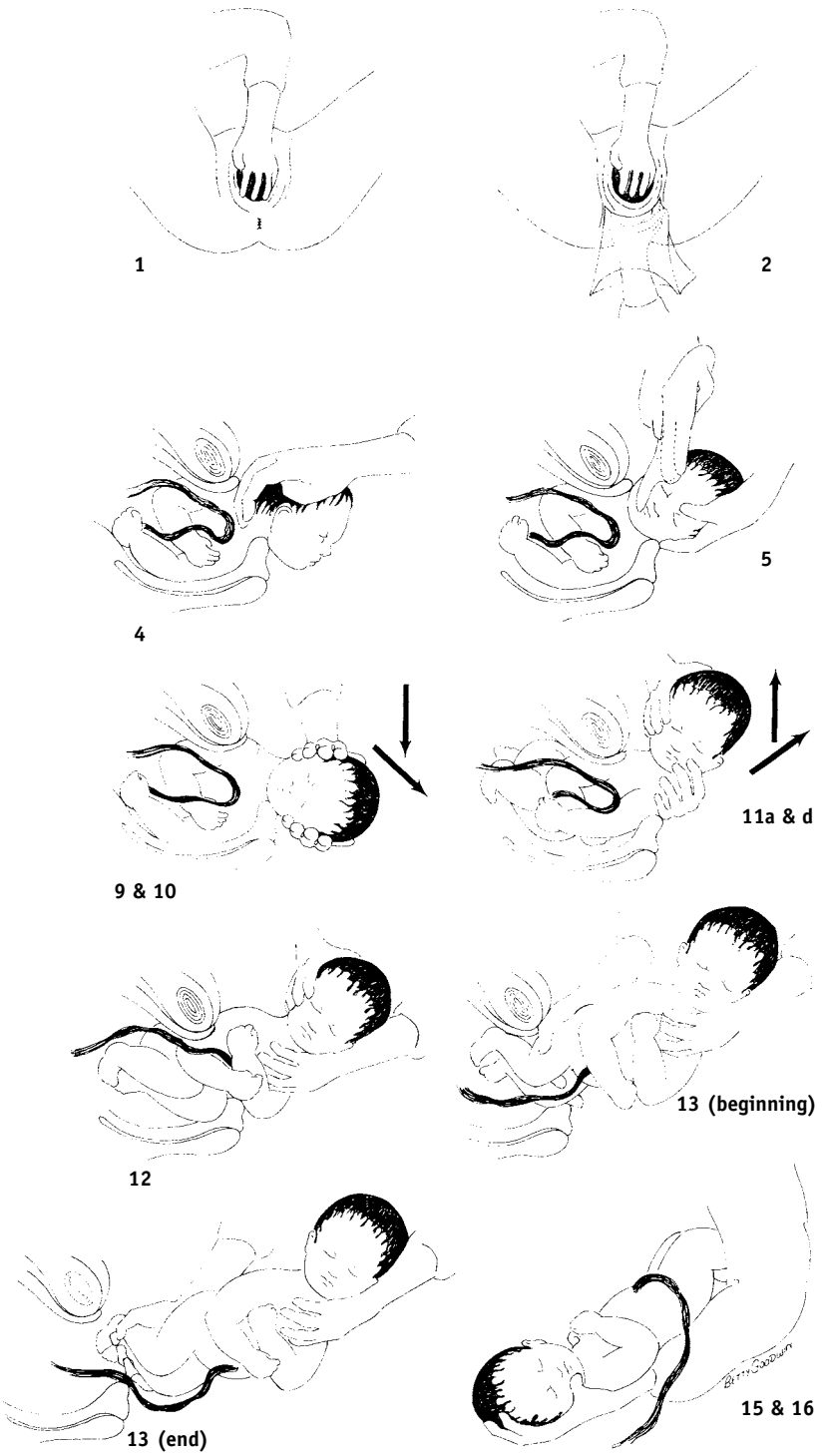

FIGURE 70-1 Hand maneuvers for birth of the baby in occipital anterior position with the mother in lithotomy or modified lithotomy position. Numbers correspond with the numbered paragraphs in the narrative text on the hand maneuvers and their rationale.

Hand Maneuver	Rationale
Stand or sit between the woman's legs at the foot or side of the delivery table or birth bed. The baby is in an occipital anterior position.	
1. For control of the baby's head place the pads of your fingertips on the portion of the vertex showing at the vaginal introitus. Be careful not to let your fingers slip inside the vagina alongside the head. As more of the head is accessible at the vaginal introitus, spread your fingers over the vertex of the baby's head with your fingertips pointing toward the as yet unseen face and your elbow pointing upward toward the mother. Allow the head gradually to extend beneath your hand by exerting a controlling, but not prohibitive, pressure with your hand. Use the length of your fingers in doing this and not just your fingertips. For head control, use the hand most comfortable for you. Most practitioners use their nondominant hand, leaving their dominant hand to handle any equipment or supplies that may be suddenly and quickly needed. For example, a right-handed person would use the left hand on the head, thereby leaving the right hand free for other actions.	**1.** Letting your fingers slip inside the vagina increases the possibility of introducing infection and increases the risk of tearing. Spreading your fingers over the vertex evenly distributes the pressure you are exerting, thereby avoiding any possibility of intracranial injury. Pressure applied at this time keeps the head flexed until the suboccipital region impinges under the symphysis pubis and extension begins. If the head is allowed to extend too soon, the result often is periurethral lacerations. Gradual extension of the head as the diameter changes from the suboccipitobregmatic diameter of 9.5 centimeters to the occipitofrontal diameter of 11.5 centimeters and then to the occipitomental diameter of 12.5 centimeters prevents the baby's head from popping out, which can cause intracranial injury, and reduces the possibility of trauma (lacerations) to the mother. Using the length of your fingers rather than just your fingertips more evenly distributes the pressure and also enables you to have better control, as you are in contact with more of the head and you can better adjust the pressure as needed.
2. Some midwives believe that proper control of the head will preserve the perineum and result in birth over an intact perineum. Others believe that it is necessary to support the perineum in addition to controlling the head in order to achieve this result. If you want to try supporting the perineum in order to make up your own mind about the efficacy of this technique, it is most important that you do it correctly. It is incorrect simply to place your hand against the perineum and press. The correct method is as follows:	**2.** Pressing on the perineum serves only to place additional stress on the perineum and to obliterate your view of the perineum.
a. Cover the hand not being used on the baby's head with a towel.	**a.** The towel prevents your hand from being contaminated by accidentally brushing against the rectal orifice.
b. Place your thumb in the crease of the groin midway on one side of the perineum.	**b.**, **c.**, and **d.** Placing your thumb and middle finger in the crease of the groin on either side of the perineum (perineal body) avoids placing stress on the perineum itself. The downward pressure includes more tissue in the action, and the inward motion distributes any additional tissue toward the crucial midpart of the perineum, thereby providing a little give to relieve the strain there.
c. Place your middle finger in the crease of the groin midway on the other side of the perineum.	
d. Apply pressure with the thumb and finger downward and then inward toward each other and the middle of the perineum (perineal body).	
e. Be sure to keep your hand parallel to the perineum while doing this in order to be able to observe the perineum in the space between your thumb and middle finger and your hand.	

Hand Maneuver	Rationale
3. Watch the perineum while the head extends and is born.	**3.** You should be sure to observe the final stretching of the perineum. Thin white lines appear immediately prior to the perineum tearing. This would be an indication to increase perineal support. Some clinicians would cut an episiotiomy. Watching the perineum also keeps your other hand away from the perineum if you're not supporting the perineum, thereby preventing the possibility of contaminating it on the anal opening and causing subsequent infection.
4. As soon as the head is born, place the fingertips of one of your hands on the occiput and then slide them down the curve of the baby's head to the baby's back at the level of the top of the shoulders and sweep them in both directions, feeling for the umbilical cord. Most midwives use their dominant hand for this maneuver, as it is the hand most accustomed and sensitive to touch.	**4.** This maneuver is done to determine if the umbilical cord is around the baby's neck and, if it is, to judge how tight it is as a basis for deciding how to manage the situation. Starting at the occiput helps locate where you are on the baby. It is easy for inexperienced fingers to get confused and have difficulty identifying what they are feeling during this maneuver because the neck of a baby is short. Sliding your fingers down from the occiput to the top of the back ensures that you will feel a nuchal cord if one is present. Sweeping your fingers from side to side picks up a cord over a shoulder. It also enables you to identify the position of the shoulders.
Management of a nuchal cord is as follows:	
a. If the cord is loose, slip it over the baby's head (cord reduction).	**a.** and **b.** A loose cord may tighten as the baby's body is born unless it is slipped away from the baby's neck.
b. If the cord is too tight to slip over the baby's body but not tight around the neck, slip it over the shoulders as the baby's body is born and deliver the baby through the cord.	
c. If the cord is too tight to slip back over the shoulders but has a little give to it, somersault the baby out, as follows [1]: **(1)** Slowly deliver both shoulders without manipulating the cord. **(2)** As the shoulders are delivered, flex the baby's head so the face is pushed toward the mother's thigh. **(3)** Keep the baby's head next to the perineum while the body is delivered (somersaults out). **(4)** Unwrap the umbilical cord.	**c.** The somersault maneuver does not require equipment, can be performed regardless of the number of times the cord is looped around the baby's neck, can be used with the mother in any birth position, and allows the cord to be cut under more calm and less risky circumstances [1].
d. if the cord is tight, immediately double clamp and cut the cord between the clamps at the neck before the baby's body is born. Tell the mother to pant while you are clamping, cutting, and unwinding the cord.	**d.** A tight cord may cause hypoxia or anoxia. Having the mother pant will keep her from pushing the remainder of the baby out (tightening the cord still further and defeating your efforts) before you are through clamping, cutting, and unwinding the cord and before your hands are in position for the next maneuver.

Hand Maneuver	Rationale
5. Wipe off the baby's face and head and wipe off fluid from the nose and mouth with a soft, absorbent cloth.	**5.** and **6.** Drying the baby's face and head prevents loss of body heat from these surfaces. Wiping away fluid from the nose and mouth and aspirating the nasal and oral passages clear the baby's airway, thereby preventing aspiration of fluid into the lungs with the baby's first breath.
6. Suction the baby's nasal and oral passages with a soft rubber bulb syringe.	
7. Wait for a contraction and watch the head return to anatomical alignment with the body (restitution) and external rotation.	**7.** Watching may inhibit any inclination to interfere, gives the shoulders time to rotate internally to the anteroposterior diameter of the pelvic outlet, confirms or refutes your prebirth judgment regarding the fetal position, and prepares you to place your hands for the subsequent hand maneuver.
Place a hand underneath the upper half of the baby's head while watching. Unless the cord has been cut, there is no need to hurry or interfere by rotating the shoulders manually. If the cord has been cut and external rotation is not yet completed, assist rotation of the shoulders, as described in the management of shoulder dystocia in Chapter 30, into the anteroposterior diameter of the pelvis.	This provides support to the head. Keeping your hand under just the upper half of the head keeps your fingers away from the rectum, thereby avoiding contamination.
8. Adjust your position by shifting a little to the right or left as indicated. If the head rotates to the LOT, then shift your body toward the mother's left. If the head rotates to the ROT, then shift your body toward the mother's right.	**8.** Shifting your position enables you to place your hands correctly and comfortably for the next hand maneuver.
9. Place one hand on each side of the baby's head so that your fingers point toward the baby's face and your little fingers are closest to the mother's perineum ("pinkies to perineum"). This means that for a baby in the LOT position, your left hand will be the bottom hand underneath the baby's head and your right hand will be the hand on top of the baby's head; for a baby in the ROT position, your right hand will be the bottom hand underneath the baby's head and your left hand will be the hand on top of the baby's head.	**9.** This places your hands in a position to avoid contamination from the rectum. The natural inclination is to place the bottom hand so the fingers are pointing toward the rectum, but invariably in so doing, the fingers inadvertently touch the anus or even slip inside slightly while you are concentrating on the birth of the baby. Deliberate placement of the hands sideways prevents this possibility. This placement of your hands also provides for the correct hand to be in the correct location for the hand maneuvers in 11d, 12, and 13 below.
10. Exert downward and outward pressure on the side of the baby's head with your top hand until the anterior shoulder has impinged beneath the symphysis pubis and can be seen.	**10.** Placing your hands on the sides of the baby's head keeps your fingers from pulling anywhere under the mandible or pressing in or on the neck, thereby avoiding injury to the cervical or brachial nerve plexus. (Steps 10 and 11 reflect the mechanism of labor called *birth of the shoulders and body by lateral flexion via the curve of Carus*.)
11. a. Apply upward and outward pressure on the side of the baby's head with your bottom hand, and with both hands lift the baby's head toward the ceiling.	**11. a.** See Step 10 above. The direction of this maneuver follows the curve of Carus.
b. While doing this, bend over sufficiently to watch the perineum during the birth of the posterior shoulder.	**b.** Observe the perineum for rapidity of birth and to see if there is a hand of the baby alongside the shoulder that needs to be controlled.

Hand Maneuver	Rationale
c. If the baby is coming too rapidly, you can slow it down by telling the mother to pant and by applying controlling pressure with the side of your bottom hand to the top of the posterior shoulder.	**c.** You want the shoulders to ease out over the perineum and to have control of the upper arm, elbow, and hand as described in d. below. This will help prevent perineal laceration.
d. As the baby is being born, slide your bottom hand under the baby's head from the side of the baby's head, across the neck and onto the shoulder and upper arm of the baby as they clear the perineum. In effect, you slide your hand down until the side of it rests against the top of the perineum at the fourchet. Then as the shoulder is born the upper arm is actually born into the palm of your hand while your ring finger, little finger, and the edge of your hand control the baby's elbow and hand as they clear the perineum.	**d.** This hand maneuver is *absolutely essential* for control of the upper arm, elbow, and hand of the posterior shoulder as they are being born. Otherwise, the hand or elbow can flip out and cause a perineal laceration. Perineal laceration is prevented if your hand keeps the upper arm pressed against the body until the elbow and hand have cleared the perineum.
12. As the upper half of the baby's body is born and the elbow and hand have cleared the perineum, "shake hands" with the baby's body with your bottom hand by having your thumb on the baby's back, your fingers across the baby's chest, the baby's neck in the V created between your thumb and fingers, and the baby's head supported on your wrist.	**12.** This gives you a hold on the baby, which gives you complete control of the remainder of the birth of the body and places the baby securely in your grasp without any possibility of the baby slipping past you or through your hands or fingers.

Note: Control of the baby's birth has gone from your top hand for birth of the head and the anterior shoulder to your bottom hand for birth of the posterior shoulder and body. The controlled birth of the posterior shoulder and the body has been accomplished with one smooth movement of your bottom hand from the side of the head in 9, down to the perineum in 11d, and into the "handshake" in 12 above.

13. As the baby's body is being born, slide your top hand down the baby's back, slip your index finger between the baby's legs as the buttocks clear the perineum, curve your middle finger and thumb around the legs, and continue running your hand down the legs until you can grasp the baby around the ankles. At this point, close your thumb and middle finger onto your index finger, thus totally encircling and enclosing the legs in your grasp. One foot of the baby will rest in the V created between your thumb and index finger, and the other foot will rest in the V created between your index and middle fingers.	**13.** This hand maneuver, combined with 12 above, gives you an absolute hold on the baby. No baby, no matter how slippery with fluid and vernix, can slip out of this hold. The baby is securely held in your two hands and there is no chance of the baby's "falling in the bucket," which is the primary fear of the inexperienced student helping a mother in a lithotomy position give birth to her baby.

Then do either 14 and 15 or 16 and 17.

14. Move the baby in a smooth arc onto the mother's abdomen. Be sure of the following as you place the baby on the mother's abdomen:	**14.** Placement on the mother's abdomen gives the mother immediate contact with her baby and causes the uterus to contract.
a. The baby's head is lower than the baby's body.	**a.** This allows drainage of fluid from the baby's body oral and nasal air passageways.
b. The baby is placed on her or his side or the baby's head is turned to the side if the baby is in a prone position.	**b.** This will maintain a patent oropharyngeal airway.

Hand Maneuver	Rationale
c. There is no tension on the umbilical cord.	**c.** This prevents tearing the cord from its insertion in either the placenta or the baby.
15. Keep one hand on the baby as you use your other hand to reach for necessary supplies and equipment for suctioning, drying the baby, clamping and cutting the cord, and so forth.	**15.** This is a safety measure that protects the baby from sliding, falling, or flipping off the mother's abdomen.
16. Move the baby in a smooth arc into the football hold, as follows:	**16.** The football hold is known as a safety hold in nurseries. Putting the baby into a football hold keeps the baby at the same level as the placenta.
a. Let the baby's head and shoulders pivot in your bottom hand so that the head is now supported by the palmar surface of your outstretched index and middle fingers, the suboccipital region and back of the neck are in the palm of your hand, and your thumb and remaining fingers are *resting*, not pressing, against the sides of the neck. Your top hand continues its grasp around the ankles during this maneuver.	**a.** The thumb and fingers resting against the neck serve as a barrier to movement between the mandible and the shoulders. If the baby slides either way, it will go no further than the fingers. Do *not* close your thumb and fingers around the baby's neck. The baby's head is supported and you have control over the position of the baby's head for suctioning. Your continued grasp on the ankles absolutely ensures that the baby will not fall.
b. Place the baby's legs between the elbow and upper arm of your bottom hand and your body at waist level and remove your top hand from around the baby's ankles. The baby's back is supported on your lower arm and the bottom part of the baby's body is tucked securely between your elbow/upper arm and your body.	**b.** This completes getting the baby into the football hold and frees one hand for subsequent actions of suctioning, drying the baby, clamping and cutting the cord, and so forth. *Note:* If the baby was born from a LOT position, the baby will end up under your left arm. If the baby was born from a ROT position, the baby will end up under your right arm. If you are unable to use your minor hand for the necessary subsequent actions, then you will need to switch the baby from under one arm to under the other arm. If you are inexperienced in handling babies and do not know how to get a baby into a football hold or how to transfer football holds from one side to the other, go to a normal newborn nursery and practice until you are comfortable.
17. *Be sure* as the baby is born in 11d and 12 and placed in safety holds in 13 and 16 that you do the following:	**17.**
a. Keep the head of the baby in a downward, dependent position, and turned somewhat to the side.	**a.** This allows drainage of fluid from the oral and nasal air passageways and maintains a patent oropharyngeal airway.
b. Exert no tension on the umbilical cord.	**b.** This prevents tearing the cord from its insertion in either the placenta or the baby.
c. Keep the baby well supported at all times.	**c.** The baby will not feel a frightening loss of support.

The hand maneuvers for the actual birth of the baby end with placing the baby on the mother's abdomen or with the baby being held securely in the football hold.

You will see many other methods, or variations of this method, used in helping a mother in lithotomy or modified lithotomy position give birth to her baby. Before trying variations or alternatives, the inexperienced student should learn one method, whatever it is, that is guaranteed to be safe and atraumatic and that will foster self-confidence. This one is recommended. In considering another method, or variations of this one, the student should scrutinize and analyze the method for valid rationale and for safety and security features.

Reference

1. Schor, M. N., and Blanco, J. D. Management of the nuchal cord. *J. Nurse-Midwifery* 36(2):132 (March/April) 1991.

CHAPTER

71

Hand Maneuvers for Birth with the Mother in Dorsal Position

If you have been accustomed to helping a mother give birth to her baby when she is in the lithotomy or modified lithotomy position and are now preparing yourself to be able to help a mother give birth to her baby when she is in the dorsal position, the most important thing for you to realize is that the hand maneuvers you used for birth in the lithotomy or modified lithotomy position, as described in Chapter 70, will not work when you are standing beside the mother in the dorsal position. The maneuvers have certain similarities, but it is unsafe even to think of running from one side of the table or bed to the other side (depending on the direction of restitution and external rotation of the baby's head) at the very time your hands should be facilitating and controlling the birth of the baby's shoulders and body. On the other hand, it is possible for you to use some of those hand maneuvers if you are seated cross-legged in front of a woman in dorsal position.

If you are learning birth of babies with the mother in the dorsal position, you must realize that when you later learn birth in the lithotomy or modified lithotomy position, you will need to learn a different set of hand maneuvers.

The hand maneuvers described below and illustrated in Figure 71-1 describe in detail what to do with your hands every moment of the actual birth of the baby when you are standing beside a mother in dorsal position. Although there is no danger of dropping the baby any great distance when the mother is in the dorsal position, it is still important to practice these maneuvers before actually helping a mother give birth to her baby in order to effect an atraumatic birth for both the baby and the mother. For practice you need someone else to serve as the power to manipulate a doll through a pelvis or anything with a hole large enough to simulate a pelvis and accommodate the doll. Have this person vary the rate of speed of birth.

These same hand maneuvers are applicable for all babies who birth from a cephalic presentation once the head is born. Prior to that time the hand maneuvers vary in accord with the indicated direction of pressure exerted for control of the birth of the baby's head.

Hand Maneuver	Rationale
The baby is in an occipital anterior position.	
1. Position yourself on one side of the table or bed. If you are right-handed, you will be positioned on the mother's right side. If you are left-handed, you will be positioned on the mother's left side.	**1.** Proper positioning in accord with your dominant hand is important for your own comfort and ease in doing examinations and in managing the situation and relevant supplies and equipment.

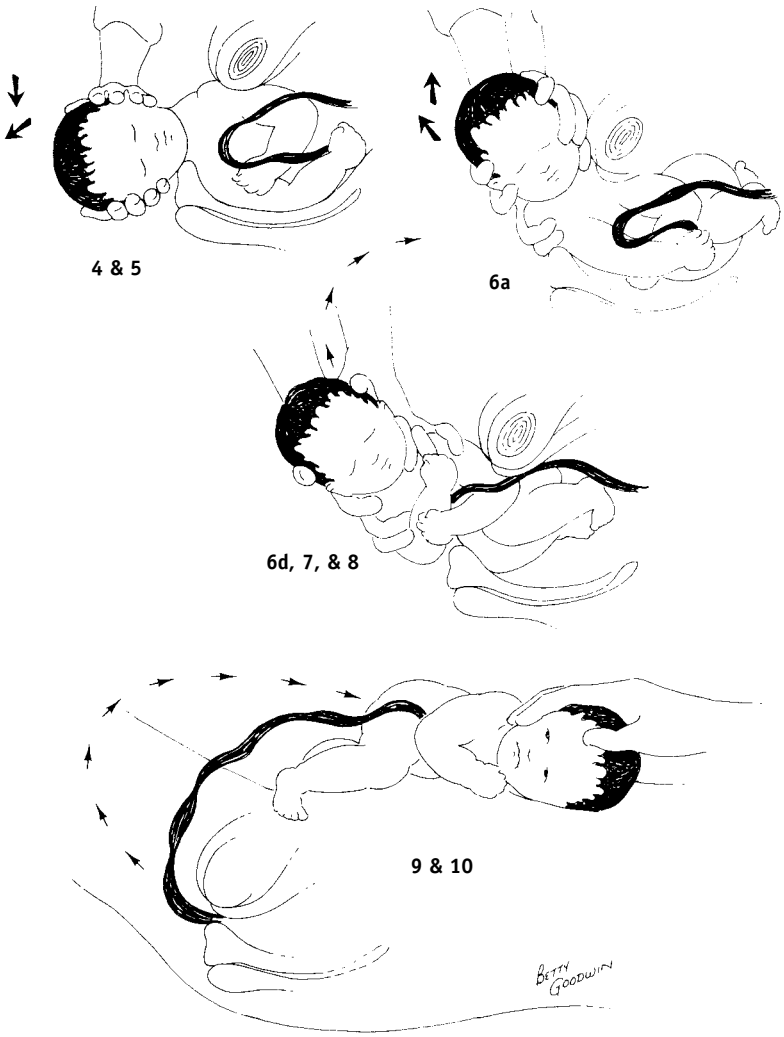

FIGURE 71-1 Hand maneuvers for the birth of a baby in occipital anterior position with the mother in dorsal position. Numbers correspond with the numbered paragraphs in the narrative text on the hand maneuvers and their rationale.

Hand Maneuver	Rationale
2. You should be positioned just below the level of the mother's knees, which are flexed and well separated out to the sides. From this position you reach over her leg to function in the area between her legs, reaching upward toward the perineum to assist the mother with birth of her baby and downward toward the foot of the table or bed to where your supplies and equipment are located.	**2.** Working inside her leg keeps the mother's knee from getting in your way; gives you an element of control, if necessary, of the mother's legs; and positions you in a way that guarantees access to both the baby and the necessary supplies and equipment.
3. The hand maneuvers involved in control of the birth of the baby's head, checking for a nuchal cord, wiping the baby's head, suctioning, and watching for restitution and external rotation are the same as the hand maneuvers for birth of the baby with the mother in lithotomy or modified lithotomy position (Steps 1 to 7) described in Chapter 70.	**3.** See the rationale for Steps 1 to 7 described in Chapter 70.

Hand Maneuver	Rationale
4. Place one hand on each side of the baby's head. If you are standing on the right side of the mother, your left hand will be on top of the baby's head and your right hand will be underneath the baby's head. If you are standing on the left side of the mother, your right hand will be on top of the baby's head and your left hand will be underneath the baby's head. This positioning of your hands will be true regardless of which direction restitution and external rotation take. Be sure that the palms of your hands are on the baby's head with your fingers pointing toward the mother's opposite leg ("pinkies to perineum"). This places the sides of your hands at right angles to the perineum.	**4.** This placement of your hands is designed to accomplish three things: **a.** Prevent contamination of your bottom hand through contact with the rectum. **b.** Prevent grasping the baby under the mandible or around the neck for birth of the shoulders and body. **c.** Prevent damage to the cervical or brachial nerve plexus.
5. Exert downward and outward pressure on the *side* of the baby's head with your top hand until the anterior shoulder has impinged beneath the symphysis pubis and can be seen.	**5.** Same as for 4b and 4c above. (Steps 5 and 6 constitute the mechanisms of labor called *birth of the shoulders and body by lateral flexion via the curve of Carus*.)
6. a. Apply upward and outward pressure on the side of the baby's head with your bottom hand and with both hands lift the baby's head toward the ceiling.	**6. a.** This is same as for 4b and 4c above. The direction of this maneuver follows the curve of Carus.
b. Watch the mother's perineum during the birth of the posterior shoulder.	**b.** Observe the mother's perineum for rapidity of birth and to see if there is a hand to be controlled alongside the baby's posterior shoulder.
c. If the baby is coming too rapidly, you can slow it down by telling the mother to pant and by applying controlling pressure with the side of your bottom hand to the top of the posterior shoulder.	**c.** You want to ease the shoulders over the perineum and to have control of the posterior upper arm, elbow, and hand in order to prevent perineal lacerations.
d. As the baby is being born, slide both your top and bottom hands, with the exception of your index fingers, down from the sides of the baby's head onto the baby's shoulders and upper arms as they clear the mother's perineum and are born. The index fingers of both of your hands remain on the parietal bones on either side of the baby's head. During this maneuver your bottom hand slides down until the side of it rests against the top of the perineum at the fourchet. Then as the posterior shoulder is born the upper arm is actually born into the palm of your hand while your ring finger, little finger, and edge of your hand control the baby's elbow and hand as they clear the perineum.	**d.** This positions your hands for the next hand maneuver, described in Step 7. Your index fingers on the parietal bones steady and support the baby's head between them. This action of your bottom hand is essential for control of the upper arm, elbow, and hand of the posterior shoulder as they are being born. Otherwise, the hand or elbow can flip out and cause a perineal laceration. If your hand keeps the upper arm pressed against the body until the elbow and hand have cleared the perineum, then perineal laceration is prevented.
7. As the upper half of the baby's body is born, grasp the baby's body around the upper arms, upper chest, and upper back. Your thumbs will be on one side of the baby's body, your index fingers will be on the parietal bones, and your remaining fingers will be on the other side of the baby's body.	**7.** This provides you with a secure hold of the baby's body and also enables you to guide the direction of the remainder of the birth of the body via the curve of Carus.

Hand Maneuver	Rationale
8. Guide the baby's body upward and outward in a smooth arc for the birth of the lower half of the baby's body.	**8.** This follows the curve of Carus.
9. Continue your arc and place the baby on the mother's abdomen.	**9.** Placement on the mother's abdomen gives the mother immediate contact with her baby, causes the uterus to contract, and keeps the baby out of the fluids that have now accumulated on the table or bed in the area between the mother's legs.
Be sure of the following as you place the baby on the mother's abdomen:	
a. The baby's head is lower than the baby's body.	**a.** This allows drainage of fluid from the oral and nasal air passageways.
b. The baby is placed on his or her side or the baby's head is turned to the side if the baby is in a prone position.	**b.** This will maintain a patent oropharyngeal airway.
c. There is no tension on the umbilical cord.	**c.** This prevents tearing the cord from its insertion in either the placenta or the baby.
10. Keep one hand on the baby as you use your other hand to reach for necessary supplies and equipment for suctioning, drying the baby, clamping and cutting the cord, and so forth.	**10.** This is a safety measure that protects the baby from sliding, falling, or flipping off the mother's abdomen.

The hand maneuvers for the actual birth of the baby end with the placing of the baby on the mother's abdomen.

CHAPTER

72

Hand Maneuvers for Birth with the Mother in the Hands and Knees Position

SARASWATHI VEDAM, CNM, MSN

Hand maneuvers for the birth of a baby with the mother in a hands and knees position are designed to provide the midwife with a safe and efficient method of receiving the baby and, subsequently, transferring the baby to the mother's arms. The issues of assessing fetal well-being and maintaining perineal integrity are addressed by steps that are very similar to those for other maternal positions. While the mechanisms of labor are not changed by maternal position, the reversed and delayed appearance of the emerging vertex necessitates alterations in timing and in placement of the hands.

Visibility and access to effect maneuvers are enhanced in this position. However, the inability to establish eye contact with the mother during delivery requires a greater emphasis on anticipatory guidance as well as a birthing environment that allows for undisturbed verbal contact between woman and midwife at the time of birth. If the woman is hearing impaired, one of her support persons may have to relay your words by sight.

Stress on the anterior labia and on the periurethral area is slightly increased when the mother assumes a hands and knees position for pushing. Hence, methods of perineal support must focus on the prevention of lacerations in those areas. Finally, as in lithotomy or supported squat positions, the baby will emerge suspended above the surface of the bed or floor. A secure hold on the baby is essential.

The following hand maneuvers are one approach to managing the birth of a baby with the mother in the hands and knees position. Each midwife will develop her or his own style for conducting a birth.

Hand Maneuver	Rationale
The baby is in an occipital anterior position.	
1. Sit, kneel, or stand to one side of the mother's hips as you begin to notice rectal bulging with pushing. Your shoulders and body should be parallel to her side as you visualize the rectal and perineal area.	**1.** Rectal bulging and gaping will be the first apparent sign of fetal descent to the perineum in this maternal position. It is easier to establish timely communication with the woman if you can see both the woman's face and perineum.
2. Establish eye contact with the mother (moving yourself into her line of vision if necessary), and explain that if she delivers in the hands and knees position, you will need to hand the baby to her from behind through her bent legs, after which she can simply sit down with the baby on her abdomen.	**2.** When the plan is to cut the cord after the mother has received the baby, the cord length is generally inadequate to circumvent the mother's leg.

Hand Maneuver	Rationale
Remind her not to sit back or down immediately after delivery before she has received the baby.	Upon delivery many women will naturally lower their haunches to sit back. If she sits before passage of the baby to her arms, she may sit on the cord or baby and make receiving the baby more complicated.
3. Encourage her, her supporting family, and nursing staff to facilitate communication between you and the woman at the time of delivery. Delegate someone to lift or remove her garment as the baby is delivering so that it does not obstruct the path between the perineum and the mother's arms.	**3.** She will not be able to see you, the baby, or the perineum during delivery so you must communicate instructions, requests, and reassurances verbally or through an assistant. The baby or the mother can get tangled in the clothes as the baby is passed to the mother or she changes position from hands and knees to sitting after the birth.
4. Watch for the roundness of the brow to distend the rectal and perineal wall. Place the pads of your fingertips, palm up, on the crown of the head with the fingertips pointing toward the mother's abdomen. As the head begins to emerge, spread the fingers slightly and exert a slight upward pressure with the length of the fingers on the vertex. Be careful to avoid pressure on the clitoris. Allow the head to extend gradually into your hand maintaining a steady but gentle counterpressure until the biparietal diameter is delivered and you can visualize the ears.	**4.** The ability to visualize the emerging head at the introitus is somewhat reduced. A rounded distention of the perineum will be the first sign that crowning is imminent. Maintaining flexion until the suboccipuit passes under the symphysis pubis and extension begins will reduce the possibility of perineal trauma. Flexion must be effected in accordance with fetal position. In hands and knees maternal position, the baby in an OA position appears face up. Gradual extension prevents the head from popping out, which can cause perineal lacerations and may be more traumatic for the baby.
5. It is possible to support the perineum with the other hand alone or with a warm moist towel. Many women appreciate moist heat on the rectal area as the head crowns and delivers. Review the correct procedure and rationale for perineal support in the section on hand maneuvers for delivery in the lithotomy or modified lithotomy position. (See Step 2, Chapter 70.)	**5.** See rationale for Step 2, Chapter 70.
6. If necessary, guard or reduce the stress on the anterior labia and periurethral area with your fingertips. Use the same technique of providing support with your thumb and middle fingers that is described above only with the placement of fingertips on either side of the anterior apex of the introitus.	**6.** When the vertex emerges with the woman in a hands and knees position, the pressure exerted on the perineum is distributed anteriorly. Lacerations along the anterior labial borders or periurethral area are more common but tend to be shallow if the delivery of the vertex is controlled.
7. The hand maneuvers involved in checking for a nuchal cord, wiping the baby's head, watching for restitution and external rotation are the same as the maneuvers for delivery of the baby in lithotomy or modified lithotomy position described in Chapter 70 (Steps 4–9). In the hands and knees maternal position, the checking hand will be palm up and sliding under the head. Wiping the baby's face and suctioning, if necessary, will be easier to effect as the face is up.	**7.** See rationale for Steps 4–10 described in Chapter 70.
8. a. Exert downward and outward pressure on the side of the baby's head with your top hand until the posterior shoulder is visible.	**8. a.** Follows the Curve of Carus and effects birth of the posterior shoulder and body by lateral flexion.

Hand Maneuver	Rationale
b. Apply upward and outward pressure on the side of the baby's head with your bottom hand, and with both hands lift the baby's head toward the mother's back. As the anterior shoulder emerges, slide your bottom hand down along the neck and shoulder keeping the anterior arm close to the baby's body as it emerges at the perineum.	**b.** This motion will assist the anterior shoulder to pass under the mother's symphysis pubis. The arm will have a tendency to abduct from the body as the shoulder delivers and its motion and dimension can contribute to periurethral lacerations if not controlled.
c. As the upper half of the baby is born and the elbows and hands have cleared the perineum, you can "shake hands" with the baby's body with your bottom hand by having your thumb on the baby's back and your fingers across the baby's chest, while placing your top hand in the same position on the other side of the baby. Alternatively, you can place your hands, fingers together, under the baby's armpits and across the chest, thumbs supporting the back, as you lift the baby while the mother spreads her legs. Or you can follow Steps 13–15 in Chapter 70 to place the baby in a football hold until the mother is ready to reach for the baby.	**c.** The baby will be slippery and in motion. It is important to find a hold on the baby that gives you control of the remainder of the delivery of the body and places the body securely in your grasp as you lift and give the baby to the mother. You goal is to support the baby's body without squeezing or poking the soft parts.
9. Pass the baby to the mother through her legs, keeping a secure hold on the baby until she has a firm grasp. Then assist her to sit down and back, while you move to her front to assess and care for the baby. Alternatively, the mother can carefully lift one leg while you pass the cord under it as she turns to sit down facing you. She is then ready to receive the baby, which you can place on her abdomen.	**9.** When the plan is to cut the cord after the mother has received the baby, the cord length is generally inadequate to circumvent the mother's leg. Upon delivery many women will naturally lower their haunches to sit back. If the mother sits before passage of the baby to her arms, she may sit on the cord or baby and make receiving the baby more complicated. Placing the baby on the mother's abdomen gives her immediate contact, places the baby on a warm surface, and keeps the baby within reach for assessment and care.
10. Place the baby stomach down, head turned to face you, on the mother's abdomen as you instruct her to sit down. Keep your hands on the baby until the mother is stable enough to replace your hands with her own. Be conscious of the length of the cord, and adjust the height of the placement of the baby so there is no tension on the cord.	**10.** A dependent position of the head allows for drainage of fluid from the oral and nasal passageways. The mother will need to sit and find a stable position for herself before she can use her arms to support the baby. If the cord is too taut, it will pull on the insertion site on the baby and/or cause maternal discomfort at the introitus.

The hand maneuvers for the actual birth of the baby end with the placing of the baby on the mother's abdomen.

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CHAPTER

73

Hand Maneuvers for Birth with the Mother in the Squatting or Supported Squat Position

SARASWATHI VEDAM, CNM, MSN

Hand maneuvers for the birth of a baby with the mother in a squatting position combine elements of the hand maneuvers for the lithotomy position and those for the dorsal position. The issues of maintaining perineal integrity, visibility, and safety for the baby vary slightly, depending on whether the mother is in a true squat with her perineum close to the bed or floor, or in a supported squat with her perineum suspended above the floor or foot of the bed.

In a true squat, the mother's legs are bent and abducted. Weight bearing is distributed between her legs and feet. She may stabilize her upper body by resting her arms on a support person sitting behind her or by holding onto a rope or bar in front of her. This position brings the perineum close to the surface she is squatting on, so the baby emerges just inches above the surface. Moreover, the curve of Carus parallels the surface at the introitus, so the natural arc of the baby's path would serve to deposit the baby along his or her back onto the surface. Hence, the hand maneuvers are designed mainly to follow this process while preserving perineal integrity and assisting the mother to receive her baby on the warm surface of her abdomen.

In the supported squat, the mother's buttocks are partially supported by the edge of a broken birthing bed or a birthing chair or stool. The mother may place her hands on a squatting bar or on handles on the stool. The weight bearing is distributed between her hands, buttocks, legs, and feet. The perineum is suspended 6 to 18 inches above the surface of the bed or floor. Securing a good hold on the emerging baby becomes more important as there is a risk of dropping the baby.

The following hand maneuvers are one approach to managing the birth of a baby with the mother in the squatting position. Each midwife will develop her or his own style for conducting a birth.

Hand Maneuver

The baby is in an occiput anterior position.

1. Sit or squat on a low stool or on the floor between the woman's legs, facing the perineum, with your shoulders at or below the level of the mother's bent knees.

2. As the vertex appears at the vaginal introitus, place the pads of your fingertips on the crown of the head with the fingertips pointing toward

Rationale

1. Placing yourself low and between her legs allows you greater visibility, access, and control during the delivery. Your shoulders also provide a passive barrier to prevent the mother's knees from adducting during pushes.
2. It is difficult to twist the elbow and exert a controlling pressure with the fingertips pointing downward when the woman is squatting above

Hand Maneuver	Rationale
the mother's abdomen and your elbow pointing to the floor. As the head begins to emerge, spread the fingers slightly and exert a slight downward pressure with the length of the fingers on the vertex. Be careful to avoid pressure on the clitoris. Allow the head to extend gradually into your hand maintaining a steady but gentle counterpressure until the biparietal diameter is delivered and you can visualize the ears.	you. The ability to visualize the emerging head is enhanced with the fingertips spread. Maintaining flexion until the subocciput passes under the symphysis pubis and extension begins reduces the possibility of perineal trauma. Gradual extension prevents the head from popping out, which can cause perineal lacerations and may be more traumatic for the baby.
3. It is possible to support the perineum with the other hand alone or with a warm moist towel, but this support will be by feel, not by sight, in this position. Review the correct procedure and rationale for perineal support in the section on hand maneuvers for delivery in the lithotomy or modified lithotomy position. (See Step 2, Chapter 70.)	**3.** See the rationale for Step 2 in Chapter 70.
4. Watch the introitus while the head extends and is born, paying attention to the labial borders. If the labial edges appear taut or blanched, provide support by placing a thumb and middle finger just below and just above the strained area and exerting pressure with an inward motion toward each other.	**4.** When the vertex emerges with the woman in a true squatting position, the pressure exerted on the introitus is distributed between the labia and the perineum. Lacerations along the labial borders are more common but tend to be shallow if the delivery of the vertex is controlled. This pressure includes more tissue in the action and the inward motion distributes the additional tissue toward the strained area of the labia, thereby relieving some of the stress and reducing the possibility of a laceration.
5. The hand maneuvers involved in checking for a nuchal cord, wiping the baby's head, watching for restitution and external rotation, and delivery of the anterior shoulder are the same as the hand maneuvers for delivery of the baby in the lithotomy or modified lithotomy position described in Chapter 70 (Steps 4–10). Suctioning, if necessary, will be easier to effect once restitution has occurred.	**5.** See the rationale for Steps 4–10 in Chapter 70.
6. a. Apply upward and outward pressure on the side of the baby's head with your bottom hand, and with both hands lift the baby's head toward the mother's abdomen.	**6. a.** Follows the curve of Carus and effects birth of the posterior shoulder and body by lateral flexion.
b. As the posterior shoulder emerges, slide your bottom hand down along the neck and shoulder keeping the posterior arm close to the baby's body as it emerges at the perineum.	**b.** The arm will have a tendency to abduct from the body as the shoulder delivers and its motion and dimension can contribute to perineal lacerations if not controlled.
c. As the upper half of the baby is born and the elbows and hands have cleared the perineum, you can "shake hands" with the baby's body with your bottom hand by having your thumb on the baby's back and your fingers across the baby's chest, while placing your top hand in the same position on the other side of the baby. Alternatively, you can	**c.** The baby will be slippery and in motion. It is important to find a hold on the baby that gives you control of the remainder of the delivery of the body and places the body securely in your grasp as you lift and give the baby to the mother. Your goal is to support the baby's body without squeezing or poking the soft parts. Placing the baby on the

Hand Maneuver	Rationale
place your hands, fingers together, under the baby's armpits and across the chest, thumbs supporting the back, as you lift the baby onto the mother's abdomen.	mother's abdomen gives her immediate contact, places the baby on a warm surface, and keeps the baby within reach for assessment and care.
7. Place the baby stomach down, head turned to face you, on the mother's abdomen as you instruct her to sit down. Keep your hands on the baby until the mother is stable enough to replace your hands with her own. As she repositions herself, assess the baby's need for suctioning or respiratory support as you dry the baby. Be conscious of the length of the cord, and adjust the height of the placement of the baby so there is no tension on the cord.	**7.** A dependent position of the baby's head allows for drainage of fluid from the oral and nasal passageways. The mother will need to sit and find a stable position for herself before she can use her arms to support the baby. It is possible to complete immediate assessment of the baby at this point. The cord will pull on the insertion site on the baby or cause maternal discomfort at the introitus if too taut.
The hand maneuvers for the actual birth of the baby end with the placing of the baby on the mother's abdomen.	

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CHAPTER

74

Inspection of the Placenta, Membranes, and Cord

The placenta, membranes, and cord are inspected in order to diagnose the normality of the placenta, umbilical cord insertion, and cord; to screen for abnormality; and to ascertain whether the placenta and membranes have been completely delivered.

In order to diagnose normality of the placenta and cord insertion, the midwife must know the parameters of normal. Screening for abnormality then encompasses anything not within the parameters of normal; however, it is useful to know and be able to recognize the more common deviations from normal. The causes of these deviations are not always known, and the significance of deviations from normal may lie not in their cause but instead in pointing to potential problems their existence may have created. All of this information makes up the necessary database for inspection of the placenta and membranes.

Database

Normal Placenta, Cord Insertion, and Cord

The normal term placenta weighs approximately 500 grams (just under 1 pound 2 ounces), which is roughly one-sixth of the weight of the newborn. It varies in shape, usually being discoid (flattened and circular) with an average diameter of 15 to 20 centimeters (roughly 6 to 8 inches) and an average thickness of 1.5 to 3 centimeters (about $^{2}/_{3}$ to $1^{1}/_{4}$ inches).

The maternal surface of the placenta is the side of the placenta that was attached to the uterine wall. Normally it is dark red (primarily as a result of fetal hemoglobin), covered with a grayish film of decidua basalis, soft, and friable if torn. It evidences a variable number of cotyledons separated by decidual septa composed of fibrous tissue and interwoven with innumerable blood vessels (see Chapter 21).

The fetal surface of the placenta is the side that was next to the fetus; it is thus covered with the shiny fetal membranes that extend beyond the placenta to form the two-layered membranous sac in which the fetus was enclosed. The outer layer, or chorion, and the inner layer, or amnion, are separable up to the insertion of the umbilical cord. It is difficult to impossible to separate the chorion from the fetal surface of the placenta. The chorion is more easily torn, more opaque, and thicker than the inner, glistening, transparent amnion. The fetal surface of the placenta is irregular because of the branching of the placental blood vessels from the umbilical cord. The color is grayish, although the redness of the placenta can be seen through the membranes except where there are infarcts.

Degenerative changes in the placenta are normally observed as infarcts. These are hard, nodular, whitish areas, which may be found on either the maternal or the fetal surface, or both. They vary in size from a few millimeters to several centimeters. Frequently small calcifications are also observed on the maternal surface of the placenta. These feel gritty to touch and normally may be spread all over the maternal surface to a moderate degree. Developing a reasonable amount of these degenerative changes (in-

farct formation and small calcifications) is a normal part of the aging process of the placenta.

The umbilical cord inserts into the placenta on the fetal surface and the insertion is usually somewhat eccentric—that is, the cord inserts somewhere between the center and the margin. A central cord insertion is normal but much less common. The umbilical cord normally averages approximately 55 centimeters (22 inches) in length and thus is slightly longer than the total length of the average term newborn. The amount of Wharton's jelly supporting and protecting the blood vessels in the cord varies considerably but the cord is normally full and firm to touch. The normal number of blood vessels in the umbilical cord is three: two arteries and one vein. Although these vessels collapse after the cord is cut, they can be easily identified because the vein has a larger aperture than either of the two arteries.

Placental Variations, Anomalies, and Abnormalities

All abnormal placentas indicative of a disease process require consultation with a physician and should be sent to pathology for detailed examination. Placental variations, anomalies, and abnormalities include the following.

1. Larger and heavier than normal placentas may occur with excessively large fetuses, fetal syphilis, or erythroblastosis.
2. Smaller and lighter than normal placentas may occur with maternal general systemic diseases or local uterine conditions causing undernourishment of the placenta and usually resulting in intrauterine growth retardation.
3. Placental tissue that is obviously lighter in color than normal is caused by fetal anemia such as is found in erythroblastosis.
4. Extensive infarction of entire cotyledons is abnormal and usually is the result of disease processes such as severe chronic maternal hypertension or severe preeclampsia or eclampsia. Such extensive infarcting reduces effective placental functioning, which may result in intrauterine growth retardation or (if a substantial portion of the placenta is infarcted) fetal death.
5. Cysts are most frequently observed on the fetal surface. Smaller cysts, a few millimeters in size, are more common than the very uncommon larger cysts of up to 8 to 10 centimeters in diameter. Cysts are usually not significant except in the occasional instance in which the cyst contains a blighted twin.
6. With edema of the placenta, the placenta is mushy, thick, and pale, and fluid can be squeezed from it. Edema may be caused by severe maternal heart disease, diabetes, or nephritis, and by severe erythroblastosis. The fetus usually dies in utero either as a stillbirth or earlier as an abortion.
7. Tumors may be found in association with prematurity and polyhydramnios. Perinatal mortality and maternal hemorrhage are both increased.
8. A syphilitic placenta is abnormally large and pale yellowish-gray; expect a syphilitic fetus.
9. With a lobulated placenta, there appear to be multiple placentas for a single baby. In fact, it is one placenta that is divided into two or more parts that are either completely separated or joined in part. Either way, the lobes are held together by the one set of membranes and by the blood vessels (which may extend from one lobe to another or may be separate and distinct, uniting just before entering the cord, which is not inserted into any lobe). The number of lobes determines the name, for example, placenta duplex (two), placenta triplex (three). This anomaly is thought to be due to abnormalities in the blood supply to the decidua. Its main significance is that you need to be alert to make sure that all lobes have been expelled from the uterus.
10. A succenturiate placenta (placenta succenturiata) is a not uncommon placental anomaly in which one or more separate accessory lobes are in the membranes a variable distance away from the main placental mass. These accessory lobes are usually connected to the main placental mass by blood vessels extending out from the main placental mass. When there are no connecting blood vessels, the anomaly is called placenta spuria.

    The primary significance of a succenturiate placenta lies in the possibility that the succenturiate lobe(s) will be retained in the uterus after expulsion of the main placental mass. Retained succenturiate lobes may cause severe postpartal hemorrhage.

    The retention of succenturiate lobes can be detected during inspection of the placenta and membranes by noting the following:

    a. There are torn blood vessels at the margin of the maternal surface of the placenta with the fetal membranes, or the extension of blood vessels into the membranes. (This may also be noted from the margin of the fetal surface of the placenta.)
    b. There are rough or torn roundish defects in the membranes a short distance from the placenta; occasionally these may have a fragment of decidua attached on the periphery of the defect.

Manual exploration of the uterus and removal of the succenturiate lobe(s) is indicated if retention has occurred.

11. Extrachorial placenta is a placental anomaly observed on the fetal surface as a thick, white ring, which gives the impression that the central portion of the placenta is somewhat depressed. Within this depression the fetal surface looks as usual with the insertion of the umbilical cord. However, all the large blood vessels pass into the depths of the placenta before reaching the ring, instead of coursing over the totality of the fetal surface as they usually do.

There are two varieties of extrachorial placenta, which are determined by the location of the ring. Both may be complete or incomplete, as dictated by whether the ring circumscribes a full circle:

a. In placenta circumvallata (circumvallate placenta), the ring is situated a variable distance between the margin and the middle of the placenta. The ring is formed by a double fold of both the chorion and the amnion doubling back on themselves, with fibrin and degenerated decidua interposed between the folds of the membranes. This gives the ring its raised effect.

b. In placenta marginata (circummarginate placenta), the ring is located at the edge, or margin, of the placenta and is raised by the presence of degenerated decidua and fibrin interposed between the membranes and the placenta at the edge of the placenta; the membranes do not fold back on themselves.

The etiology of extrachorial placentas is not known. Their incidence and significance are a subject of controversy in the literature. At any rate, any significance occurs prior to the time of delivery of the placenta (e.g., antepartal hemorrhage), so an extrachorial placenta may answer some diagnostic questions but there is no indication for clinical action.

Variations, Anomalies, and Abnormalities of the Umbilical Cord and Its Insertion

1. Battledore placenta is a variation in which the umbilical cord inserts in the edge, or margin, of the placenta. Although considered a normal cord insertion, marginal insertion of the cord occurs in less than 10 percent of placentas.

2. Velamentous insertion of the cord is when the blood vessels in the umbilical cord separate and leave the cord prior to insertion into the surface of the placenta (the three vessels course between the chorion and amnion for a variable distance before each enters the placenta surrounded by only amnion). Velamentous insertion occurs approximately 1 percent of the time, with an increased incidence in the event of multiple gestation.

A velamentous insertion of the cord is fraught with danger for the fetus. Rupture of the membranes may also rupture a fetal blood vessel, because their protection is flimsy since they are covered only with amnion. A ruptured vessel may cause hemorrhage in, and exsanguination of, the fetus. The vessels are also liable to compression, which would cause fetal anoxia.

By the time you note such an insertion on inspection of the placenta after its delivery, any disaster that might have happened will have already happened. In such an event, noting a velamentous insertion would be of diagnostic value. Fortunately such circumstances are rare.

3. Vasa previa—a dangerous anomaly with a high perinatal mortality if rupture occurs—is when unprotected blood vessels, covered only with amnion and coursing between the chorion and the amnion, present first at the cervical os by crossing the os ahead of the fetal presenting part. With fetal descent and rupture of the membranes, the vessels are subject to compression and rupture with resulting exsanguination and anoxia of the fetus.

Vasa previa usually occurs in conjunction with a velamentous insertion of the cord. However, vasa previa may also occur when there is a succenturiate placenta since the vascular connections to the succenturiate lobe are also unprotected vessels coursing between the chorion and amnion.

Vasa previa occurs in less than 0.2 percent of pregnancies. Although it is extremely rare, it should be thought of as a possibility any time you are not positive of what you feel presenting at the cervical os. Your examination should include feeling for pulsations synchronous with the fetal heart rate in the questionable presenting entity. It is not always possible, however, to feel a vasa previa during examination. Consultation with the physician is mandatory whenever you cannot identify the presenting part or believe it to be abnormal.

4. An abnormal number of blood vessels in the umbilical cord is an abnormality that has a high correlation with fetal anomalies. About one-third of infants born with only one umbilical artery will have multiple, severe malformations.

5. A short cord may be classified as relative or absolute. An absolute short cord is one that is short in length; a relative short cord is one of average length (or, more likely, one that is ex-

cessively long) that has become looped around the body or neck of the fetus so that it is too short to reach from its placental insertion to the newborn's umbilicus outside the maternal vulva, as is necessary for normal birth.

A short cord, although unusual, may be the causative factor in failure of the fetus to descend. In such an event, it might additionally cause abruptio placentae, umbilical hernia, fetal distress, rupture of the cord, shoulder dystocia, or a combination of these.

A short cord usually is not recognized until there is evidence of a problem. Therefore, it should be considered as a possibility whenever descent is not occurring normally in the presence of an adequate pelvis and good contractions. Fetal distress enhances the accuracy of the diagnosis and compounds the urgency for action, which will require a physician.

6. An excessively long cord is more common than a short cord. Of itself, it has no significance. However, a long cord is of great clinical significance if it becomes looped around the fetal body or neck, thus causing a relative short cord. It can also become knotted or prolapse in front of the presenting part.
7. Cord looping is usually the result of a cord that is longer than average (50 to 55 centimeters, or about 20 to 22 inches). A vast majority of cords longer than 100 centimeters (39 inches) will be looped. Looping occurs in approximately 20 percent of all pregnancies. Single or multiple looping may cause a short cord with all its possible complications. In addition, looping of the cord around the neck may cause fetal distress (although rarely death) as a result of either compression of the cord between the clavicle and the mandible during flexion or tightening of the cord around the neck during descent, especially if the distance is short between the loop and the placental insertion. Therefore it is important to check for a cord around the neck as soon as the baby's head is born.
8. True cord knotting must be differentiated from false knotting. False knotting of the cord occurs when the cord appears to be knotted but instead the blood vessels within the cord are kinked. A true knot occurs when the fetus has passed through a loop in the cord and a real knot has been created (see Figure 74-1). True knotting is most apt to occur in one of two situations:
   a. There is a small fetus, long cord, and large amount of amniotic fluid. The higher ratio of amniotic fluid to fetal size in early pregnancy makes this the time of greatest incidence. True knots, although usually benign because the pulsations in the blood vessels may keep the knot from tightening, may be the cause of intrauterine death at any gestational age.
   b. There is a multiple gestation within a single amnion. All sorts of cord entanglements and knots are possible because the fetuses have greater freedom of movement within the fetal sac, thereby increasing both the chance of a knot's forming and the chance of its tightening. Mortality rate is high.
9. A markedly decreased amount of Wharton's jelly may be seen in malnourished and postmature newborns.
10. Rarities that may occur in the umbilical cord are hematomas, tumors, cysts, and edema. Hematomas usually are the result of rupturing of the umbilical vein. Edema is not uncommon with an edematous or macerated fetus.

FIGURE 74-1 True knot in the umbilical cord.
Source: Photograph courtesy of Carrie Klima, CNM, MSN.

Procedure

A gross inspection can be done as the placenta is delivered. Obvious immediately is whether the membranes trail, with or without tearing; the general appearance and characteristics of the cord; the general size, wholeness, health, and characteristics of the placenta; and the type of cord insertion. A thorough inspection is done as follows:

1. Umbilical cord
   a. Count the number of cord vessels (see Figure 74-2). To do this, take a gauze 4 × 4 and wipe off the cut end. Apply pressure and the apertures of the vessels will be visible. If for some reason time has passed and the vessels

FIGURE 74-2 Counting the number of cord vessels.

FIGURE 74-3 Midwife examining the fetal side of the placenta. The membranes are incomplete.

have collapsed beyond your being able to identify them, reclamp and recut the cord and look for them at the site of the new cut, where they will be readily visible.

b. Measure the length of the cord. Whether the cord is measured usually is dictated by institutional policy and not every institution requires it. Regardless of policy, if the cord appears abnormally long or short it should be measured. Remember to include the length of cord cut off the baby's end when the baby's cord was finally clamped and cut.

c. Inspect the cord for knots, hematomas, tumors, cysts, edema, and the amount of Wharton's jelly.

2. Cord insertion. Inspection of the cord insertion includes the following:

a. location of normal cord insertion, that is, eccentric, central, or marginal (Battledore placenta)

b. abnormal cord insertion (velamentous cord insertion)

3. Membranes. Inspect the membranes for the following:

a. Completeness. This is done by placing the placenta maternal side down, then placing a hand inside the membranes on the fetal surface of the placenta and holding the membranes up to simulate the sac they once were (see Figure 74-3). If the membranes do not form a sac, they are incomplete and most likely ragged. Your hand will have gone inside the membranes in the opening created when the membranes ruptured. This is also the opening the placenta will have come through if delivered via the Schultz mechanism of expulsion. If so delivered, the sac will have been inverted and will need to be turned right side in again for this inspection.

b. Succenturiate lobes, defects, or blood vessels.

4. Placenta. The following steps are involved in inspecting the placenta:

a. Inspect the placenta for meconium staining and areas of calcification.

b. Inspect the fetal side for cysts and to determine if this is an extrachorial placenta (either a placenta circumvallata or a placenta marginata). If necessary, tear or invert the membranes in order to see the entire fetal surface. The fetal surface should also be examined closely for torn or intact blood vessels leading into the membranes in order to identify a missing or intact succenturiate lobe (see Figure 74-3).

c. Inspect the maternal side for cysts, tumors, edema, abnormal color, and multiple placentas.

d. Inspect the maternal side for infarcts and the extensiveness of the infarct formation.

e. Examine the maternal side for intactness (see Figure 74-4). To do this, place the placenta on a flat surface, maternal side up. Use a 4 × 4 gauze to wipe off blood and extraneous material in order to clearly visualize the placental surface.

To identify a cotyledon missing from the margin of the placenta or a missing accessory lobe, wipe off the margin of the placenta and run your finger around the edge of the placenta. It should feel smooth. Any area of roughness should be investigated thoroughly because roughness is indicative of torn placental tissue. Examine the placental margin closely for torn or intact blood vessels leading into the membranes in order to identify a missing or intact succenturiate

FIGURE 74-4 Midwife examining the maternal side of the placenta. The placenta is intact.

lobe. Compare this with your findings from the fetal surface.

A cotyledon missing from the main placental mass is identified by a defect with a rough surface where it tore away. This must be differentiated from a simple tear in the placenta without loss of tissue, which also leaves a rough surface. Differentiation is made by holding the placenta in your hands, maternal surface up, so that the cotyledons fall into place against each other. A missing cotyledon is then readily evident because, as in a jigsaw puzzle, the surrounding pieces will not fit together.

f. Measure and weigh the placenta. This usually is dictated by institutional policy and is not always done. Regardless of policy, if the placenta appears to be of abnormal size, measuring and weighing are indicated. This information is then recorded on the baby's chart.

Bibliography

Benirschke, K., and Kaufmann, P. *Pathology of the Human Placenta*, 4th ed. New York: Springer-Verlag, 2000.

CHAPTER

75

Postbirth Inspection of the Cervix and Upper Vaginal Vault

This discussion concentrates on the postbirth inspection of the cervix and upper vaginal vault, since generally speaking this inspection is not done routinely and since it involves skills beyond those used in the routine inspection of the vulva, perineum, and lower vaginal tract. This latter inspection is merely a matter of separating the labia and looking, and inserting two fingers into the vagina, applying pressure in different directions, and again looking.

The following considerations and key points apply to both cervical inspection and inspection of the upper vaginal vault:

1. These are uncomfortable, possibly painful, procedures. Therefore you need to do the following:
   a. Forewarn the woman of discomfort or pain and give a brief explanation of why the examination is necessary.
   b. Perform the procedure as quickly as possible.
   c. Provide some form of pain relief if the situation permits and the woman's threshold of pain warrants it.
2. The key to performing an inspection that will indeed allow you to visualize the area in order to obtain accurate information is to insert three or four of your fingers the full length of the vagina and exert strong pressure to compress the vaginal tissue in a direction away from the area you want to inspect. Otherwise, the just distended vaginal walls literally collapse around two fingers and an instrument and obstruct your path of vision. Being able to visualize the area readily also reduces considerably the amount of time it takes to perform the procedure and ensures accurate information.
3. The key to adequate visualization is a good source of light.

Procedure for Cervical Inspection

The following are steps taken in inspecting the cervix:

1. Insert three or four of your fingers, palmar side down, the length of the vagina to just in front of the cervix and exert strong pressure downward on the posterior vaginal wall.
2. Insert a long-length ring forceps and grasp the anterior lip of the cervix with it. Be careful not to mistake a fold of redundant bladder or lax vaginal wall for the anterior lip of the cervix.
3. Now move your fingers the full length of the posterior vaginal wall (i.e., into the posterior fornix) and again exert strong pressure downward on the posterior vaginal wall.
4. Insert a second long-length ring forceps and grasp the posterior lip of the cervix with it.
5. Hold the handles of the two ring forceps in your hand. Pull, if necessary, to bring the cervix more into view. Move the handles of the forceps toward one side of the perineum, thus slightly pulling the cervix so that you can visualize one lateral side of it.
6. Visually inspect the area of the cervix between the two ring forceps on one side.
7. If necessary, confirm your visual inspection by using the index finger of your vaginal hand to feel

the edge of the cervix while continuing to exert vaginal pressure with your remaining fingers.

8. Repeat Steps 5, 6, and 7 above, moving the handles of the forceps toward the other side of the perineum in order to visualize and inspect the other lateral side of the cervix.
9. If there are no cervical lacerations, remove the ring forceps and your vaginal hand.
10. If there is a cervical laceration, move the ring forceps to appropriate placements for repair of the laceration.

Hints and Alternatives

1. Maintain firm contact with the posterior vaginal wall as you insert your fingers. This helps you know precisely where you are, thereby aiding you in correct identification of the multitudinous folds of tissue and keeping your fingers from inadvertently entering a patulous cervix.
2. Be sure to insert your fingers the *full* length of the posterior vaginal wall and press *firmly* downward in order to bring the posterior cervical lip into view. Visualizing and grasping the posterior cervical lip seem to be the most troublesome aspects of the procedure of cervical inspection for the student. Utilizing this technique with your vaginal hand will minimize this problem.
3. If the cervix is very patulous, such as that found in a grand multipara, you may not be able to visualize adequately all of the cervix between the ring forceps placed on the anterior and posterior lips of the cervix. In such an event, you can assure yourself of having inspected the entire circumference of the cervix by walking the ring forceps around the cervix. This is done by placing one ring forceps on the anterior lip of the cervix and the second forceps next to it. Release the first forceps and place it on the other side of the second. Continue to leap-frog the ring forceps around the cervix. This technique can also be used if you are unable to locate the posterior lip of the cervix.

Procedure for Inspection of the Upper Vaginal Vault

The procedure for inspection of the upper vaginal vault includes the following steps:

1. Fold a 4×4 gauze square in fourths and clamp a long-length ring forceps on it.
2. Insert three or four of your fingers, palmar side down, the full length of the posterior vaginal wall.
3. Exert strong downward pressure on the posterior vaginal wall with your fingers.
4. Insert the ring forceps with the gauze on it by sliding it down the top of your vaginal fingers. This helps you avoid the tender anterior structures and keep as much of the gauze as possible away from the vaginal walls, since the gauze is abrasive to them.

   The gauze serves as a sponge to blot the area being exposed of blood and other fluids in order to facilitate visualization. If the gauze becomes saturated, remove the ring forceps, dispose of the saturated gauze, clamp on another gauze, and reinsert the ring forceps.
5.
   a. Locate both your fingertips and the end of the ring forceps in the posterior fornix.
   b. Press with the ring forceps against the cervix and press with your fingers against the vaginal wall.
   c. As you press, move your fingertips and the ring forceps away from each other and inspect the area you visualize between them.
   d. Repeat (b) and (c) after sequentially locating your fingertips and the tip of the ring forceps in each of the lateral fornices and in the anterior fornix.

CHAPTER

76

Manual Removal of the Placenta

Manual removal of the placenta is one of several actions to take in the management of a third stage hemorrhage (see Chapter 32). If at all possible, the woman should have a patent IV and some form of analgesia or anesthesia, as this is an extremely painful procedure.

The woman should be catheterized unless you are sure she has an empty bladder. A full bladder not only impedes your performing a manual removal of the placenta but may also impede resolution of the problem by preventing proper contraction and position of the uterus. An empty bladder also reduces trauma to the bladder during this procedure.

Although it is ideal to use a gauntlet glove on the hand doing the manual removal, the reality is that most hospitals do not have these gloves readily available. If at all possible to do so quickly, you should at least change the glove on the hand you are going to insert into the uterus and double glove. As time is of the essence, however, most clinicians proceed with the gloves they have on but should double glove and make sure the end of the glove is pulled as far up the arm as possible without tearing the glove.

Your *whole* hand (including the thumb) is placed inside the uterus by following the cord to the placenta. See Figure 76-1. Once you have inserted your hand into the uterus, do not bring your hand out until you have separated the placenta from the uterine wall and are bringing out the placenta. Do not go in and out, in and out, as this increases the risk of infection.

Your other hand grasps the uterus (fundus) externally through the abdominal wall (see Figure 76-1). This accomplishes three purposes:

1. Controls the mobility of the uterus
2. Keeps the fundus as contracted and thick as possible, which both facilitates separation and reduces the risk that the internal hand might perforate the uterus
3. Serves as a specific counterforce to your internal hand, which better enables you to feel what you are doing between your two hands

Once you locate the placenta, quickly feel the entire fetal surface of the placenta to obtain an anatomical perception of the size of the placenta and where the cord is inserted in order to get a sense of what you need to do. At the same time, sweep the margin of the placenta to find any area of separation

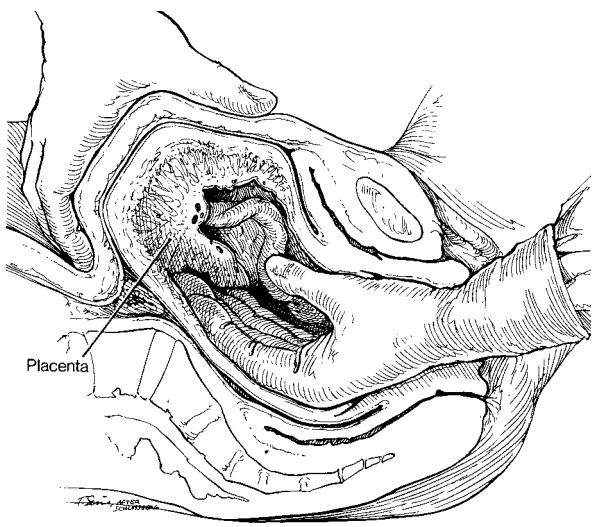

FIGURE 76-1 Manual removal of the placenta.

Source: From Cunningham, F. Gary, Gant, Norman F., Leveno, Kenneth J., Gilstrap, Larry C. III, Hauth, John C., Wenstrom, Katherine D. *Williams Obstetrics*, 21st Edition. McGraw-Hill, New York, 2001. Reproduced with permission of the McGraw-Hill Companies.

that will give you a starting point in the right plane for separating the placenta from the uterus.

The back of your hand is placed against the uterine wall, as this slight cupping of the hand parallels the curve of the intrauterine cavity. Insinuate your fingers between the placenta and the uterus to establish a line of cleavage. Then sweep your hand back and forth from side to side, cutting through the decidua with the outer edge of your little finger, fingertips, and first finger (see Figure 76-1). You will perceive a spongy feeling with a definite give to it as the placenta separates from the uterus. You may need to turn your hand over in order to separate the anterior portion of the placenta. This leaves the back of your hand still against the uterine wall.

The entire placenta should be in the palm of your hand before you bring it out. If you are unsure whether the placenta is totally separated, sweep the uterine wall with your hand, keeping the back of your hand in contact with the uterine wall, feeling for and separating any remaining areas of attachment. Make sure the placenta is totally separated before bringing it out so as not to invert the uterus when you remove your hand (and the placenta).

Bring the entire placenta out at once; don't pull on just a piece, as that piece will simply tear from the rest of the placenta and make assessment of the placenta difficult and potentially inaccurate. Bring the placenta out slowly as your external hand continues to keep the uterus contracted as it empties. The membranes may need to be teased out, which is done the same way as for any delivery of the placenta and membranes (see Chapter 31).

Make sure the uterus is contracted and immediately inspect the placenta, membranes, and cord (see Chapter 74). The placenta should be intact with complete membranes.

Clinicians disagree on whether the uterus should be explored routinely after manual removal of the placenta. Those who argue in favor of routine intrauterine exploration after manual removal of the placenta state that they do it to be sure that all the placenta and membranes have indeed been removed. Those who argue against routine intrauterine exploration after manual removal of the placenta state that such action increases the risks of infection, trauma, and uterine rupture. All clinicians agree that intrauterine exploration is mandatory if the placenta comes out in pieces or is not intact on inspection. See Chapter 77 for the technique of fourth stage intrauterine exploration.

The administration of oxytocin is the last step in manual removal of the placenta. It is given after intrauterine exploration of the uterus (if this is done) to ensure contraction of a now traumatized and possibly exhausted uterus. Further follow-up with a methylergonovine (Methergine) series postpartally (0.2 mg every 4 hours for 6 doses) is done if there is any question of possible retained placental fragments or incomplete trailing membranes.

CHAPTER

77

Fourth Stage Intrauterine Exploration

Intrauterine exploration is one of several actions taken in the management of an immediate (fourth stage) postpartum hemorrhage. If done, intrauterine exploration should be performed as quickly and smoothly as possible, as it is a painful procedure. It is performed when you think there might be placental fragments, cotyledons, or membranes retained in the uterus after the placenta has been expelled. The debate between clinicians as to whether the uterus should routinely be explored after manual removal of the placenta is discussed in Chapter 76.

The woman should be catheterized unless you are sure she has an empty bladder. This will reduce trauma to the bladder during this procedure. It also ensures that a full bladder will not be displacing the uterus, thereby decreasing the ability of the uterus to contract properly.

Wrap one 4 × 4 gauze around two (or four) fingers. A gauze is used because it provides a rougher surface than your gloved hand. A rougher surface helps pick up any placental fragments or ragged membranes which your uncovered gloved hand would just slip over. *One* gauze is used as a routine in order to best keep track of the gauze to be sure no gauze is left inside the uterus or vagina. Your thumb holds the end of the gauze against the side of your first finger.

Your *whole* hand (including your thumb) is placed inside the uterus. Your other hand grasps the uterus externally through the woman's abdominal wall for the same reasons this is done during manual removal of the placenta (see Chapter 76).

Once you have inserted your hand in the uterus, keep it there until you have explored the entire inner surface of the uterus. Do not repeatedly go in and out, in and out, as this increases the risk of infection.

Use the back of your hand to sweep the inside of the uterus. Cupping your hand inside the uterus will cause the outer surface (back) of your hand to conform with the inner contour of the uterus.

Sweep the entire uterus. You will need to turn your hand over in order to do this and keep the back of your hand in contact with the uterine wall. Carefully use the tips of your fingers to separate any cotyledons. The movements of your intrauterine hand should be well counterbalanced by your external hand in the precise area in order to better feel what you are doing and reduce the risk of perforating the uterus.

When you have explored the entire intrauterine cavity, slowly withdraw your hand. Look at what you bring out and identify everything as either blood clots, placental tissue, or membranes. If you are *not sure* that you got everything out in the process of bringing out your hand, unwrap and discard the gauze on your hand, wrap *one* fresh gauze around your hand as before, and go back in *once*. Quickly sweep the uterus, bring your hand out slowly, and identify whatever you bring out.

Unwrap and discard the gauze from around your fingers. Mentally note that you have done this so you will have no question later of having left this gauze in the uterus or vagina.

Massage the uterus with your external hand. The uterus should be well contracted.

Oxytocin is administered after fourth stage intrauterine exploration to ensure continuing contraction of the uterus. Some clinicians will also follow up with a postpartal series of methylergonovine (Merthergine) 0.2 mg every 4 hours for 6 doses.

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CHAPTER

78

Bimanual Compression

Bimanual compression is one action used for controlling immediate postpartum hemorrhage. (See Chapter 34.) It is well named because it literally involves the midwife compressing the uterus between his or her two hands. Bimanual compression is accomplished as described in the following paragraphs and illustrated in Figure 78-1.

One hand is inserted into the vagina and then doubled up into a fist. The fist is placed into the anterior fornix, *palmar side up*. It is important that the fist be positioned palmar side up because this position provides the proper directional thrust and allows you to use greater power behind the fist for compression. Pressure and massage are then applied inward and upward against the anterior wall of the uterus, largely in the area of the lower uterine segment and the corpus (body) of the uterus.

At the same time, the other hand presses deeply into the abdomen behind the uterus. The open abdominal hand, palmar side against the uterus, then

FIGURE 78-1 Bimanual compression of the uterus. Note the position of the hands.

Source: From Cunningham, F. Gary, Gant, Norman F., Leveno, Kenneth J., Gilstrap, Larry C. III, Hauth, John C., Wenstrom, Katherine D. *Williams Obstetrics*, 21st Edition. McGraw-Hill, New York, 2001. Reproduced with permission of the McGraw-Hill Companies.

applies pressure and massage in an in-and-downward direction against the posterior wall of the uterus, largely in the area of the fundus and the corpus of the uterus.

The in-and-upward thrust of the vaginal fist and the in-and-downward thrust of the abdominal hand compress the uterus between the two hands. This compression of the uterus places direct pressure on the bleeding uterine vessels and also stimulates the uterus to contract, which will also compress the vessels by virtue of the uterine musculature arrangement through which the arteries and veins course.

Bimanual compression is continued until uterine contraction is ensured and bleeding is diminished. This can be tested for by momentarily releasing the pressure on the uterus and then evaluating the uterine consistency and amount of bleeding.

CHAPTER

79

Cutting an Episiotomy and Repairing Episiotomies and Lacerations

An episiotomy is a surgical incision of the perineal body. The factors to be considered in deciding whether to cut an episiotomy are discussed in the chapter dealing with management of the second stage of labor (Chapter 28). The discussion here pertains to the knowledge and skills necessary for cutting and repairing episiotomies, cutting and repairing a defibulation, and repairing various lacerations, and to specific techniques involved in these skills.

Relevant Anatomy

A thorough knowledge of pelvic muscles and structures is essential to proper cutting and repair of episiotomies and repair of lacerations. Structures of the perineum are discussed in Chapter 56. Pertinent pelvic muscles and their location are as follows and as illustrated in Figure 79-1.

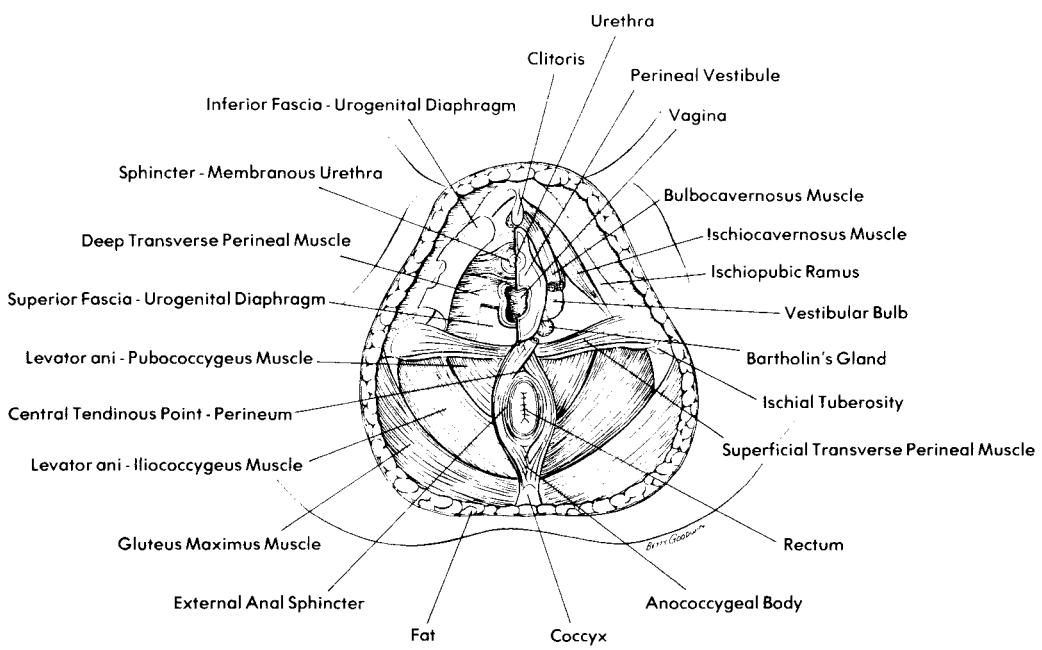

FIGURE 79-1 Muscles of the perineum and related structures.

The muscles of the perineum include the bulbocavernosus, ischiocavernosus, superficial transverse perineal, deep transverse perineal, sphincter of the membranous urethra, and external anal sphincter. The central tendinous point of the perineum is also a part of the perineum. Table 79-1 gives the boundaries and functions of each of these muscles and the central tendinous point of the perineum [1, 2].

The urogenital diaphragm is located between the inferior rami of the pubis and the ischium (ischiopubic ramus) which, with the symphysis pubis, comprise the anterior triangle of the pelvic outlet. It is a musculomembranous sheath that serves as the anterior portion of the pelvic floor musculature. Muscles of the perineum that are superficial to the urogenital diaphragm are the bulbocavernosus, ischiocavernosus, and superficial transverse perineal.

The urogenital diaphragm consists of the inferior fascia (which lies immediately beneath the superficial muscles) and the superior fascia (which is the posterior fascia of the urogenital diaphragm). Between these two layers of fascia, and therefore within the urogenital diaphragm, are the deep transverse perineal muscle and the sphincter of the membranous urethra. The urethra and the vagina are openings through the urogenital diaphragm.

The pelvic diaphragm consists of the levator ani and coccygeus muscles and their fascia (see Figure 79-2). These combine with the piriformis and obturator internus muscles to comprise the muscles within the pelvis. Together they serve as the most inferior portion of the body wall. As such they give support to the pelvic viscera, confine the contents of the abdomen, and close the abdominopelvic cavity. They also exert a sphincteric action on the vagina and rectum. The coccygeus, piriformis, and obturator muscles are much too far posterior and lateral to be involved in either episiotomies or lacerations of the vagina or perineum, and so are not described here.

The muscle comprising the largest portion of the pelvic floor is the levator ani. Because it is a broad muscle and because of its attachments, it is often described as a hammock of muscle. Its superior attachments are anterior to the pelvic brim on the pelvic surface of the superior ramus of the pubis, medial to the medial surface of the ischial spine, and more posterior to the fascia of the obturator muscles. The muscle fibers sweep across the pelvic cavity at varying degrees of direction, with some crossing the sides of the urethra and vagina and others sheathing the rectum between the external and internal sphincter. They are separated from each other anteriorly by the passage between them of the urethra, vagina, and rectum. Posteriorly most of the muscle fibers simply become continuous with their counterparts from the other side in the area between the rectum and the coccyx; some blend with muscle fibers of the rectum; others insert posteriorly into the anococcygeal body and the coccyx.

The levator ani has two major groupings of muscle fibers: (1) the pubococcygeus and (2) the iliococcygeus. Of these two, the iliococcygeus, arising in part from the ischial spine and inserting in the anococcygeal body and the coccyx, is too far posterior and lateral to be involved in either episiotomies or lacerations of the vagina or perineum.

The pubococcygeus group of muscle fibers arises from the pelvic surface of the superior ramus of the pubis on either side of the pelvis. The muscle fibers extend posteriorly as they descend in the pelvis on either side of the urethra, vagina, and rectum and sheath these structures. They are separated by the interlevator cleft (genital hiatus), which accommodates the passage of the urethra, vagina, and rectum. The anterior, or medial, muscle fibers of the pubococcygeus form musculofascial extensions, which support these organs and insert into the posterior aspect of the urogenital diaphragm and the central point of the perineum. The majority of the muscle fibers pass horizontally posterior around the rectum with a lesser number of superficial, anterior fibers inserting into the anococcygeal body and a greater number of deep, more posterior, fibers forming a sling in the space between the rectum and the coccyx by joining and blending with the muscle fibers from the other side.

In effect, then, there are three layers of muscles from outside to inside starting at the perineal body and vaginal introitus and following an imaginary pathway paralleling the posterior and lateral walls of the vagina. These three layers are as follows:

Layer 1: bulbocavernosus and superficial transverse perineal

Layer 2: deep transverse perineal

Layer 3: pubococcygeus of the levator ani

Layer 1 contributes with other muscles to the makeup of the central point of the perineum. Layers 2 and 3 have muscle and fascial fibers that extend to the posterior aspect of the central point of the perineum.

TABLE 79-1 Muscles of the Perineum

Muscle	Boundaries	Function
Bulbocavernosus	There are two bulbocavernosus muscles, one on either side of the vaginal orifice; posteriorly they attach to the central tendinous point of the perineum and the inferior fascia of the urogenital diaphragm; anteriorly they insert into the corpora cavernosa clitoridis; laterally they surround the orifice of the vagina, covering the vestibular bulbs and Bartholin's glands on either side.	Known as the sphincter vaginae, their contraction reduces the size of the vaginal orifice; the anterior muscle fibers contribute to clitoral erection.
Ischiocavernosus	There are two ischiocavernosus muscles, one on either lateral boundary of the perineum; posteriorly they arise from the inner surface of the ischial tuberosities; anteriorly they cover and insert into the sides and posterior surface of the crus clitoridis; laterally they extend from the clitoris to the ischial tuberosities along the ischial ramus, from which they derive some of their fibers.	Maintain clitoral erection
Superficial transverse perineal (transversus perinei superficialis)	There are two superficial transverse perineal muscles, which generally follow the transverse diameter of the pelvic outlet; they arise from the inner and anterior surface of the ischial tuberosity of the superior ramus of the ischium by a small tendon; they insert into the central tendinous point of the perineum.	Fix the location of the central tendinous point of the perineum
Deep transverse perineal (transversus perinei profundus)	There are two deep transverse perineal muscles, which are broader than the superficial transverse perineal muscles; they arise from the inferior ramus of the ischium; they insert into the sides of the vagina.	Help to fix the vagina
Sphincter of the membranous urethra (sphincter urethrae membranaceae)	There are two sphincters of the membranous urethra muscles, consisting of external and innermost fibers; they arise from the margin of the inferior ramus of the pubis on either side; they cross the space of the pubic arch, pass around all sides and encircle the urethra, and unite with the muscle fibers from the other side by blending with them.	Urethral sphincter
External anal sphincter (sphincter ani externus)	The external anal sphincter consists of two strata of fibers (superficial and deep), which together form one flat plane of muscular fibers; it arises from the anococcygeal body, which is a tendinous band extending from the tip of the coccyx to the posterior margin of the anus; it passes around, encircles, and surrounds the anal canal; it inserts in the central tendinous point of the perineum.	Anal sphincter; helps to fix the location of the central tendinous point of the perineum
Central tendinous point of the perineum	A fibromuscular structure in the midline between the vagina and the anus and at the base of the urogenital diaphragm; the tissue is fibrous because it is the point of fusion of both the superior and inferior fascia of the urogenital diaphragm and the external perineal fascia and Colles' fascia; it has muscular fibers because it is a common point of attachment for a number of muscles whose fibers blend together into the central tendinous point of the perineum, among them the bulbocavernosus, superficial transverse perineal, some fibers of the deep transverse perineal, external anal sphincter, and the levator ani-pubococcygeus.	Common point of attachment for a number of layers of fascia and muscles

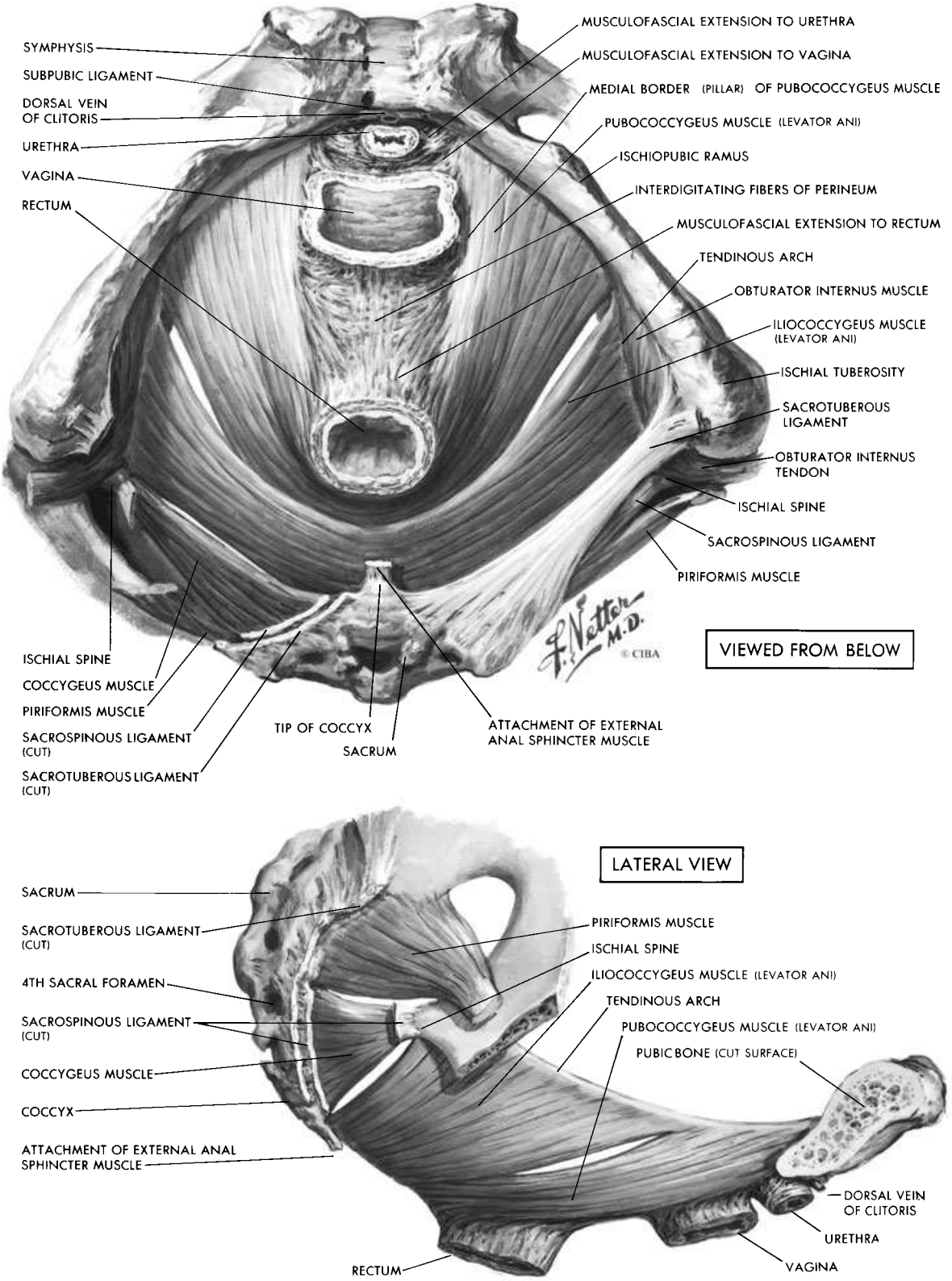

FIGURE 79-2 Pelvic diaphragm.

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Cutting an Episiotomy

There are two types of episiotomies: (1) the midline (medial) and (2) the mediolateral, which may be to the left or to the right (see Figure 79-3). The following principles should be observed, regardless of which type is cut:

1. The presenting part of the fetus is protected from injury.
2. A single cut in any direction is far preferable to repeated snipping because the latter will leave jagged edges.
3. The episiotomy should be large enough to accomplish the purpose for cutting it.
4. The cut should be timed to avoid lacerations (too late) and unnecessary blood loss (too soon). The perineum should be bulging, the vaginal orifice distended by approximately a 3-centimeter diameter of fetal presenting part between contractions, and delivery of the presenting part should be expected to occur within the next two to four contractions.

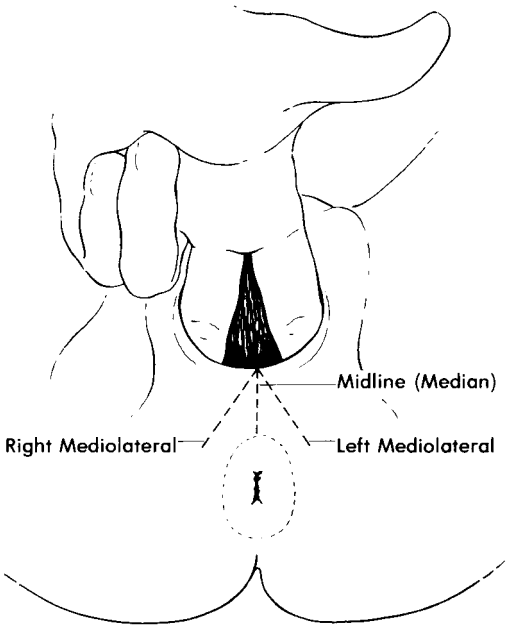

FIGURE 79-3 Types of episiotomy.

Midline Episiotomy

The midline episiotomy, cut into the central tendinous point of the perineum, separates the two sides of the bulbocavernosus and superficial transverse perineal muscles. Depending on the depth of the cut, the two sides of the deep transverse perineal muscle may also be separated. The technique for cutting a midline episiotomy follows.

Procedure	Rationale
1. Place your index and middle fingers into the vagina, palmar side down and facing you. Separate them slightly and exert outward pressure on the perineal body (Figure 79-3).	**1.** This protects the presenting part in two ways: **a.** Your fingers are against the fetal presenting part and are thick enough that scissors properly placed between them will not touch the baby. **b.** The outward pressure directs the perineal body away from the baby. The pressure also flattens the perineal body a bit more, making it easier to incise in a single cut.
2. The blades of the scissors are placed in a straight up-and-down position so that one blade is against the posterior vaginal wall and the other blade is against the skin of the perineal body, with the point where the blades cross at the midline of the posterior fourchette.	**2.** A midline episiotomy is cut in the middle of the central tendinous point of the perineum from the posterior fourchette down to the external anal sphincter.
3. a. With your vaginal fingers and with your thumb of the same hand on the outside of the perineal body, palpate for and locate the external anal sphincter.	**3. a.** A midline episiotomy cuts to, but not into or through, the external anal sphincter. Knowing the location of the external anal sphincter removes any hesitation you may feel in cutting an adequate episiotomy due to fear of accidentally cutting through the sphincter.
b. Adjust the length of the blades of the scissors on the perineal body to the projected length of the incision.	**b.** The length of the incision should be adequate to accomplish the purpose for cutting it. Knowing the location of the external anal sphincter informs you as to the maximum length possible.

Procedure	Rationale
4. Cut.	
5. Sponge, observe, and palpate again for the external sphincter. Evaluate if another cut in this plane is needed.	**5.** The sharpness or dullness of the scissors may affect the efficiency of the first cut.
6. Cut again, if needed.	**6.** Avoid snipping. Two cuts should accomplish the incision in this plane even if the scissors are dull.
7. Evaluate the extent of the incision into the vagina. Feel for a band of tight, restricting vaginal tissue just inside the introitus.	**7.** This band is frequently felt in primigravidas and may be a vestige of the hymenal ring.
8. Extend the vaginal side of the incision, if needed, or if the band of tissue is there and needs to be incised. Extension is accomplished by now pressing downward with your two vaginal fingers, holding them apart to splint the incision line and in far enough to extend beyond the projected lengthening of the incision line. Bring the scissors from above the back side of the hand to slide between the fingers and make the cut.	**8.** The vaginal side of the incision usually needs extending since the cut on that side usually does not go as far as on the skin side when the perineal body is incised. Sliding the scissors between your fingers protects the fetal presenting part.
9. Apply pressure with 4 × 4 sponges to the incision.	**9.** This will staunch any bleeding.

Mediolateral Episiotomy

The technique of cutting a mediolateral episiotomy is the same as that for cutting a midline episiotomy with the exception of the direction of the cut and, therefore, the placement of the scissors for cutting. It does not matter if a mediolateral episiotomy is cut to the left or to the right. It is easier for a right-handed learner to repair a left mediolateral episiotomy and vice versa. A mediolateral episiotomy is cut at a slant starting at the midline of the posterior fourchette with the points of the scissors directed toward the ischial tuberosity on the same side as the incision. Take care to palpate for the external anal sphincter, to direct the cut far enough laterally to avoid the sphincter, and, preferably, to leave approximately 1 centimeter of levator ani muscle between the incision and the sphincter for repair. Also take care not to start the cut on the lateral aspect of the fourchette or direct the cut too far laterally, in order to avoid the Bartholin's gland on that side.

A mediolateral episiotomy cuts into the central tendinous point of the perineum, through the bulbocavernosus and the superficial and deep transverse perineal muscles, and into the pubococcygeus (levator ani) muscle. How much of the pubococcygeus muscle is cut depends on the length and depth of the incision. Usually it is a larger cut than the midline episiotomy because it usually is performed when more space is needed than is available between the posterior fourchette and the external anal sphincter.

Aids to Wound Healing

Wound healing involves three phases: inflammation, proliferation, and maturation [3]. Wound healing is facilitated by actions taken at different times in the maternity cycle, as follows.

Antepartally

1. Prevention of nutritional deficiencies
2. Prevention of anemia

Intrapartally

1. Prevention of maternal exhaustion and dehydration
2. Strict adherence to aseptic technique
3. Prevention of unnecessary further trauma to the incisional tissues, such as might be caused by any of the following:
   a. use of an eyed needle pulling a double strand of suture through the tissue when an eyeless or swaged-on needle (atraumatic suture) pulling a single strand of suture could be used instead

   b. use of suture with suture gauge and needle size larger than needed
   c. inappropriate use of a traumatic cutting needle rather than an atraumatic round needle
   d. misplacement of stitches, requiring removal and replacement
   e. placement of stitches too close together
   f. tissue strangulation resulting from too tight stitches
   g. repeated unnecessary sponging, prodding, and probing of the wound
   h. use of instruments that crush tissue
4. Removal of blood clots and debris before closure
5. Establishing visible hemostasis before closure to avoid formation of hematomas
6. Precise approximation of tissues
7. Closure that obliterates all dead space

Postpartally

1. Diet high in protein and vitamin C
2. Perineal cleanliness
3. Warm sitz baths. A moist environment facilitates rapid epidermal healing [3].

These actions are aimed at the prevention of infection, tissue devitalization, and tissue trauma; provision of tissue building and healing nutrients; and increased circulation to the area.

Manipulation of Equipment

The following hints may ease some of the awkwardness and mistakes experienced when first learning how to suture.

Sutures

1. Use suture with a swaged-on needle.
2. Sutures may come with a curved cutting needle swaged onto one end and a curved, circular, noncutting needle swaged on to the other end. Holding the two needles in one hand, gently straighten the suture and cut it in half. Remove the half with the cutting needle on it from your immediate working area.
3. In order to prevent the length of suture from dangling or dragging across areas of contamination, keep the excess suture gathered up in the palm of the hand holding the needleholder.
4. Never place a clamp or the needleholder on the junction of the needle with the suture, or on the suture itself, except for an end that is to be cut off after tying a knot with an instrument tie. Such an action weakens the suture.

Needle

1. The needle is held by clamping the needleholder on the portion of the needle closest to the suture without being on the junction of the two.
2. The needle is clamped by the tip of the needleholder.
3. The needle is clamped so that its curve is at a 90° right angle to the needleholder.

Needleholder

1. When taking a stitch, you have the most control of the needleholder and most latitude for wrist action if you hold it so that the thumb holes are in the palm of your hand (hold them there with your ring and little fingers), your thumb and middle fingers are on either lateral side of the shaft, and your index finger is on one side (usually the upper) of the broad side of the shaft.
2. Use the same hand position on the needleholder for pulling the needle through the tissue after reclamping the needleholder on the tip (point) of the needle for this purpose.
3. When doing an instrument tie, hold the needleholder by inserting your thumb and middle finger in the holes provided for this at the hand end of the needleholder and placing your index finger on the broad side of the shaft. Your two remaining fingers help hold the excess suture in the palm of your hand.

Stitching with a Curved Needle

Wrist action, combined with entry into tissue with the point of the needle, is the key to success for stitching with a curved needle.

1. Be sure to use the point of the needle in inserting it into tissue, even though this seems to direct the needle in a direction opposite from where you wish to bring the needle out. A common mistake is to try to insert the needle by holding and pointing it in the direction and shape of the stitch to be taken. In so doing, you are actually attempting to insert the needle with the side of its tip—which is why the skin seems so tough and the needle so dull.
2. Start the stitch by holding the needle with its curved midportion up and then turn it even further until you can enter the tissue with the point of the needle. This means that your hand will be holding the needleholder shaft so that the back of your hand is up and then further

pronated as the needle point is positioned for entry.

As the needle enters the tissue, rotate your wrist and hand approximately 180° so that the needle follows the necessary directional path for exit and making the stitch.

3. The principle to use in pulling a curved needle through tissue is to follow the curve of the needle. If you pull straight up after reclamping the needleholder on the tip of the needle, you will meet resistance and traumatize the tissue. Instead, again using wrist action, simply draw the needle through in the direction of the curve of the needle and it slips through the tissue with ease. One caution with this maneuver: Be careful not to poke the woman with the point of the needle, which is now directed for entry again with this completion of the circle.

Knots and Suture Stitches

Knots

An essential skill in repairing episiotomies and lacerations is knowing how to tie knots, whether used for starting and ending a series of suture stitches or for interrupted stitches.

The knot used is the square knot. You can do either hand ties or an instrument tie or both. It does not matter which method you use for tying a knot as long as you become proficient in doing it that way. There are advocates of each. Those who know how to do both hand ties and an instrument tie have the advantage of being able to use whichever will be easier for any given location.

Skill in tying knots is a matter of much patient and repetitious practice. The learner is encouraged to study *The Knot Tying Manual* [4], which clearly illustrates both methods of tying a square knot. Use the practice board that accompanies this monograph. Pay particular attention to the rules for tying knots, on page 5 of the manual.

Suture Stitches

There are four basic suture stitches used in repairing an episiotomy: (1) blanket (continuous locked), (2) interrupted, (3) continuous, and (4) continuous mattress (Figure 79-4). In addition, a crown stitch may be used to repair the bulbocavernosus muscle. Knowledge of and skill in these various suture stitches will also enable you to repair any perineal, vaginal, cervical, periurethral, and clitoral lacerations, including third and fourth degree perineal lacerations. Following is a description of each of these suture stitches as done by a right-handed person. If you are left-handed, simply reverse the direction of the horizontal stitching. This section only discusses the mechanics of doing these sutures; use of these stitches in the repair of an episiotomy, defibulation, or laceration is described later in the chapter.

Blanket (Continuous Locked) The blanket, or continuous locked, suture stitch is used for closing the vaginal mucosa. After placing an anchoring stitch and knot (one end of the suture in the knot is cut short, the other end continues for the suture stitches), proceed as follows (see Figure 79-4):

1. Move the anchoring knot to the left side of the anchoring stitch.

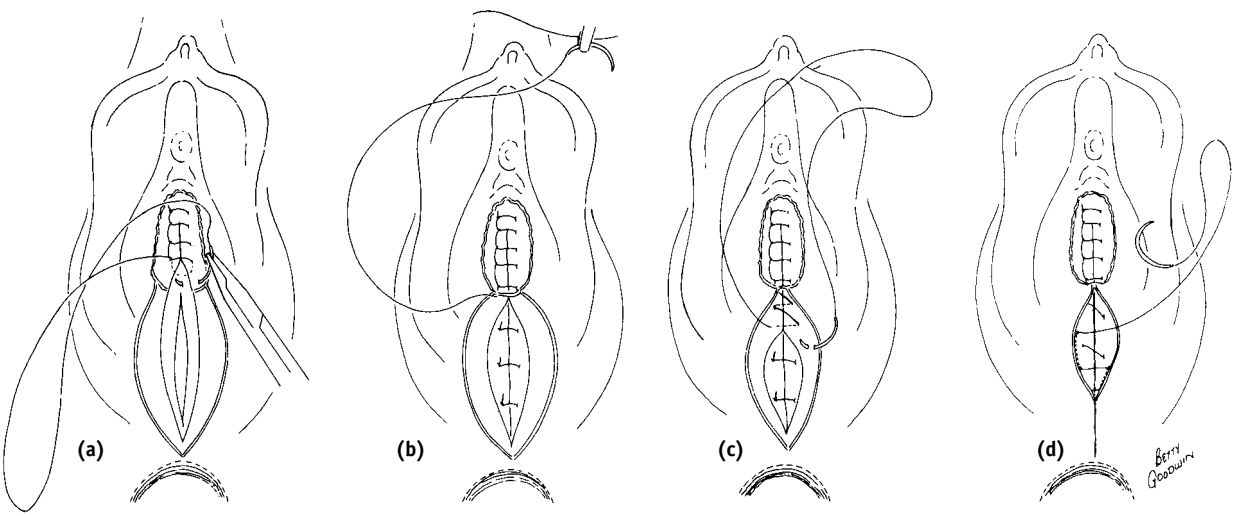

FIGURE 79-4 Suture stitches. (a) blanket (continuous locked); (b) deep interrupted; (c) continuous unlocked; (d) mattress.

2. Hold the suture down along the left side of the incision line.
3. Make sure the entry and exit points of this stitch are precisely across from each other.
4. Take a bite on the right side of the incision.
5. Bring the point of the needle just beneath the tissue surface in the midline of the incision.
6. Continue the bite to the left of the incision.
7. Exit the needle between the incision and the suture to the left of it (this locks the stitch).
8. Pull the needle and suture through.
9. Repeat Steps 2 through 8 for as many stitches as are needed.

Interrupted Interrupted stitches are used for deep muscle repair. An interrupted stitch is a single stitch with a knot (both ends cut short). It is taken from right to left, with the entry and exit points directly across from each other (see Figure 79-4).

Continuous A continuous suture is used for closure of the subcutaneous layer. The continuous suture is exactly like the blanket suture except that it is *not* a locked stitch (see Figure 79-4). Therefore, instead of holding the suture down along the left side of the incision line (Step 2 of the blanket suture stitch), hold it up alongside the stitches already taken and above where the stitch is being taken.

Continuous Mattress A continuous mattress suture stitch is used for the subcuticular closure of an episiotomy or laceration. Therefore, it is described here as an ascending line of subcuticular suture stitches because this is how they are placed when closing the perineal skin in an episiotomy or laceration repair (see Figure 79-4). The stitches can, of course, go in either direction and can be used as the final layer of stitches in repairing deeper periurethral lacerations. From the anchoring point, proceed as follows:

1. Take a shallow bite on the left side of the incision line, inserting and exiting the needle approximately "one cell layer" beneath the skin layer, in a perpendicular line on the same side of the incision. The depth of the bite between the entry and exit points can be greater than the one cell layer.
2. Pull the needle and suture through.
3. Take a shallow bite on the right side of the incision line. The entry point should be directly across from the exit point of the preceding stitch on the left side of the incision line. Again, the entire stitch is on the same side of the incision in a perpendicular line. And again, the entry and exit points are approximately one cell layer beneath the skin layer, with the depth in between being somewhat greater.
4. Pull the needle and suture through and bring the skin edges together.
5. Return to the left side of the incision line and repeat Step 1. The entry point should be directly across from the exit point of the preceding stitch on the right side of the incision line.
6. Repeat Steps 2 through 5 for as many stitches as are needed.

Although some may find it easier to use a straight needle to do a subcuticular closure with the mattress stitch, it is not suggested. Doing so means cutting off the swaged-on curved needle and using an eyed straight needle. Use of an eyed straight needle means that an unnecessary double strand of suture will be going through the tissue, which is contrary to one of the previously described actions to aid wound healing. With practice, it is possible to become proficient and comfortable in doing this stitching with the curved needle.

Crown Stitch The crown stitch is used to reunite the cut bulbocavernosus muscle. Its purpose is to reduce gaping of the vaginal introitus and to facilitate the return of good muscle tone by deliberate approximation of this muscle. This, in turn, facilitates enjoyable sexual relations for both the female and the male. Care must be taken, however, only to closely approximate the muscle in repairing it; pulling and stitching the two sides together tightly may have the reverse and adverse effect of causing dyspareunia. Study the following steps in relation to Figure 79-5.

1. Enter the tissue at the upper left side of the perineal incisional line. Be sure to start this stitch far enough away from the skin edge to allow for both subcutaneous and subcuticular closure over the completed crown stitch.

   Direct your needle so that after entry it follows a sequence of swinging up, laterally, down, and medially to where it exits in the same plane, only further down, in which it entered.

   The amount of lateral thrust must be carefully judged. It must be enough to catch the retracted cut end of the bulbocavernosus muscle but no more than this. The more lateral you go, the more vascular the area you are getting into and the greater the risk of unknowingly nicking a blood vessel. Subsequent slow seepage will result in a hematoma, which may evidence itself

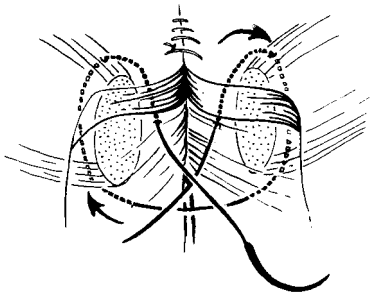

FIGURE 79-5 Crown stitch. Reuniting the divided bulbocavernosus muscle.

Source: From Oxorn, H. *Oxorn-Foote Human Labor and Birth*, 5th ed. Norwalk, CT: Appleton-Century-Crofts, 1986, p. 517. Reproduced by permission.

approximately an hour later. This is a rare happening that can be avoided by simply going only as far laterally as needed and not exaggerating this part of the stitch.

2. Check that you have indeed included this side of the bulbocavernosus muscle in this half of your stitch by grasping the two ends of the suture a short distance from the tissue and pulling down on them. If you have the bulbocavernosus muscle, you should see the entire left side of the perineum from the clitoris to your stitch pull down as you pull on the suture ends. If this does not happen, pull the suture on through and try again or get someone more experienced to put the stitch in. If you do see the pulling and know that you have the bulbocavernosus muscle on the left side, then proceed to the next step.
3. Enter the tissue at the lower right side of the perineal incisional line directly across from your exit point on the left side of the incisional line.

   Direct your needle so that after entry it follows a sequence of swinging laterally in, up, down, and medially to where it exits in the same plane, only further up, in which it entered, and directly across from the entry point on the left side of the perineal incisional line.

   Again judge carefully the amount of lateral thrust as explained in Step 1.
4. Check that you have caught the right side of the bulbocavernosus muscle using the same technique as described in Step 2. You should see the entire right side of the perineum from the clitoris to the right half of your stitch pull down as you pull on the suture.
5. Tie your knot so that the cut ends of the bulbocavernosus muscle are closely joined, but not too tightly. The placement of the two halves of the stitch ensures the approximation of the muscle.
6. Cut both of the suture ends close to the knot.

Principles of and Thoughts About Episiotomy and Laceration Repair

The repair of an episiotomy or laceration should be as artistic as you are capable of making it. An "artistic" repair is one that is done with special care, for a result that not only serves the woman well functionally but is cosmetic as well.

All repairs should, of course, have good functional results. Specifically, the repair should restore the structure of the pelvic musculature and its support to the pelvic organs. An effective repair provides for prophylactic gynecology, particularly in years to come, against cystoceles, rectoceles, and uterine prolapse. It also promotes sexual satisfaction by providing a musculature base for Kegel exercises to build on in reducing the vaginal laxness created by tissue stretching during childbirth. Also, there should be good bowel control and sphincter tone in the event the external anal sphincter was severed. Good functional results also include *not* creating functional problems during the process of repair, for example, not creating fistulas by misplacing stitches, thus providing a channel between orifices; or not creating sexual problems by placing stitches in the hymenal ring; not approximating tissue anatomically, or reuniting the bulbocavernosus muscle too tightly—all of which can cause dyspareunia.

The artistry relates to the cosmetic results. Cosmetic results are important because an episiotomy and lacerations do constitute an assault on the woman's body which, like any type of surgery or injury elsewhere on the body, affects the woman's self-image and body concept. Further, the perineum has become a much more visible portion of the woman's body both to herself and to her sexual partner. Her body should not be disfigured by careless repair of episiotomies or lacerations. The perfect repair results in a scar the breadth of a hair and with all aspects of the perineum in precise anatomical alignment without wrinkles, puckers, or overlapping skin edges. It may not always be possible or within the individual clinician's ability to achieve perfection—but it is a goal to aim for. It has been observed that midwives who do needlework

(e.g., sewing, embroidery, needlepoint) generally have an advantage in doing the fine needlework in episiotomy and laceration repair.

Adequate anesthesia is an essential prerequisite to episiotomy or laceration repair. The area of repair is physically sensitive and the woman is likely to be psychologically sensitive about the procedure as well. You need to recognize and respect this sensitivity as evidenced by concern that the woman not feel pain during the repair. Pudendal block or local infiltration for repair will provide adequate anesthesia and is described in Chapters 68 and 69. You should instruct the woman to differentiate between pressure and pain since she may still feel pressure even though not feeling pain.

The aids to wound healing listed earlier that are pertinent during the actual repair are presented again below with further elaboration:

1. Strict adherence to aseptic technique. This includes changing gloves and redraping if necessary; using an extra sterile glove over the sterile glove(s) you already have on your examining hand for checking the rectum and discarding the extra glove immediately after use; and positioning a sterile drape (hand towel) across the rectal area and below, to beneath the level of the table or bed, in order to provide a noncontaminated field in the event suture drops to that level and brushes against whatever is there.
2. Prevention of unnecessary further trauma to the incisional tissues. Examples of unnecessary further trauma include the following:
   - **a.** use of an eyed needle pulling a double strand of suture through the tissue when eyeless or swaged-on needles pulling a single strand of suture through the tissue are available.
   - **b.** use of a suture with suture gauge and needle size larger than needed. The following are generally used for episiotomy and laceration repairs:
     - **(1)** 4-0 chromic catgut is used for (a) repair of the anterior wall of the rectum in fourth degree lacerations, (b) repair of clitoral lacerations, or (c) repair of any other place when very fine sutures are desired.
     - **(2)** 3-0 chromic catgut is used for (a) repair of the vaginal mucosa, (b) the subcutaneous stitches, (c) the subcuticular stitches, and (d) repair of periurethral lacerations.
     - **(3)** 2-0 chromic catgut is used for (a) repair of the external anal sphincter, (b) repair of cervical lacerations, (c) repair of lateral vaginal wall lacerations, and (d) deep interrupted stitches of pelvic muscles. (These may also be repaired with 3-0 chromic catgut if the cut or laceration is not too extensive.)

       It helps when selecting suture gauge to remember that muscle requires a stronger suture. The larger the gauge number, the finer the suture (e.g., 4-0, 6-0, 8-0) and the smaller the gauge number the heavier the suture and the stronger the tensile strength of the suture (e.g., 2-0, 1-0).

       The size and type of needle usually used is the atraumatic, swaged-on General Closure needle. An atraumatic swaged-on G-I needle may be used for very fine, tiny stitches, as might be indicated in repairing a clitoral laceration.
   - **c.** inappropriate use of a traumatic cutting needle rather than an atraumatic round needle. A cutting needle is triangular and each edge is a cutting edge. Many clinicians believe that a cutting needle is not needed for the repair work under discussion. They prefer a round needle, which has a tapered point and will go through soft tissues easily with less trauma than a cutting needle. There is also less chance of nicking or lacerating a blood vessel with a round needle than with a cutting needle. Other clinicians believe that since the cutting needle is designed for the tougher, less vascular tissues it is valid to use a cutting needle for placing stitches in subcutaneous and subcuticular tissues.
   - **d.** unnecessary, excessive number of needle punctures caused by either
     - **(1)** misplacement of stitches, requiring removal and replacement or
     - **(2)** too many stitches, too close together. Too many stitches also means excessive suture in the wound, which slows the healing process by causing an inflammatory reaction to foreign material. You should carefully plan your stitches before you stick the woman. Good visualization facilitates proper placement of stitches.
   - **e.** tissue strangulation because stitches are too tight. Tissue strangulation devitalizes the tissue and, if the stitches are so tight that circulation is inadequate, may even cause the tissue to slough.
   - **f.** unnecessary repeated sponging and probing of the wound. This can cause further trauma and disrupt clotting, especially if the sponge is used to rub rather than blot. Constant

probing and sponging usually result from anxiety and insecurity. This is common in the learner, who should make a conscious effort not to sponge and probe repeatedly.

g. use of instruments that crush tissue, specifically, the use of pickup forceps. Learn to use them so you can hold tissue securely with them without crushing the tissue. Forceps with teeth allow for gentle grasping of tissue.

3. Removal of blood clots and debris prior to closure. If blood clots and debris are stitched over they can become foci for bacterial growth, inflammatory reaction, and tissue and repair breakdown.

4. Establishing visible hemostasis prior to closure. This avoids the formation of hematomas that can totally disrupt a repair with infection and tissue and repair breakdown. All significant bleeders, whether pumping or oozing, should be tied off before you begin the repair.

5. Precise approximation of tissues, the closure of which obliterates all dead space. Dead space weakens the tissue's healing ability and its function when healed. It also provides a non-pressure-producing spot conducive to hematoma formation and nonconducive to hemostasis. As such, it may also be a focus for bacterial growth and infection. It is also important that dead space not be created by allowing knots to slip while they are being tied. They should be snug enough to ensure approximation but not tight, which might cause tissue necrosis.

A suture often used in repair of episiotomies and lacerations is chromic catgut. Catgut is an absorbable suture as it is made from animal tissue (sheep intestine) and is composed primarily of collagen. As such it is a foreign protein in the human body and is dissolved by digestive enzyme action (proteolysis). Chromic catgut is catgut that has been treated with chrome salts. The function of the chrome salts is to delay the process of proteolysis by which catgut is absorbed, thereby extending the length of time the suture holds the tissue together during the healing process. Plain catgut will absorb in approximately one week and will begin to lose its strength in about 3 days. Chromic catgut delays absorption for 10 to 40 days, depending on the amount of chrome salts used, but generally will retain its strength for 2 to 3 weeks. This gives support to the wound for a longer period of time while it is healing. Absorbable suture is used because artificial support is not needed indefinitely. Catgut has the disadvantage of causing marked tissue inflammatory reaction. This, in turn, can produce edema, which places tension on the sutures and may cause tissue necrosis. The result of this is excessive scarring, which means a weaker functional repair. This inflammatory reaction can be minimized by using only sufficient suture to ensure hemostasis, closure of dead space, and approximation of the tissues—and not one stitch more. Artistry does *not* mean excessive decorative stitchery.

Hemostasis is one of the purposes for doing episiotomy and laceration repair. It is accomplished not only by tying off both pumping and oozing bleeders, by closure that eliminates dead space, and by not using a cutting needle, as mentioned before, but also by the following:

1. Probing the depth of the wound before stitching in order to identify the true depth that needs repair beneath the mucosal layer

2. Starting any line of suture at least 1 centimeter beyond the apex of the wound in order to include any retracted blood vessels

3. Using types of suture stitches that facilitate hemostasis in the most vascular areas, such as the blanket (continuous locked) suture stitch

In doing episiotomy and laceration repair it is imperative that you have good visualization of the field. Good visualization is achieved by positioning the woman properly, which may mean in lithotomy position in stirrups for extensive lacerations and complex repairs; proper positioning of light to illumine the field; proper exposure of the field (which may mean asking someone to scrub in to hold retractors and instruments, such as for cervical lacerations or high vaginal lacerations); use of a tamponade to provide a field that is clean and dry—that is, without a continual uterine blood flow obscuring the field; and positioning yourself properly for maximum efficiency in visualization and manipulation of tissues, materials, and equipment.

Finally, a happy balance has to be struck between the learner's need for time to perform an episiotomy or laceration repair without feeling rushed and the woman's need to have her legs down and together. If a woman is in stirrups, she should be in stirrups no longer than absolutely necessary. Being in stirrups over time can fatigue and become uncomfortable for the woman. Being in stirrups also impairs circulation, which if continued for a long time may be a causative factor in postpartal thrombophlebitis. A total of $1^1/_2$ hours should be considered the maximum amount of time any woman should have to be in stirrups. One effective way of handling this situation is for the learner to have a

set amount of time for doing the repair, after which any work not yet done will be completed by an experienced midwife. The learner can then pace himself or herself in accord with his or her learning needs. It is also possible to do episiotomy or minor repairs with the woman in the dorsal position.

Repair of a Midline Episiotomy

Following are the steps, listed in sequence, to take in repairing a midline episiotomy. As in other skills, this is only one way of doing it; there are other methods. This method is sound and will yield satisfactory functional and cosmetic results. Be open to other methods and individual variations, always seek the underlying rationale, and formulate your own basic methodology and individual variations. The method presented here will give you a valid base from which to develop and experiment and decide whether to continue or change this methodology [5].

1. Insert a tamponade to provide a field free of uterine bleeding. The most common tampon is a tailed, rolled, vaginal gauze sponge. It should be inserted in such a way that both of the following goals are met:
   a. The woman's discomfort during insertion is minimized as much as possible. To do this the tampon should not scrape along the tender and recently traumatized vaginal walls. You can minimize discomfort in three ways:
      (1) Lightly moisten the outside of the tampon to reduce friction and the scratchiness of dry gauze.
      (2) Insert three fingers along the posterior vaginal wall with the fingertips extending into the posterior vaginal fornix and exert strong downward pressure. (This braces the wound and creates space for insertion of the tampon.)
      (3) Insert the tampon by (a) holding it between the palmar surface of the index and middle fingers and the thumb of your inserting hand with the tail tucked into your palm; (b) inserting your index and middle fingers so that the back of them protects the anterior structures and vaginal wall from the gauze tampon; (c) pushing the tampon with your thumb the length of the vagina between the protective splinting and space provided by your two hands; and (d) clamping the tail of the tampon onto the abdominal drape, as a safeguard reminder to remove the tampon when no longer needed.
   b. The tampon should be inserted far enough to be well beyond the apex of the wound to allow for good visualization and room for the first stitch.
2. Identify the following structures and their anatomical juxtaposition both with the episiotomy open and with it gently pushed together with your fingers:
   a. depth of the cut or laceration
   b. vaginal apex of the cut or laceration
   c. hymenal ring
   d. mucocutaneous junction
   e. tissue layers
   f. muscles
   g. rectal sphincter
   h. perineal apex of the cut or laceration
3. Repair the vaginal mucosa with a 3-0 chromic catgut suture using an atraumatic (swaged-on) needle.
   a. Place your anchoring stitch approximately 1 cm above (beyond) the vaginal apex of the cut to catch any retracted blood vessels and provide hemostasis.
   b. Tie a knot after taking the anchoring stitch. Cut off the short end close to the knot.
   c. Plan ahead the number of stitches you will need between the anchoring stitch and a stitch placed right behind the hymenal ring.
   d. Close the vaginal mucosa with the other end of the suture using the blanket (locked continuous) suture stitches (see Figure 79-4 and the discussion of this stitch earlier in this chapter).
   e. If the incision is deep, do not completely close the vaginal mucosa at this time, as to do so will make it too difficult to get into the area for the deep interrupted stitches.
   f. Close the vaginal mucosa to the mucocutaneous junction (the junction of the vaginal mucosa with the perineal skin).
   g. Do not place a stitch in the hymenal ring, as this may cause dyspareunia. To avoid placing a stitch in the hymenal ring yet carry on the closure of the vaginal mucosa, do the following:
      (1) Lock the stitch immediately behind (inside) the hymenal ring by inserting the needle on the same side of the incision as you just exited for that stitch.
      (2) Swing the needle through the tissue underneath the hymenal ring.

(3) Exit on the same side, only now in front of the hymenal ring.

(4) Continue closure of the vaginal mucosa as before.

h. The first one or two blanket stitches should consist of bites large enough to close the cut in the area completely. Thereafter, the stitches include only the vaginal mucosa. The apex of the cut and the area beneath the vaginal mucosa will be closed next with the deep interrupted stitches.

i. After closing the vaginal mucosa, clamp the needle and the remaining suture onto the abdominal drape to be used later for the subcutaneous and subcuticular closure.

4. Repair the bulbocavernosus muscle with a crown stitch (see Figure 79-5 and the procedure earlier in this chapter). Use a 2-0 chromic catgut suture with an atraumatic (swaged-on) needle.

5. If the cut is quite deep, you may prefer to put in a layer of deep stitches first; you can sequentially then (a) finish closure of the vaginal mucosa, (b) repair the bulbocavernosus muscle with the crown stitch, and (c) put in a second layer of deep stitches. In a cut or laceration this deep, the first layer of deep stitches would close the deep transverse perineal muscle and the second layer of deep stitches would close the superficial transverse perineal muscles.

6. Repair the superficial transverse perineal muscles with deep interrupted stitches (see Figure 79-4 and the discussion of this procedure earlier in this chapter). Use 2-0 chromic catgut suture with an atraumatic (swaged-on) needle. Again, before taking any stitches, plan the number of deep interrupted stitches that will be needed to effect hemostasis, close dead space, and approximate the tissue. Bring the point of the needle just beneath the tissue surface in the midline or apex of the cut after taking half the stitch. This ensures closure of the area without dead space. You can then continue to the other side.

7. After placing the deep interrupted stitches, especially if the cut was deep enough to require two layers of deep interrupted stitches, put another glove on top of the glove already on your examining hand. Do a rectal examination to determine whether any of the stitches accidentally entered the rectum. Discard the cover glove after completion of the examination, as it is grossly contaminated.

   If a stitch is in the rectum, the episiotomy repair must be taken apart to the extent of identifying which stitch it is and removing it. Such a stitch is removed because it is a path for contamination and bacteria from the rectum, thereby being the potential cause of infection and development of a sinus tract or fistula. Discovery now entails much less in the way of taking apart and redoing the episiotomy repair with its additional trauma to the tissues than would discovery later. You can avoid placing stitches in the rectum if you take care to direct the bite of the needle laterally and straight back, *not* down.

8. Repair the perineal subcutaneous fascia. Use the same suture for this repair as you used for repair of the vaginal mucosa, unclamping the needle from where you attached it to the abdominal drape in Step 3(i) above.

   a. Start the suture line of continuous stitches at the upper end of the perineal body as follows:

      (1) Lock the stitch at the mucocutaneous junction by inserting the needle on the same side of the incision as the exit of the last stitch.

      (2) Swing the needle through the vaginal mucosa on that same side.

      (3) Exit in the perineal subcutaneous fascia on the same side.

   b. Close the subcutaneous fascia using the continuous suture stitches (see Figure 79-4 and the discussion of this procedure earlier in this chapter).

   c. Again, before taking any stitches, plan the number of stitches you will need before the last one, which is placed differently; see (e) below.

   d. Take care to leave sufficient and equilateral room on both sides for the final layer of subcuticular stitches.

   e. The last stitch is placed differently since its exit point becomes the start of the layer of the subcuticular suture stitches. Therefore, from the entry point, instead of going straight across as with the preceding stitches, come through the subcutaneous tissue on the same side, going a little beneath the perineal apex to include any retracted blood vessels, and exit one cell layer underneath the skin precisely at the perineal apex.

9. Close the skin edges of the episiotomy or laceration with a layer of subcuticular suture stitches. For this repair use the remainder of the same 3-0 chromic catgut used for repair of the vaginal mucosa and the subcutaneous fascia. Subcuticular closure is done using the mattress suture stitch (see Figure 79-4 and the discussion of this procedure earlier in this chapter). Start

the suture line on the side of the incision opposite the side on which the last subcutaneous continuous stitch was taken.

10. Tie off the suture as follows:
    a. When the mucocutaneous junction is reached and the skin edges are completely closed, take a stitch through the perineal subcutaneous fascia and swing the needle on up through the vaginal mucosa, exiting just in front of the hymenal ring.
    b. Take a final stitch in front of the hymenal ring for the purpose of creating ties with which to knot the suture. Try to place this stitch so that the cut ends of the knot will not be sticking the woman. The entry point of this stitch should be on the same side as, and close to the exit point of, the preceding stitch, and the exit point should be straight across on the opposite side.
    c. Do *not* draw the suture all the way through the tissue with this stitch. Instead, leave a length of suture, actually a loop, to tie with.
    d. Cut the needle off the other end if you desire.
    e. Tie your knot slightly loose to allow for some edema resulting from inflammatory reaction to the suture.
    f. Cut the ends short.
11. Remove the tampon gently and quickly. Protect the vaginal suture line with the fingers of one hand while removing the tampon with your other hand.
12. Do a vaginal examination:
    a. Inspect the vaginal suture line.
    b. Make sure all foreign objects (e.g., sponges) have been removed.
    c. Remove any blood clots in the vaginal fornices.
    d. Help contract the uterus.
    e. Check for hematomas.
13. Do a rectovaginal examination to feel the rectovaginal wall and perineal body muscle support after repair.
14. Do a rectal examination to ensure that there are no rectal stitches and to check for hematomas. Discard this glove.

Repair of a Mediolateral Episiotomy

The repair of a mediolateral episiotomy, irrespective of which side it is on, is essentially the same as the repair of a midline episiotomy insofar as the type of suture stitches used and their sequence is concerned. There is, however, one important difference—the angle of the cut. The mediolateral episiotomy was cut on a slant in relation to the perpendicular midline of the perineum. This affects repair in two ways:

1. In a mediolateral episiotomy the medial aspect of the incision tends to retract more than the lateral aspect. Therefore, be careful when taking stitches in the medial half of the cut to secure the tissue involved without entering the rectum.
2. Stitching from side to side of the incision must be done in accord with the angle of the incision (on a slant) and *not* done straight across as though at right angles to a perpendicular midline. Stitching on a slant is facilitated by holding the needleholder parallel to the edges of the incision. In a mediolateral episiotomy there will be more tissue on the lateral side than on the medial side of the incision; therefore, care must be taken in aligning and approximating the tissues. This is done by including more tissue in the lateral bite and half of the stitch than in the medial bite and half of the stitch and recognizing that the interval between the stitches on the medial aspect of a row of suture stitches will be closer together than the interval between the stitches on the lateral aspect of a row of suture stitches.

Keeping this important difference of angle in mind, repair the mediolateral episiotomy in the same sequence of suture stitches and steps as you use for repair of a midline episiotomy (see the discussion of this procedure earlier in this chapter):

1. Insert a tamponade.
2. Identify the pertinent structures.
3. Repair the vaginal mucosa.
4. Repair the bulbocavernosus muscle.
5. Repair the pubococcygeus and deep transverse perineal muscles with one layer of deep interrupted stitches.
6. Repair the superficial transverse perineal muscle with another layer of deep interrupted stitches.
7. Do a rectal examination to check for sutures in the rectum.
8. Repair the perineal subcutaneous fascia.
9. Close the skin edges.
10. Tie off the suture.
11. Remove the tampon.
12. Do a vaginal examination.
13. Do a rectovaginal examination.
14. Do a rectal examination.

Repair of First and Second Degree Lacerations and Sulcus Tears

First degree (1°) lacerations are those that involve the vaginal mucosa, posterior fourchette, and perineal skin. Second degree (2°) lacerations are those that involve the vaginal mucosa, posterior fourchette, perineal skin, and perineal muscles. Muscle involvement depends on the depth and direction of the tear, therefore possibly involving any or all of the following: bulbocavernosus, superficial transverse perineal, deep transverse perineal, and pubococcygeus of the levator ani.

Sulcus tears are a type of second degree laceration in which the vaginal mucosa and underlying tissue lacerate along one (unilateral) or both (bilateral) sides of the posterior column of the vagina instead of up the middle. The posterior column of the vagina is a longitudinal ridge of the inner surface of the lining extending the length of the vagina. The lateral edges of the column as they meld into the lateral vaginal walls create a slight groove (sulcus) from which a laceration extending any distance up this groove derives its name.

Repair of first degree lacerations depends on their extent. Some vaginal nicks or skid marks barely lacerate the vaginal mucosa and will heal by themselves without stitches since the edges approximate and stay together once the woman's legs are together again. More extensive first degree lacerations can be repaired using the blanket suture stitch for the vaginal mucosa, the continuous suture stitch for the perineal fascia, and the continuous mattress suture stitch for subcuticular closure of the skin edges.

Repair of second degree lacerations uses the same sequence of suture stitches and Steps (1 to 14) as repair of episiotomies. However, lacerations often are jagged wounds with ragged edges, making approximation of tissue more difficult. Care must also be taken to place all stitches in accord with the angle of the wound, recognizing that the angle may change in a jagged tear.

Repair of sulcus tears differs only in the repair of the vaginal mucosa if it is a bilateral sulcus tear. In this event two apexes and two suture lines of blanket stitches are needed to close the separate tears in the vaginal mucosa. At their common base, one line of suture stitches is tied off with a final stitch and a square knot while the other continues to draw the larger base opening together. Sulcus tears usually are deep lacerations and often necessitate two layers of deep interrupted stitches. To provide better access for placing the deep interrupted stitches, you may want to repair the vaginal mucosa just a stitch or two into the common base of the bilateral tear for approximation of the tissues, then put in your deep interrupted stitches, and then return to complete your repair of the vaginal mucosa.

Repair of Third Degree Lacerations

Third degree (3°) lacerations are those that involve the vaginal mucosa, posterior fourchette, perineal skin, perineal muscles (which ones depending on the depth of the tear); and external anal sphincter. (Some authorities refer to this as a partial third degree laceration, with a complete third degree laceration involving also the anterior rectal wall. Other authorities refer to this latter as a fourth degree laceration; this is the designation used in this text.) Sometimes the equivalent of a third degree laceration is cut deliberately (sphincterotomy). Third degree lacerations may occur in deliveries in which no episiotomy has been cut; however, frequently they are a lacerated extension of a midline episiotomy.

The first step in repair of a third degree laceration is to identify it. This is done as follows:

1. Observe for the ends of the torn external anal sphincter in the open wound. As the torn ends retract, the ends are found flush with, or as dimples in, the lateral walls at the bottom of the perineal aspect of the wound near the surface. The muscle fibers of the sphincter are obviously different from the surrounding fascia and look rough and stringy.
2. The experienced midwife can often tell by palpating in the open wound whether the rectal sphincter is intact. However, if you are not sure, put another glove over the glove already on your examining hand and put a finger in the woman's rectum. You should be able to palpate the sphincter between your finger inside the rectum and your thumb outside the rectum or to feel its absence anteriorly in the area of the perineal laceration. Be sure to discard the cover glove as soon as you finish with your rectal palpation because it is grossly contaminated.
3. Ask the woman to tighten her rectal sphincter if she is able. You can observe the constriction of the sphincter and also feel it close around your palpating rectal finger if it is intact. It is not possible for her to tighten her sphincter if she has had any type of spinal anesthesia or is under the effects of a pudendal block.

4. The final proof is when you grasp each torn end with an Allis clamp and pull them toward each other, causing them to meet by crossing the Allis clamps and thereby demonstrating the drawing up of perineal tissue on both sides.

A lacerated external anal sphincter is repaired with interrupted stitches approximating the torn ends grasped by the Allis clamps. Inclusion of the anterior and posterior fascial layers will strengthen the repair. Use 2-0 chromic catgut suture. The remainder of the repair is the same as for repair of an episiotomy or a second degree laceration. Some midwives prefer to first anchor a 3-0 chromic catgut suture within the inferior apex of the skin extension of the laceration and take a few subcuticular stitches, then lay this suture aside until the end. They do this in order to avoid later difficulty, which sometimes arises from being unable to visualize this apex after repair of the sphincter.

After repairing the sphincter and before continuing with the remainder of the repair, do a rectal examination to make sure that you have not placed any suture through the rectal mucosa. If you have, that suture will have to be removed so that it does not become a pathway for infection or cause the development of a fistula. Put on a cover glove, which you remove and discard after the examination.

Repair of Fourth Degree Lacerations

Fourth degree (4°) lacerations are those that involve the vaginal mucosa, posterior fourchette, perineal skin, perineal muscles (which ones depending on the depth of the tear), external anal sphincter, and anterior rectal wall. After identifying the tear in the anterior rectal wall and the torn ends of the anal sphincter, begin by repairing the anterior rectal wall. This is repaired in two layers with 4-0 chromic catgut on a swaged-on atraumatic needle:

1. The first layer starts at the apex and consists of a row of interrupted stitches placed in the rectal submucosa to approximate the rectal mucosa without placing stitches in the lumen of the bowel. This suturing requires painstaking care.
2. The second layer covers the first layer and consists of either a row of interrupted stitches or a continuous suture line approximating the overlaying layers of fascia. This layer reinforces the line of repair.

After checking for suture in the rectal lumen, repair the external anal sphincter as described in the preceding section; the remainder of the repair is as described for repair of an episiotomy or a second degree laceration. Special care must be taken in rebuilding the muscle layers of the perineal body, which have been totally rent.

Repair of Periurethral and Clitoral Lacerations

Periurethral lacerations derive their name from the fact that they occur near the urethra. Usually they are longitudinal lacerations that follow, for a variable distance, the general contour of the vestibule of the perineum. They vary in depth as well as in length, with the longest extending into the clitoris. At other times they may be transverse lacerations extending into the labia minora. Their repair depends on their depth or, if superficial, whether they are bleeding (either actively or oozing) or the need for a cosmetic repair. Repair of any periurethral laceration close to the urethra should be preceded by insertion of a urinary catheter to prevent accidental closure of the urethra.

Small superficial periurethral lacerations will heal spontaneously without stitches, as the edges of the tear will be approximated when the woman's legs are together again. If you are unsure whether a laceration fits this category, you may take a single interrupted stitch in the middle of the laceration to facilitate this approximation. Any laceration that is oozing must be repaired. Larger periurethral lacerations can be repaired with interrupted sutures. However, it is more cosmetic to use a mattress suture, or, if the laceration is deep, a layer of continuous suture covered with a subcuticular closure using mattress suture stitches.

All periurethral lacerations should be repaired with 3-0 chromic catgut on a swaged-on needle, except clitoral lacerations, for which 4-0 chromic catgut is used. Such repairs challenge the ingenuity and artistry of the clinician for a cosmetic result since they often involve jagged skin edges. Because of this, there is no precise pattern or sequence of stitches to use, as there is for repair of the other lacerations and for episiotomies. Instead, you have an arsenal of skills in various suture stitches, a knowledge of the pertinent anatomy, a gentle approach, and a caring philosophy.

Repair of Cervical Lacerations

There are two keys to quick and easy repair of cervical lacerations:

1. *Good visualization.* This means positioning the woman properly, proper placement of the light source, retraction of the vaginal wall, effective use of the ring forceps on the cervix to bring the cervix and its laceration into full view, and a well-contracted uterus so obscuring bleeding is minimal.
2. *An extra pair of hands.* An assistant is invaluable in this situation to hold the retractors that will enable good visualization.

Cervical lacerations more than approximately 1 centimeter in length should be repaired in order to prevent possible future problems that might occur if the lacerations were left unrepaired—erosions, chronic ascending infections, and so forth. Repair is with 2-0 chromic catgut on a swaged-on needle. Cervical lacerations that extend into the lower uterine segment require repair by the physician.

Approximation of the two sides of the tear is facilitated by the placement of a ring forceps on each side of the laceration. These should be close enough to the edges to be of use but far enough away from the edges that the bites of the stitches can be taken without sewing through the ring of the forceps and thereby including it in a stitch. On longer lacerations you can avoid forceps impingement for a while by clamping the ring forceps only on the lower portion of the laceration, which means they will be out of the way during repair of the upper reaches of the laceration.

Cervical lacerations are repaired with either interrupted stitches, a continuous suture, or a blanket (continuous locked) suture. The first stitch should be placed approximately 1 cm above (beyond) the apex of the laceration to catch any retracted blood vessels. Care should be taken in the placement of each stitch approximating the two sides of the tear that only one side of the cervix is included in the stitch, thereby maintaining the patency of the cervical canal.

Defibulation and Repair

Defibulation is the reversal of infibulation. Infibulation is the WHO Type III classification of female genital mutilation [6] in which the clitoris and labia minora and inner surface of the labia majora are excised. The incised sides of the labia majora are then stretched toward each other and stitched together, creating a false hood of skin over the urethra and anterior part of the vaginal orifice, which narrows the vaginal opening and leaves only a small opening at the introitus through which menstrual blood and urine dribble. In addition to a number of medical and gynecologic complications, female genital mutilation doubles the risk of the mother dying during childbirth [7]. The major obstetrical problem is obstruction from the resulting anatomy and scar tissue necessitating the need for defibulation or "anterior episiotomy." This can be done because the scar tissue that forms during the healing process from infibulation does not fuse with the underlying tissue of the female genitalia [8]. Cesarean section is not indicated solely on the basis of infibulation.

During the last two decades, the immigration of women from various African and Middle Eastern countries that practice female circumcision/female genital mutilation/female genital cutting has led to the presence of thousands of women residing in the United States who have been infibulated. When these women present for health care when pregnant, midwives will need to know how to provide culturally competent care [8, 9]. Part of that care is defibulation for childbirth.

Discussion of defibulation needs to be initiated early in pregnancy and involve the husband. Provision of counseling, either nondirectional or against re-infibulation, includes information on the medical risks and starts at the time of discussing the necessity for defibulation. The knowledge of medical risks is critical in the decision-making process. It will take time for a woman to think this through and to begin her psychological adjustment to differences in the way her genitals look and feel after defibulation. Fears and apprehensions must be thoroughly explored and usually involve societal and marital concerns. Separate counseling with the husband may be advisable followed by a counseling session with the couple to arrive at a mutual decision [9].

Defibulation should either be done during the second trimester under local anesthesia or when it becomes necessary during the second stage of labor. Doing it earlier in labor only subjects the woman to increased pain and increased potential of infection and bleeding [9]. Second trimester defibulation has

the advantage of being able to assess the pelvic organs and pelvic anatomy more accurately, monitor the progress of labor, and more readily perform urinary catheterization if indicated [7]. The major disadvantage depends on when prenatal care started and if the woman and her husband have had sufficient time to process information and develop trust in their health care provider. Most defibulations take place toward the end of second stage at the same time an episiotomy would be cut.

To perform a defibulation during late second stage labor, insert one or two fingers at the introitus upward underneath the hood that was formed from the infibulation. Perform local infiltration for anesthesia along an anterior central line the same way you would locally infiltrate the perineal body for an episiotomy (see Chapter 69). Insert the blunt end of bandage scissors in front of the fingers and cut the skin/scar tissue anteriorly for 2 to 3 inches (5 to $7^1/_2$ centimeters) taking care not to injure or cut any intact clitoral parts under the top of the hood [9, 10]. Your finger should protect the urinary meatus.

There usually is minimal bleeding as this is scar tissue. However, any remaining scar tissue lacks the ability to be flexible and to stretch and may also tear in unpredictable ways. Therefore, midwives should be prepared to cut a generous episiotomy to provide more room posteriorly and take the tension off of the scarred anterior tissue [11]. This is particularly necessary for those women who now may be better nourished and having larger babies than they might have had in their own country. Cultural food taboos for pregnant women are often a means of attempting to control birth weight, and the diet of all immigrant women needs to be carefully checked for adequate amounts of protein, calories, and iron [11].

The two sides of the wound may need to be sutured at the edges in order to keep them apart so that in the healing process they do not form a "pseudo-infibulation" [12]. This allows for a larger introitus, freedom of urinary and menstrual blood flow, and increased comfort during sexual intercourse. Suturing of each cut edge is done with a continuous locked or unlocked stitch with 4-0 chromic catgut suture [9, 13]. The episiotomy is repaired as described in the procedures discussed earlier in this chapter. Postpartum care should include sitz baths.

References

1. Williams, P. L., and the Editorial Board (Eds.) *Gray's Anatomy*, 38th ed. New York: Churchill Livingstone, 1995, pp. 663–678.
2. Netter, F. H. *The CIBA Collection of Medical Illustrations*, Vol. 2, *Reproductive System*. Summit, NJ: CIBA Pharmaceutical Company, 1965.
3. Leffell, D. J., and Brown, M. D. *Manual of Skin Surgery: A Practical Guide to Dermatologic Procedures*. New York: Wiley, 1997.
4. *The Knot Tying Manual*. Somerville, NJ: Ethicon, 1986.
5. Fleming, N. Can the suturing method make a difference in postpartum perineal pain? *J. Nurse-Midwifery* 35(1):19–25 (January/February) 1990.
6. *Female Genital Mutilation Report of a WHO Technical Working Group*. Geneva, Switzerland: World Health Organization, July 1995.
7. International Centre for Reproductive Health. *Medical Aspects of Female Genital Mutilation*. July 1999. Accessed online at www.icrh.org/areas/fgm.
8. Wright, J. L. *Ritual Female Genital Cutting: An Ethnographic Exploration of the Cultural Context and Rite-of-Passage Ceremony Surrounding the Practice of Excision in One Tribe in the Central African Republic*. Master's thesis. New Haven, CT: Yale University School of Nursing, 2000.
9. Toubia, N. *Caring for Women with Circumcision: A Technical Manual for Health Care Providers*. New York: Research, Action and Information Network for the Bodily Integrity of Women (RAINBO), 1999.
10. *Caring for Women with Circumcision: Fact Sheet for Physicians*. New York: RAINBO, 1999.
11. Marshall, M. A. Personal communication, August 26, 2002.
12. Rushwan, H. Female genital mutilation (FGM) management during pregnancy, childbirth, and the postpartum period. *Int. J. Gynaecol. Obstet.* 70(1):99–104 (July) 2000.
13. Baker, C. A., Gilson, G. J., Vill, M. D., and Curet, L. B. Female circumcision: obstetric issues. *Am. J. Obstet. Gynecol.* 169(6):1616–1618 (December) 1993.

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CHAPTER

80

Physical Examination of the Newborn

TABLE 80-1 Physical Examination of the Newborn

Normal	Significance	Abnormal	Significance
Color good indicator of overall status of infants, especially cardiopulmonary system: Inspection			
Pink; in dark-skinned infants, mucous membranes should be pink	No cardiopulmonary compromise	Duskiness or cyanosis (other than acrocyanosis)	Poor circulation or respiratory difficulty or distress
Acrocyanosis of hands and feet during first 24 hr of life	Sluggish peripheral circulation caused by transition to the cool extrauterine life	Acrocyanosis lasting longer than first 24 hr	Poor peripheral circulation; may have cardiac compromise
Reddish hue (especially noted immediately after birth)	Adjustment in oxygen levels in extrauterine environment	Plethora	Elevated hematocrit or hemoglobin levels, polycythemia levels, or hyperviscosity of blood
		Pale	Cardiopulmonary compromise or failure
Ecchymosis over presenting part (to differentiate between cyanosis and ecchymosis, apply pressure to darkened area; cyanotic area blanches, whereas ecchymotic area remains dark)	Pressure over presenting part, causing bruising and trapping of blood in external tissue layers		
Mongolian spots over buttocks, may extend to sacral region (usually in dark-skinned infants)	Hyperpigmentation		
Jaundice after first 48 hr of age, receding by days 4–5 (peak will occur later in preemie, may be after day 4)	Physiologic jaundice; transition of blood supply to liver, increased RBC count with decreased lifespan of cells, decreased plasma protein level, and decreased glucuronyl transferase that aids in bilirubin conjugation	Jaundice on day 1 or after day 4	Isoimmunity such as Rh, ABO incompatibility, polycythemia, enzyme deficiencies, excessive bruising or bleeding, Hirschsprung's disease, pyloric stenosis, other intestinal obstructions that increase blood supply or shunt blood to the liver; maternal diabetes, SGA

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
General appearance indicative of nutritional status, infant maturity, and general well-being: Inspection			
Well-formed and rounded, with presence of subcutaneous tissue; no obvious anomalies	Good nutritional status; generally healthy	Little or no subcutaneous tissue, wasting muscle, loose skin, thin extremities, anomalies	Malnourished or with a variety of congenital defects, such as cleft lip and/or palate, omphalocele, gastroschisis, meningomyelocele; infant stressed in utero
Vernix	Increases with gestational age		
Lanugo	Decreases with gestational age		
Posture: Inspection			
Fetal position: fists clenched; arms adducted, flexed; hip abducted; knees flexed (extension of extremities may be normal in preemie but abnormal in full term, as extension of legs and then flexion occurs as development progresses); flexion moves upward to arms; spinal column straight	Full term	Opisthotonos (neck in extension)	Brain damage, birth asphyxia; neurological abnormality
		"Frog position" of legs	Prematurity
		Bulge or curvature of the spinal column	Spina bifida or meningomyelocele
Spontaneous, symmetrical movement, may be slightly tremulous (flexion and extension should be equal bilaterally)	Full-term newborn activity	No movement; or asymmetrical, irregular, tremulous (jerky motions, unequal movement)	Birth asphyxia; neurological dysfunction; prematurity; drug-induced birth injury
Muscle strength and tone: Inspection			
Strength and tone strong	May be full term	Strength and tone weak, hypotonia, or flaccid	Birth asphyxia or prematurity
Palmar grasp strong	Good overall strength; may be full term	Palmar grasp weak	Prematurity
Alertness and cry: Inspection			
Mood ranges from quiet to alert; consolable when upset	Normal newborn activity	Not easily aroused, not very alert	Prematurity; stressed; septic; states of wakefulness from neurological problem
Cry: strong	Strong; no increased intracranial pressure	Weak, high-pitched, or absent	Brain damage or increased intracranial pressure
		Raspy	Upper airway problem
		Expiratory grunt	Respiratory distress
		Unilateral drooping of mouth when crying	Nerve damage

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Cardiopulmonary system: Inspection			
Respiratory effort: easy, unlabored rhythm; may be irregular, but periods of apnea >15 sec are abnormal; abdominal breathing	No respiratory distress or difficulty	Dyspnea: accessory muscle retraction (substernal, supracostal, intercostal, supraclavicular); flared nostrils, stridor, or grunting	Respiratory distress or difficulty
Respiratory rate: 40–60 breaths per minute	Normal rate	Apnea lasting >15 sec and accompanied by duskiness, cyanosis, or respiratory rate >60 breaths per minute	Prematurity; respiratory difficulty; sepsis; tachypnea in C-section or in full-term infants may be transient (from retention of lung fluid)
Symmetrical excursion of thorax	Normal respiratory pattern	Asymmetry or unequal chest excursion	Diaphragmatic hernia; pneumothorax; phrenic nerve damage
Anteroposterior diameter normal	Normal respiratory pattern	Exaggerated anteroposterior diameter: ratio greater than 1:1, barrel chest; hyperinflation equal without exaggeration	Respiratory distress
Cardiopulmonary system: Auscultation			
Clear breath sounds, equal bilaterally, anteriorly, and posteriorly; a few rales may be present the first few hours after birth because of residual fetal lung fluid; no color changes or cyanosis should accompany this finding	Clear lung fields	Rales after first day; rhonchi; expiratory grunting; wheezing Unequal breath sounds	Lung congestion; respiratory distress; pulmonary edema; pneumonia Pneumothorax or diaphragmatic hernia
Heart rate: 100–160 beats per minute; regular, without murmurs (initially may hear slight murmur until ductus arteriosus closes)	Normal cardiac rhythm without significant abnormalities	Bradycardia <100 beats per minute or tachycardia >160 beats per minute; murmur (usually heard at left sternal border or above apical pulse)	May be secondary to respiratory difficulty; increased workload on the heart; prematurity; sepsis; congenital heart defect with or without cyanosis
Cardiopulmonary system: Palpation			
No bruit in cranium or abdomen	No arteriovenous malformation	Bruit either in abdomen or cranium	Arteriovenous malformation
Apical pulse at fourth or fifth intercostal space, midclavicular line, left anterior chest (point of maximum impulse at fourth intercostal space just right of midclavicular line, may be shifted to the right during the first few hours of life)	Normal position of cardiac pulse; no shifting; without cardiomegaly	Displaced apical pulse	May have cardiac defect or cardiomegaly

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Cardiopulmonary system: Palpation (continued)			
No thrill	No increased cardiac activity	Thrill after first few hours of life	Increased cardiac activity
Blood pressure: average systolic rate 28–32 weeks: 52; 32–36 weeks: 56; full term: 63; BP equal in all four extremities	Normal cardiac output; good circulation; possibly no cardiac defect	Decreased blood pressure	Shock or hypovolemia
		Unequal blood pressure in the extremities, especially between upper and lower extremities	Cardiac defect: coarctation of the aorta
Cardiopulmonary system: Percussion			
No increased tympany over lung fields	Normal lung field borders	Increased tympany over lung fields	Hyperinflation of the lungs
Skin: Inspection			
Moist, warm to touch, no peeling	Normal, well hydrated	Dry, peeling, cracked	Postmature infant
		Wrinkled	Intrauterine growth retardation
		Gelatinous with visible veins (transparent skin and visible veins disappear with increasing gestational age)	Prematurity
Vernix (thick, white cheesy material)	Increases with gestational age	No vernix	Prematurity
Scant lanugo (fine hair over body)	Full term; decreases with gestational age	Abundant lanugo	Prematurity
Milia	Blocked sebaceous glands (common in newborns)		
Erythema toxicum	Newborn rash over body, usually on days 1–3	Nevus flammeus	Hyperpigmentation
		Meconium staining	Fetal distress
		Petechiae	Hematopoietic disorder
		Edematous, shiny, taut skin	Kidney dysfunction, cardiac failure, and/or renal failure
		Skin tags	Extra folds of skin, overgrowth of tissue; sometimes associated anomalies
Mottling	May be normal reaction to immaturity of organ systems	Mottling	May be abnormal if associated with cold stress, color changes, bradycardia
Skin: Palpation			
Warm (axillary temperature 35.5–36.5°C)	Normal range	Cool (<35.5°C)	Poor peripheral perfusion; prematurity
		Warm (>37°C)	Hyperthermia or fever

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Head: Inspection			
Normocephalic in proportion to body (head circumference for average full-term newborn is 32–38 cm)	Normal	Microcephalic	Congenital syndromes or decreased brain growth as with substance abuse
		Hydrocephalic	Blockage of the passage of CSF such as in meningomyelocele; or excessive production of CSF
		Anencephaly	Absent cerebral tissue and/or scant or absent skull
		Encephalocele	Brain and spinal cord that have herniated
		Bradycephalic	Premature closure of coronal suture line; AP diameter shortened and lateral growth increased
		Craniosynostosis	Premature closure of suture lines
		Molding: cranial distortion lasting 5–7 days	Excessive pressure on cranium during vaginal delivery
		Overriding sutures	Excessive pressure on cranium during vaginal delivery
		Caput succedaneum	Edematous region of scalp extending over suture lines, resulting from pressure on presenting part during vaginal delivery
		Cephalhematoma	Trapping of blood in tissues not crossing the suture lines and lasting up to 8 weeks
		Forceps marks; edematous or reddened areas	Forceps delivery
Head lag: not greater than 10 degrees in full term (pull newborn up, supporting the arms, from supine to sitting position; grade degree of head lag by position of head in relationship to trunk—part of gestational age exam)	Head lag: decreases with maturity	Head lag: greater than 10 degrees; little or no support of head	Hypotonia or prematurity
Hair distribution: over top of head, with single strands identifiable	Full term	Hair distribution: fine, fuzzy, may be over entire head	Prematurity

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Head: Palpation			
Without masses or soft areas over skull bones	Normal	Masses or soft areas such as craniotabes over parietal bones	May be normal variation if no abnormality present
Head: Auscultation			
No bruit	Normal	Bruit	Cerebral arteriovenous malformation
Fontanelles: Inspection and palpation			
Anterior fontanelle (open until 12–18 months): diamond shaped, 5 × 4 cm along the coronal and sagittal sutures	Normal	Craniosynostosis	Premature closure of suture lines may result from brain growth retardation
Posterior fontanelle: triangle shaped, very small, 1 × 1 cm along sagittal and lambdoidal suture lines; or closed at birth	Normal	Bulging fontanelle; usually the anterior fontanelle	Increased intracranial pressure
		Sunken fontanelle	Dehydration
Facies: Inspection			
Eyes on line with ears; nose midline	Normal	Low-set ears; asymmetry of features	Congenital syndromes such as Down syndrome, or genetic defect
		Wide-eyed, worried	Postmature; SGA; or intrauterine growth retardation
		Hypertelorism >2.5 cm	Congenital syndrome: genetic disorders
		Hypotelorism <2.5 cm	Trisomy 13
Oral cavity: Inspection			
Mouth: midline of face, symmetrical	Normal	Mouth: drooping or slanting unilaterally with crying; movement of mouth	Seventh cranial nerve damage; facial nerve damage
Mouth: shape and size in proportion with face	Normal	Birdlike mouth: shortened vermilion border	Fetal alcohol syndrome
		Wide mouth (macrostomia)	Metabolic disorder
		Small mouth (microstomia)	Down syndrome
Mucous membranes: moist, pink	Well hydrated and oxygenated	Mucous membranes: dry, dusky	Dehydrated or poorly oxygenated
Chin shape and size in proportion with face	Normal	Micrognathia	Pierre Robin syndrome
Lips completely formed, pink, moist	Normal	Cleft lip	Congenital anomaly: failure of midline fusion during first trimester
Palate: no arching; intact (determine by palpating)	Normal	High-arched palate	Turner's syndrome
		Cleft palate	Failure of midline fusion during first trimester

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Oral cavity: Inspection (continued)			
Tongue: size in proportion with mouth	Normal	Macroglossia	Hypothyroidism
Tongue: midline	Normal: no neurological dysfunction	Tongue: deviation from midline	Cranial nerve damage
Uvula: midline rises with crying	Normal function of glossopharyngeal and vagus nerves	Uvula: not midline or does not rise with crying	Neurologic dysfunction
Gag reflex: present (reflexes generally develop from head to toe during gestation)	Normal neurologic function of glossopharyngeal and vagus nerves	Gag reflex: absent	Neurologic dysfunction
Sucking reflex: present and strong when nipple or finger offered	Normal maturity and intact hypoglossal nerve	Sucking reflex: absent	Prematurity or brain dysfunction
Rooting reflex: present when cheek is stroked, infant turns toward stroking	Normal maturity and intact trigeminal nerve	Rooting reflex: absent	Prematurity or brain dysfunction
Salivation without excess	Normal	Excessive salivation	Tracheoesophageal fistula; esophageal atresia
Nose: Inspection			
Position: midline	Normal	Position: off midline	Congenital malformation or syndrome
		Flattened nasal bridge	Congenital syndromes
		Beaked	Treacher Collins syndrome
		Enlarged or bulbous	Trisomy 13
Nares: bilaterally present	Intact	Nares: not present bilaterally	Congenital malformation or syndrome
Nares: patent (occlude neonate's nostrils one at a time while holding mouth closed; infant should be able to breathe through one side at a time; passing a catheter into newborn's nares, one at a time, also demonstrates patency)	Normal	Nares: not patent	Nasal obstruction; choanal atresia
Grimace or cry in response to strong odors passed under nose	Normal; intact olfactory nerve	No response to strong odors passed under nose	Olfactory nerve damage
Nose: Auscultation			
Nares (with a stethoscope auscultate for breathing, one side at a time): breathing detected bilaterally	Patent	Nares: breathing not detected bilaterally	Not patent; nasal obstruction

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Eyes indicate many systemic problems: Inspection			
Sclera: clear	Normal	Sclera:	
		Yellow	Jaundice
		Hemorrhages	Birth trauma
		Blue	Osteogenesis imperfecta
Conjunctiva: clear	Normal	Conjunctiva:	
		Hemorrhage	Birth trauma
		Pink	Conjunctivitis, may be chemical, caused by silver nitrate
Iris: colored evenly, bilaterally	Normal	Iris: Brushfield's spots (these gold flecks may be normal if not found with other anomalies)	Down syndrome or congenital syndrome
		Coloboma (opening of pupil that extends into iris on one side)	May be associated with congenital malformation (internal)
Pupils: equal bilaterally and reactive to light (examination done in darkened room with penlight or flashlight; if done with newborn in incubator or in nursery, shield infant's eyes as much as possible)	Normal: intact oculomotor nerve	Pupils: unequal bilaterally; nonreactive	Brain damage or increased intracranial pressure
Cornea: clear	Normal: intact	Cornea:	
		Hazy	Prematurity
		Milky	Congenital cataracts possibly due to congenital rubella
Retina: transparent	Normal: intact	Retina:	
		Areas of pigmentation	Damaged retina
		Blood vessels without clear demarcation, or tortuous	Retinal hemorrhage
Lacrimal duct: patent	Normal	Lacrimal duct: blocked or absent	Congenital obstruction
Blink reflex: reactive (responds to bright light)	Intact optic nerve	Blink reflex: nonreactive or absent	Facial nerve paralysis or optic nerve damage
Red reflex: present	Lens intact	Red reflex: absent	Congenital cataracts
Eyelids: without ptosis or edema	Normal; intact oculomotor nerve	Eyelids:	
		Edema	Birth trauma
		Ptosis	Oculomotor nerve damage
		Epicanthal folds	Down syndrome or cri du chat syndrome

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Eyes indicate many systemic problems: Inspection (continued)			
Doll-eye response: present (with infant in supine position, turn head from one side to the other: eyes move to side opposite the side to which head is turned)	Normal: intact trochlear, abducens, and oculomotor nerves	Doll-eye response: absent	Damage to trochlear, abducens, and oculomotor nerves
Eye position: without slant	Normal	Eye position:	
		Slant upward	Down syndrome
		Slant downward	Treacher Collins syndrome
		Sunset eyes (downward slope of pupils below lids)	Hydrocephalus
Ears: Inspection			
Position: ears in straight line with eyes; vertical angle that is greater than straight vertical line; without slant	Normal	Position: set below eyes; ears slant, internally or externally rotated	Down syndrome
Skin tags: absent	Normal	Skin tags: present	Congenital renal anomaly
Cartilage formation: well-curved pinna, sturdy, stiff cartilage, instant recoil	Normal	Cartilage formation: flattened or folded, slow recoil	Prematurity
Neonate startles or cries in reaction to loud noise or snapping fingers	Hearing intact: auditory nerve intact	Startles or cries in reaction to loud noise or snapping fingers; absent or little response (infant can be tested further with other hearing tests)	Deaf or decreased hearing
Otoscopic examination (this examination is often omitted since it is difficult to perform and may be potentially harmful if the examiner is not skilled; ear should be pulled down and back for examination): umbo (cone) of light present, pearl-gray tympanic membrane may have vernix; membrane is movable without bulging	Normal: intact ear without infection	Otoscopic examination: umbo of light dull or absent; dull or immobile tympanic membrane	Congenital malformation; infection
		Red membrane	Infection
		Blue membrane	Hemorrhage
		Bulging membrane	Infected: otitis media
Neck: Inspection			
Shape: symmetrical	Normal	Shape: asymmetrical	Fetal position
Head: turns from side to side equally, full range of joint motion	Normal	Shape: asymmetrical	Fetal position
Short: without excessive skin	Normal	Short and webbed	Down syndrome

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Neck: Inspection (continued)			
Tonic neck reflex: asymmetrical and present but decreases (place infant in supine position; turn head to one side with body restrained; extremities on side to which head is turned are extended, but extremities on other side are flexed: newborn's attempt to right head when turned to side tests accessory nerve)	Normal	Tonic neck reflex: asymmetrical and strongly present	Prematurity
		Tonic neck reflex: symmetrical	Neurologic dysfunction
Neck: Palpation			
Thyroid: midline	Normal	Thyroid: enlarged	Goiter (rare)
Lymph nodes: not palpable	Normal	Lymph nodes: palpable	Congenital infection
No masses	Normal	Mass in neck	Cystic hygroma
		Sternocleidomastoid enlarged	Torticollis: birth or in utero injury resulting in hematoma of sternocleidomastoid muscle
Carotid: pulse rate strong and regular (do not massage carotid artery or neck: can result in reflex bradycardia)	Normal cardiac and circulatory function	Carotid: pulse rate weak or absent	Cardiac defect or circulatory problem
Clavicles: even and without "lumps" along bones; symmetrical	No fractures	Clavicles: fracture or lump felt; uneven; asymmetrical	Birth injury
Abdomen and thorax: Inspection			
Chest circumference: 30–36 cm	Average for full-term neonate	Chest circumference <30 cm	Prematurity; or SGA
		Chest circumfernce >36 cm	Barrel chest: respiratory difficulty; or LGA
Equal excursion of diaphragm	Normal	Unequal excursion of diaphragm	Phrenic nerve damage
Ribs: symmetrical	Normal	Ribs: asymmetrical	Birth injury or congenital syndrome
Breast: nipple spacing on line without extra nipples	Normal	Breast: nipple spacing not on line, or extra nipples	Congenital syndrome
Areola: raised and without discharge	Full term	Areola: flat and/or discharge	Prematurity or discharge from hormonal influence
		Hypertrophy	Maternal hormonal influence
Abdomen: rounded, contoured, symmetrical	Normal	Abdomen: scaphoid	Diaphragmatic hernia

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Abdomen and thorax: Inspection (continued)			
		Distended (if suspected, measure the abdominal girth every 4 hr to detect changes)	Intestinal obstruction, renal problem; ascites: edema caused by a variety of problems, including congenital kidney or cardiac defects, prematurity, fetal hydrops
		Distention in left upper quadrant	Pyloric stenosis or duodenal or jejunal obstruction
		Asymmetrical	Abdominal mass
Umbilical cord: 3 vessels (2 arteries, 1 vein)	Normal	2 vessels (1 artery, 1 vein)	Internal congenital anomalies possible
Bluish-white	Normal	Meconium-stained	Distress in utero
		Reddened with discharge	Infection
		Thick cord	LGA
		Small cord	SGA or malnourished
		Mass	Hernia
		Hernia of the cord through which abdominal viscera, intestines, sometimes other organs enter	Omphalocele
		Hernia (lateral to the cord may contain abdominal content)	Gastroschisis
Abdominal musculature: strong	Normal	Abdominal musculature: weak	Prune-belly syndrome, may have associated problems, including hypoplastic kidneys
		Visible abdominal wall defect over bladder areas	Exstrophy of the bladder
No visible peristaltic waves	Normal bowel activity	Visible peristaltic waves	Intestinal obstruction; usually not present immediately after birth
Abdomen and thorax: Auscultation			
Bowel sounds: present	Normal	Bowel sounds:	
		Absent	Obstruction
		Hyperactive (unless just after feeding)	Hypermotility
Abdomen: no bruit	Normal	Abdomen: bruit	Arteriovenous malformation
Renal: no bruit	Normal	Renal: bruit	Renal artery stenosis
Abdomen and thorax: Palpation			
Xiphoid process: present	Normal: intact	Xiphoid process: absent or depressed	Fracture (sometimes due to resuscitation)
Ribs: without masses or crepitous	Intact, without defects or "air leaks"	Ribs: masses or crepitous	Fractures or mass; subcutaneous air due to air leaks from pulmonary dysfunction

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Abdomen and thorax: Palpation (continued)			
Breast tissue: 1 cm	Normal: full term	Breast tissue: <1 cm, may be ″5 mm	Prematurity
Abdomen: soft and not tender; without masses	Normal	Abdomen; tense, rigid, tender, masses	Intestinal deformity or obstruction; renal or urinary tract deformity
		Separation of abdominorectus muscles (diastasis recti)	Common in newborns especially premature
Kidneys: 4–5 cm in length; right kidney lower than left, found in abdomen and posteriorly in lumbar or flank area (palpate with newborn's legs flexed in fetal positon to relax infant)	Normal	Kidneys: enlarged	Polycystic
		Absent	Potter's association
Liver: sharp edge just above right costal margin; firm	Normal	Liver:	
		Below right costal margin	Respiratory distress or congestive heart failure
		Hard	Liver damage or cardipulmonary problems
Spleen: 1 cm below left costal margin	Normal	Spleen: absent or not palpable	Congenital heart problems
Bladder; not distended (unless just prior to void)	Normal kidney and urinary tract system	Bladder: distended; may be visible above pubic bone	Urinary tract obstruction
Groin: femoral pulse rate strong and regular bilaterally	Normal	Groin: femoral pulse rate weak or absent bilaterally	Coarctation of the aorta
		Bounding femoral pulses	Patent ductus arteriosus
No hernias or groin masses	Normal	Groin masses	Inguinal hernia
Abdomen and thorax: Percussion			
Gastric bubble: just below left costal margin and toward midline; tympanic	Normal	No tympany	Esophageal atresia or gastric deformity
Abdomen: tympanic except dull over liver, spleen, and bladder	Normal liver, spleen, bladder, no masses (indicated by dullness)	Abdomen: increased tympany	Increased presence of fluid or air
		Increased areas of dullness (if liver or spleen is enlarged, dullness extends below the costal margins; if bladder is enlarged, dullness extends toward umbilicus: be sure to reexamine after void)	Masses or enlarged abdominal organs, located where the dullness is increased
Genitourinary tract: Inspection of female newborn			
Labia majora: present and extend beyond labia minora	Full term	Labia majora: smaller than labia minora	Prematurity
Labia minora: present and well-formed	Full term	Labia minora: larger than labia majora	Prematurity

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Genitourinary tract: Inspection of female newborn (continued)			
Clitoris: present, may be enlarged	Full term or prematurity		
Urethral meatus: present in front of vaginal orifice	Normal	Urethral meatus: displaced	Urinary malformation
Vagina: patent with or without white discharge	Normal	Vagina: not patent, with or without slight bleeding	Hormonal influence
Genitalia: distinguishable as female or male	Normal	Genitalia: not clearly distinguishable as to sex, may have organs of both sexes	Ambiguous genitalia; endocrine problems
Perineum: smooth	Normal	Perineum: dimpling or extra opening	Urinary or genital malformation, or urinary fistula
Anus: midline, patent (test by inserting small finger)	Normal	Anus: shifted anteriorly or posteriorly	Anal defect
		Nonpatent or dimpling	Imperforate anus
Anal wink: present (light stroking of anal area produces constriction of sphincter)	Normal sphincter	Anal wink: absent	Poor muscle strength of sphincter
Genitourinary tract: Inspection of male newborn			
Penis: straight; proportionate to body (length: 2.8–4.3 cm)	Normal	Penis:	
		Curved	Chordee
		Enlarged	Renal problems
Urinary meatus: midline and at tip of glans (if neonate is uncircumcised, gently retract the foreskin; if circumcised, also check for edema or bleeding)	Normal	Urinary meatus:	
		Displace to ventral surface	Hypospadias
		Displaced to dorsal surface	Epispadias
Urinary stream: straight from penis (first void should occur no later than 24 hr postnatally)	Normal urinary pattern	Urinary stream:	
		Not straight	Urinary obstruction or malformation
		From opening in abdomen or perineum	Urinary fistula
		Failure to void within first 24 hr of life	Renal or urinary obstruction or malformation
Testes and scrotum: full, numerous rugae	Full term	Testes and scrotum: flaccid, smooth, or few rugae	Prematurity
Darkly pigmented	Normal	Bluish testes or scrotal sac	Torsion of the testicles
		Enlarged or edematous	Hydrocele or breech delivery
		Dimpling	Torsion of the testicles
Perineum: smooth	Normal	Perineum: dimpling or extra opening	Urinary or genital malformation, or urinary fistula
Anus: midline, patent (test by inserting small finger)	Normal	Anus: shifted anteriorly or posteriorly	Anal defect

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Genitourinary tract: Inspection of male newborn (continued)			
		Nonpatent or dimpling	Imperforate anus
Anal wink: present (light stroking of anal area produces constriction of sphincter)	Normal sphincter	Anal wink: absent	Poor muscle strength of sphincter
Genitourinary tract: Palpation of male newborn			
Testes descended on at least one side	Full term	Testes not palpable (may be found high in the inguinal canal)	Prematurity or undescended testes
Upper extremities: Inspection			
Length: in proportion to each other; lower extremities and body symmetrical	Normal	Length: shortened extremities or asymmetrical	Diabetic mother; congenital syndrome; maternal drug use
Full range of joint motion: (includes abduction, adduction, internal and external rotation, flexion, extension as applicable to joint; full flexion of upper extremities comes with maturity)	Normal	Limited range of joint motion	Birth injury or trauma
		Limited range of flexion	Prematurity
Full range of joint motion:			
Shoulder	Normal	Limited range of motion or flexion of shoulder	Dystocia; brachial plexus damage
Clavicles	Normal	Limited range of motion of clavicles	Clavicle injury; osteogenesis imperfecta
Elbow	Normal	Limited range of motion or flexion of elbow	Birth injury or fetal position
Wrist (test for square window by flexing infant's wrist on forearm, then measure angle according to gestational examination chart—i.e., 0-degree angle for term)	Normal	Limited range of motion or flexion of wrist	Birth injury or fetal position
		Square window: angle greater than 0 degrees	Prematurity
Hand—grasp reflex: present, strong, equal bilaterally	Normal; maturity	Hand: grasp reflex: weak or absent, or unequal bilaterally	Hand injury or fetal position; prematurity or birth injury
Scarf sign: elbow short of midline (grasp infant's hand and gently pull hand around neck toward the opposite shoulder; observe position of elbow to chest; grade position according to gestational chart)	Maturity	Scarf sign: elbow beyond midline	Prematurity

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Upper extremities: Inspection (continued)			
Arm recoil (quickly flex neonate's forearms for 5 sec, then pull them to full extension and release; recoil time is graded)	Maturity	Arm recoil: slow	Prematurity
Palm: no simian creases	Normal	Palm: simian creases	Down syndrome
Fingers: 10 digits and without webbing; equal spacing	Normal	Fingers:	
		More than 10 digits (polydactyly)	May be part of syndrome
		Webbed, digital tags (syndactyly), or unequal spacing	Congenital syndrome
Carpals and metacarpals: present and equal bilaterally	No fractures; bone formation normal	Carpals and metacarpals; absent or unequal bilaterally	Fractures or absence of bone, may be associated with congenital syndromes
Nails: extend beyond nailbeds	Normal; full term	Nails: short; spoon shaped	Congenital syndromes, fetal alcohol syndrome
		Absent	May have absent radius
		Meconium-stained	Fetal distress
Upper extremities: Palpation (in the presence of a fracture may produce crying or facial grimace; observe infant's response)			
Nailbeds: pink, brisk capillary refill (″3 sec), equal bilaterally	Normal peripheral perfusion, normal oxygenation	Nailbeds: dusky, or slow capillary refill (>3 sec), bilaterally	Poor peripheral perfusion or oxygenation
Clavicles: without fractures or pain; symmetrical	Normal	Clavicles: asymmetrical or pain on palpation	Fractures, shoulder dystocia, brachial plexus damage, or palsy
Humerus, radius, and ulna present; symmetrical and without fractures	Normal bone formation	Humerus, radius, and/or ulna absent, or asymmetrical	Absence of any of these bones may be associated with syndromes
		Painful fractures	Birth injury
Pulses: brachial and radial strong and equal bilaterally and in comparison with femoral pulses	Good peripheral perfusion, without obvious cardiac defects	Pulses: brachial and/or radial weak, absent, or unequal bilaterally	Poor peripheral perfusion, possible cardiac defects
Lower extremities: Inspection			
Length in proportion to body and equal bilaterally; limbs straight	Normal extremity length	Length not in proportion to body; short or unequal; limbs not straight, leg internally rotated or bowed	Congenital syndrome; diabetic mother
Ten toes and without webbing; equal spacing	Normal	More than 10 digits or with webbing or unequal spacing	May be associated with congenital syndromes
Feet: straight	Normal	Feet: turned valgus	Absent fibula or fetal position
		Feet: turned varus	Absent tibia or fetal position

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Lower extremities: Inspection (continued)			
Ankle dorisiflexion: 0-degree angle (foot is flexed back on ankle, then angle between foot and ankle is measured)	Maturity	Ankle dorsiflexion: angle >0 degrees, may be up to 90 degrees in very premature	Prematurity
Popliteal angle: ″90 degrees (flex newborn's leg, then flex thigh; next release and extend leg; measure angle of knee)	Maturity	Popliteal angle: >90 degrees and ″180 degrees in very immature infant	Prematurity
Heel-to-ear maneuver (gently pull leg to ear without forcing; heel will not reach ear but only near shoulder area in full-term infant)	Maturity	Heel-to-ear maneuver: heel reaches ear, or just short of the ear	Prematurity
Nails: extend to end of nailbed	Normal; maturity	Nails: do not extend to end of nailbed	Prematurity
Nailbeds: pink; brisk capillary refill (″3 sec)	Good peripheral perfusion	Nailbeds: dusky, or slow capillary refill (>3 sec)	Poor peripheral perfusion
		Pedal edema	Pressure due to fetal position, also can be associated with poor peripheral perfusion, syndromes such as Turner's syndrome
Plantar creases: cover the sole of foot	Maturity	Plantar creases: few or only anterior third of sole of foot	Prematurity
Buttocks: creases symmetrical	Normal hips	Buttocks: creases asymmetrical	Congenital hip dysplasia
Lower extremities: Palpation (in the presence of a fracture may produce crying or facial grimacing; observe infant's response)			
Fibula, tibia, trochanter, and femur: present and equal bilaterally	No fractures; bone formation normal	Fibula, tibia, trochanter, and/or femur: absent or unequal bilaterally	Fractures or absence of bone, may be associated with congenital syndromes
Tarsals and metatarsals present and equal bilaterally	No fractures; bone formation normal	Tarsals and/or metatarsals absent or unequal bilaterally	Fractures or absence of bone, may be associated with congenital syndromes
Full range of joint motion (includes abduction, adduction, internal, and external rotation, flexion and extension as applicable to respective joints of legs, knees, ankles, feet, toes)	Normal; maturity	Limited range of joint motion	Birth injury or trauma
		Flexion of legs, knees, ankles, feet, toes is limited	Prematurity

TABLE 80-1 Physical Examination of the Newborn (*continued*)

Normal	Significance	Abnormal	Significance
Lower extremities: Palpation (continued)			
Hips: without clicks and full range of joint motion (Ortolani's maneuver: flex newborn's hips and knees, then abduct and adduct hip to detect a slipping of the hip out of the acetabulum or an uneven motion unilaterally; Barlow's maneuver: flex newborn's hips and knees, then place finger on the femur and trochanter, put hip through full range of joint motion and listen for audible click)	Normal range of joint motion and no clicks	Hips: limited range of motion or positive result of Ortolani's or Barlow's maneuvers	Congenital hip dysplasia
Knee jerk or patellar reflex: present, symmetrical	Normal; mature	Knee jerk or patellar reflex: absent, weak, or asymmetrical	Neurological deficit or prematurity
Plantar reflex: present and symmetrical	Normal; mature	Plantar reflex: absent, weak or asymmetrical	Neurological deficit or prematurity
Back: Inspection			
Spinal column: straight	Normal alignment	Spinal column: curved	Altered alignment that should gradually resolve if resulting from fetal positioning
No visible deviations or defects	Intact	Visible defects: mass, dimple, or bulge with or without a tuft of hair	Spina bifida
		Open spinal defect or may be covered with tissue, involving the meninges and spinal cord or just spinal cord	Meningomyelocele
		Sinus tracts present	Pilonidal cysts
Back: Palpation			
Vertebrae present, without enlargement or pain	Normal spinal column	Vertebrae with bulge, enlarged area, or pain	Mass, bulge, or cyst; fracture of a vertebrae; spina bifida; occult meningomyelocele or pilonidal cyst
Anus: see genitourinary tract			
Buttocks: see lower extremities			

Source: From Kenner, C., Lott, J. W., and Flandermeyer, A. A. *Comprehensive Neonatal Nursing: A Physiological Perspective*, 2nd ed. Philadelphia, PA: W. B. Saunders, 1998, table 17-2, pp. 237–249.

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CHAPTER

81

Circumcision

VIVIAN H. LOWENSTEIN, CNM, CRNP, MSN, CERTIFIED MOHELET

Male circumcision is the removal of the foreskin of the penis. The decision to circumcise or not is made by the parents of the newborn baby. Circumcision is usually done on the first day of life by a licensed health provider or on the eighth day in a religious ceremony performed by a recognized attendant. Ritual circumcision of newborn males is practiced by the Jewish and Muslim religions. It symbolizes a covenant with God following the tradition of Abraham in Genesis Chapter 17.

Male circumcision continues to generate a number of controversies. These include whether or not it should be done, the use of pain relief, and the role of the Certified Nurse-Midwife/Certified Midwife in offering this service. Some midwives have chosen to provide this service to parents, yet questions continue concerning whether this surgical procedure is within a CNM's/CM's scope of practice, can be included in clinical guidelines, and is covered by malpractice. Circumcision is considered within a midwife's scope of practice when it has been determined that there is a need for providing this procedure to the clientele they serve. The midwife should follow the ACNM *Guidelines for the Incorporation of New Procedures into Nurse-Midwifery Practice* when initiating this procedure into practice [1]. Midwives performing newborn circumcision need to be aware of current state legislation in this area and attempt to clarify or change it when it restricts midwives from providing this service. Additionally, midwives should review the process of credentialing within institutional clinical guidelines to ensure it is included on the list of midwifery skills.

Whether the midwife performs circumcisions or not, counseling and resources should be provided to parents in a nonbiased manner with an accurate knowledge base. The decision to have a newborn son circumcised is sometimes a difficult one. Midwives can support the parent's decision-making process by introducing current and accurate information and affording them time to come to a consensus whether to have it done or not. This information should be offered during prenatal care (at 28 weeks), early pregnancy, childbirth, and baby care classes. Information that should be included to help parents make a decision includes cultural and religious reasons, as well as medical research and recommendations. The informed consent for parents should include the risks and benefits, the current status of the methods of relieving pain during circumcision, how the procedure is done, common complications and post circumcision care.

The American Academy of Pediatrics Task Force issued a new Circumcision Policy Statement in March 1999. The Task Force came to this conclusion:

> Existing scientific evidence demonstrates potential medical benefits of newborn male circumcision; however, these data are not sufficient to recommend routine neonatal circumcision. In the case of circumcision in which there are potential benefits and risks, yet the procedure is not essential to the child's current well-being, parents should determine what is in the best interest of the child. To make an informed choice, parents of all male infants should be given accurate and unbiased information and be provided the opportunity to discuss this decision. It is legitimate for parents to take into account cultural, religious, and ethnic traditions, in addition to medical factors, when making this decision. Analgesia is safe and effective in reducing the procedural pain associated with circumcision; therefore, if a decision for circumcision is made,

procedural analgesia should be provided. If circumcision is performed in the newborn period, it should only be done on infants who are stable and healthy. [2]

Circumcision is performed in the home, in birth centers, and in hospitals. It is considered a safe procedure given adequate training and experience. The incidence of complications, including bleeding and infection, is less than 1 percent [3, 4]. Other risks include cutting too much or too little of the foreskin, injury to the top of the penis, or side effects caused by local anesthesia (if it is used).

Learning the skill of circumcision includes developing an understanding of male genital anatomy, observing an experienced skilled practitioner perform the procedure, being supervised while doing the first ten circumcisions, and having a means for evaluation/feedback. When beginning to learn the procedure of circumcision, the midwife should have the support of and the ability to collaborate with others who are experienced. In some situations a more experienced practitioner may need to assess the genitalia for abnormalities or help decide whether the circumcision should be postponed (e.g., for a preterm newborn). As with other technical procedures, the more practice the midwife acquires, the better her or his skill will be. The midwife will find that the safety of the procedure depends on being able to observe and learn techniques from others, on providing informed consent and parental counseling, and on the continued self-evaluation of her or his own practice. The practitioner that performs circumcisions must be respectful that this is a surgical procedure that is being done to a healthy newborn.

Relevant Male Genital Anatomy

The delicate nature of newborn circumcision requires that the midwife be knowledgeable about and have a high regard for newborn male genitalia.

The foreskin (prepuce) is the outer layer or fold of skin covering the glans of the penis (Figure 81-1). The foreskin is attached to the glans of the penis ventrally at the frenulum. A small blood vessel lies beneath the frenulum. During intrauterine development, the inner preputial epithelium begins to separate from the epithelium of the glans. Although retraction of the foreskin is minimal at birth, this normal physiological separation continues throughout childhood [2, 5]. The opening at the top of the prepuce is the preputial ring. Phimosis is a stenosis of the preputial ring; the prepuce cannot be retracted even though there may be complete separation of the foreskin and glans.

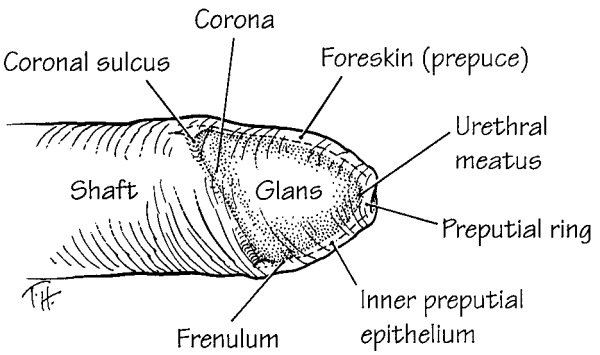

FIGURE 81-1 Anatomy of the penis.

The corona is the upper portion of the glans. The coronal sulcus is the boundary between the glans and the shaft of the penis. The correct excision of foreskin is at the level of the coronal sulcus [6]. The urethral opening (meatus) normally is located at the central top of the glans. When the urethral meatus is in the ventral or dorsal plane, the condition is known as hypospadias, and the circumcision should not be done.

Circumcision Instruments

There are a variety of clamps available specifically for performing circumcisions. The most popular are the Gomco clamp (Figure 81-2) and the Mogen clamp (Figure 81-3).

The advantages of the Gomco clamp are threefold: (1) it includes a bell that protects the glans; (2) it is associated with decreased bleeding and infection rates; and (3) it allows visualization of the glans to assess penile anomalies, since a dorsal slit is necessary for application of the bell. If an anomaly is noted the circumcision is not done. The dorsal slit can be approximated and sutured since the foreskin may be required for reconstructive surgery. The disadvantages of the Gomco are that it involves more parts, requires more steps in the procedure, and it takes more time.

The Plastibell clamp is similar to the Gomco clamp. It has a small grooved plastic ring that remains on the penis after the circumcision has been done. The ring usually sloughs off within a week. The Plastibell has a higher incidence of infection [3].

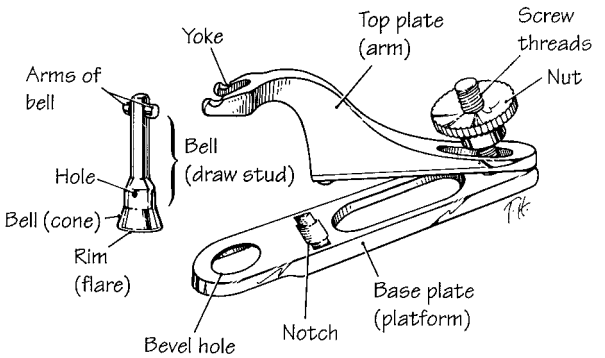

FIGURE 81-2 Gomco clamp.

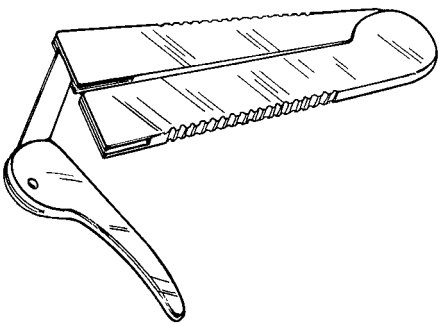

FIGURE 81-3 Mogen clamp.

The Mogen clamp (often used by Mohelim to perform ritual circumcision) has the advantage of enabling the clinician to perform the procedure very quickly since there are fewer steps. Using a Mogen has the distinct disadvantage of making the circumcision a "blind" procedure. The glans of the penis cannot be seen and thus is at risk of being cut. Anomalies may not be discovered until after the circumcision. The midwife should observe the use of different clamps in order to be able to provide accurate information to parents and to choose the method that appears most safe and comfortable for use.

Pain Relief

It is apparent through observation and clinical research that the procedure is painful to the newborn. The research has shown that there are physiologic changes in the neonate during the procedure, which includes changes in heart rate, blood pressure, oxygen saturation, and cortisol levels [7–11]. Yet in the past, neonatal circumcision was usually performed with no anesthesia. It is now recommended by the American Academy of Pediatrics that analgesia be given to the newborn before performing the procedure [2]. The methods of pain relief that have been investigated for circumcision include the subcutaneous ring block, dorsal penile nerve block (DPNB), topical anesthesia, and sucrose flavored pacifiers. The risk of the method of pain relief to the neonate must also be considered.

The subcutaneous ring block is reported to be the most effective method of pain relief for neonatal circumcision [12]. First described by Broadman et al. [13] as postcircumcision analgesia, it is now used before performing a circumcision. The injection forms a circumferential ring at the shaft of the penis near the base [2, 12, 13, 15, 16], or at the midshaft [2, 14] (Figure 81-4). The subcutaneous injection is given at the midline in a lateral direction. A 26- or 27-gauge needle is used to inject 0.8 mL of 1% lidocaine (without epinephrine), after aspirating the syringe. The circumcision can then be performed after waiting 3 to 8 minutes. There have been no reports of complications for this method [2, 14].

The dorsal penile nerve block developed by Kirya and Werthmann [17] is a subcutaneous injection into the subpubic space where the dorsal nerves traverse. The dorsal nerve branches off of the pudendal nerve and extends to the corpora cavernosa, skin, glans, and frenulum of the penis [15]. The dor-

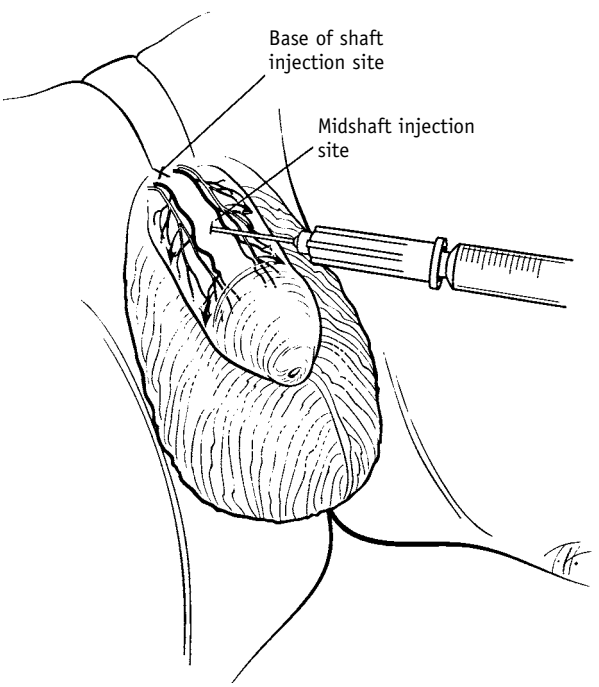

FIGURE 81-4 Subcutaneous ring block at midshaft and base of shaft injection sites.

sal arteries run medially and close to the nerves (Figure 81-5). This makes aspirating the syringe important to prevent intravascular injection. A 27-gauge needle is used to inject the 0.4 mL of 1% lidocaine (without epinephrine) at both the 10 and 2 o'clock positions at the base of the penis (Figure 81-6). The subcutaneous injection is directed laterally in a posterior direction, 3 to 5 millimeters on each side, until Buck's fascia is entered. It is important to control the direction and depth of the needle in order to avoid injury of underlying penile structures. After aspiration, the local anesthetic is injected. The anesthetic effect should occur within 3 to 5 minutes [2, 11, 14]. The most common complication is bruising [8, 18]. Other rare complications include hematoma and local skin necrosis [16].

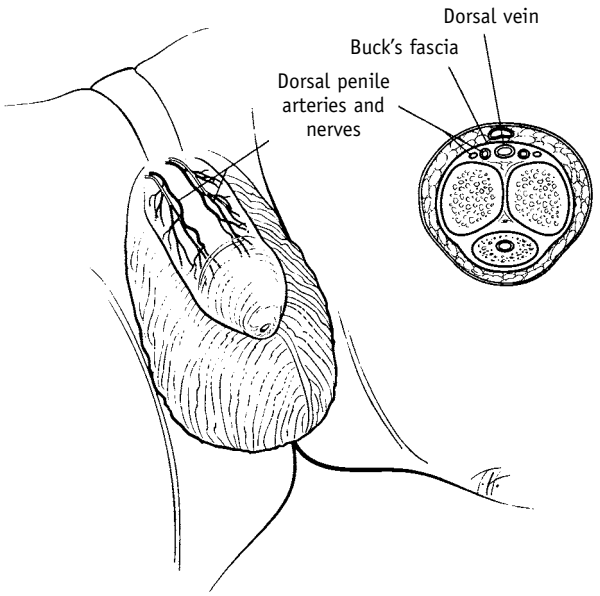

FIGURE 81-5 Anatomy of the dorsal nerves, vein, and arteries.

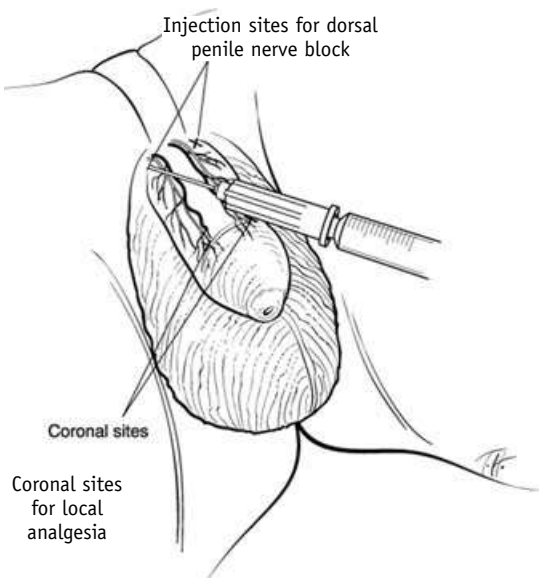

FIGURE 81-6 Dorsal penile nerve block sites and local analgesia corona sites.

Local analgesia, given at the corona, has been reported to be as effective as a DPNB [19]. At the level of the corona, after aspirating the syringe, an injection of 0.4 mL of 1% lidocaine (without epinephrine), is given at the 10 and 2 o'clock positions on each side of the foreskin [14, 19].

Topical or spray forms of local anesthetic may also be used prior to the circumcision. Studies have shown that topical 2% lidocaine or EMLA cream (a eutectic mixture of local anesthetics that contains 2.5% lidocaine and 2.5 percent prilocaine) will provide some relief [20, 21]. The dose of EMLA cream is 1 to 2 grams, applied to the distal area of the penis 60 to 90 minutes before the circumcision [2, 12, 14, 22]. The effect is superficial, since the anesthetic is applied only to the skin layer of the foreskin. When used prior to a DPNB, the topical local anesthetics were reported to decrease the neonate's distress from the injection [22]. There is a risk of methemoglobinemia when using EMLA on a newborn, because prilocaine can oxidize hemoglobin to methemoglobin. This was found when the dose of EMLA was greater than 3 grams or when the newborn was given other drugs (sulfonamides or salicylates) which have the potential to cause methemoglobinemia [2, 12, 14].

Noninvasive interventions that have been studied include giving acetaminophen (Tylenol) and pacifiers. Plain and sucrose flavored pacifiers have been shown to be effective in reducing crying [23, 24]. The nipple is dipped in a 24 percent sucrose solution (1 packet of table sugar in 10 mL of tap water). This is similar to giving the baby gauze dipped in wine to suck on prior to ritual circumcision. Acetaminophen has been found to provide postoperative relief when given 2 hours prior to the circumcision and again 4 hours after the procedure. The dose of infant acetaminophen drops is 15 mg/kg (0.15 mL/kg) [14, 25].

It should be noted that babies' distress often begins when they are put on a board and restrained. This distress might be reduced by swaddling the baby's upper body and having an attendant hold the baby's legs or minimizing the time the baby is restrained on a board. A restraint chair that is padded and physiologically adapted to the newborn has been found to decrease the baby's distress [26].

Procedure	Rationale
Preparation	
1. Counseling should begin during prenatal care, when parents should be provided with the information and resources to make a decision about circumcision if the child should be male. Informed consent is then required postpartum. The midwife should assess the parents' need for information and provide it and assess the parents' commitment to their decision to circumcise the newborn. The practitioner performing the circumcision is responsible for obtaining the informed consent. Counseling should cover what male circumcision is; medical research and recommendations [2]; religious and cultural beliefs; possible complications and risks; care of the uncircumcised and circumcised penis; signs and symptoms of complications; and whom to contact with questions or concerns.	**1.** The decision to circumcise a newborn son requires information on cultural beliefs and medical benefits and risks and clarification of any misconceptions. The time available during prenatal care offers the parents the opportunity to consider their feelings and beliefs regarding circumcision. The midwife should be supportive of the parents and help them communicate with one another to decide what is best for their child. If the father of the baby is not available the woman should be encouraged to seek support from her family or others who can help her make the decision.
Before the procedure is done, talk to the parents about how long the procedure will take and when it will be done and give them the option of being present. Plan to do the circumcision before a feeding and tell the mother that after the circumcision the baby will feed well.	Parents are very concerned about the safety of their son. Acknowledging their feelings and concerns and telling them what to expect helps to comfort them.
2. The circumcision can be performed 12 to 24 hours after the birth. Before the circumcision is performed, the following must be done to maintain safety.	**2.** The first 12 hours of life are transitional and provide the opportunity for observation of the newborn. This time period also ensures that the baby has been given vitamin K to prevent bleeding problems.
a. Review the mother's prenatal and intrapartal records, being alert for family history of blood dyscrasias, congenital anomalies, or perinatal complications that may have an effect on the health of the newborn (i.e., severe/chronic anemia, infections, birth trauma). It is recommended that the midwife also ask the parents for any health history that may not be documented in the records.	**a.** Review of the maternal and newborn records is necessary to screen for potential or existing problems. Any abnormalities should be discussed with the pediatrician involved in the care of the newborn.
b. The newborn record should be reviewed for a physical assessment (with attention to any documented abnormalities), laboratory tests (CBC, cultures) and feeding and voiding patterns.	**b.** This will screen for congenital anomalies, bleeding abnormalities, or infections. Feeding and voiding patterns should indicate the functioning of the gastrointestinal and urinary systems.
3. Set up and check all equipment; the required sterile equipment includes the following: **a.** three straight mosquito hemostats **b.** a small blunt probe **c.** povidone-iodine (Betadine) solution **d.** cotton or small gauze pads **e.** a 2 × 2 gauze pad with $^1/_2$ teaspoon of Vaseline spread on it **f.** Vaseline gauze dressing	**3.** When the midwife is systematic in setting up the equipment and knows that everything is in working order, the procedure can be done quickly, smoothly, and safely.

Procedure	Rationale
g. Gomco clamp: size 1.1 for a smaller penis and 1.3 for a normal size; have both readily available	
h. a scalpel and blade	
i. small scissors with pointed end	
j. gloves	
k. three towels/drapes	
l. a small vial of 1:1000 epinephrine	
Required nonsterile equipment includes a board or wrapping to restrain the baby's arms and legs and a pacifier or an assistant to soothe the baby. Have adequate lighting and a table that is at a comfortable height.	The midwife must be able to have a clear view of the genitalia with minimal eye or back strain.
4. Check the baby's ID name bands and the informed consent form.	**4.** This ensures proper identification and adequate documentation that the parents (or mother) acknowledge that they understand and agree to the performance of the circumcision.
5. Wash your hands.	**5.** This decreases the risk of infection.
6. Position and restrain the baby. Boards, cloth, or blanket restraints are available.	**6.** The arms and legs of the baby thus will not interfere with the procedure.
7. Check the baby's ID bands one more time before starting the circumcision.	**7.** Reconfirm the identity of the neonate.
8. Put on sterile gloves and mask (wearing a gown or lab coat is at the discretion of the midwife).	**8.** This maintains asepsis.
9. Push the foreskin back gently to identify the opening of the urinary meatus and to assess the degree of adhesions that may be present. Also look at the foreskin and size of the penis to assess the size of the Gomco clamp to be used. Check for any abnormalities and estimate how much of the foreskin will be removed. Approximately two-thirds of the foreskin should be removed.	**9.** An initial assessment of the adhesions and size of the penis allow you to determine the size of the Gomco clamp and whether the circumcision can be done. Do not perform the circumcision if the penis is too small or any abnormalities are noted. Excising too little or too much of the foreskin may result in complications that require additional surgery.
10. Put small sterile drapes around the genital area. Clean the genital area using the cotton balls soaked in povidone-iodine. Begin cleaning from the tip of the penis downward to the area surrounding the penis.	**10.** This sets up a sterile field and decreases the risk of infection.
Removing Adhesions	
11. Gently grasp the anterior foreskin with one mosquito hemostat at the 11 o'clock position and another at the 1 o'clock position (Figure 81-7). Use the small blunt probe and separate the adhesions between the foreskin and the glans of the penis. To release remaining adhesions, place another mosquito hemostat between the foreskin and the glans, opening the hemostats gently anteriorly and then on each side.	
Adhesions should be removed to the level of the coronal sulcus. Be especially careful not to traumatize the posterior frenulum or the urethral meatus.	

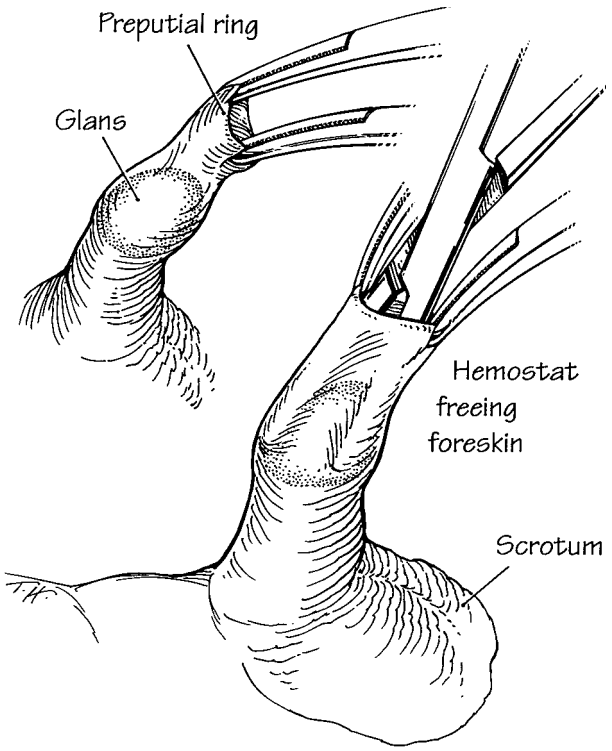

FIGURE 81-7 Removing adhesions (Step 11).

Procedure	Rationale
12. Using the same small hemostat, place it midline on the anterior foreskin measuring slightly less than the amount of foreskin to be cut for the dorsal slit. The distance is approximately halfway between the preputial ring and the corona. Keep the tip of the hemostat pointed slightly upward. Lock the hemostat tightly, but gently, closing it one notch at a time. The baby will probably be crying at this time if he hasn't already started. The midwife should focus on doing the procedure smoothly and quickly to minimize the amount of time the baby feels pain.	**12.** The mark made by the hemostat is where the dorsal slit incision will be made. The dorsal slit is cut (Step 14) to provide room for putting the bell of the Gomco clamp over the glans (Step 16). The hemostat should be angled slightly upward to avoid trauma to the glans.
Gomco Clamp Technique	
13. After approximately 1 minute remove the hemostat. The mark made by the hemostat should look blanched and very thin.	**13.** The hemostat should make the skin very thin and provide an area of hemostasis.
14. Hold the two mosquito hemostats in one hand. With the other hand pick up the small scissors and cut the mark made by the hemostats (to the apex of the mark) (Figure 81-8).	**14.** The dorsal slit serves as a means for inserting the bell of the Gomco clamp. The apex of the incision is also a guide for the placement of the base of the Gomco.
15. Gently push the foreskin downward and with the blunt probe remove any remaining adhesions anterior to the coronal sulcus. Pull the foreskin upward to its original position over the glans.	**15.** Adhesions should be removed prior to excising the foreskin. This will ensure proper healing.

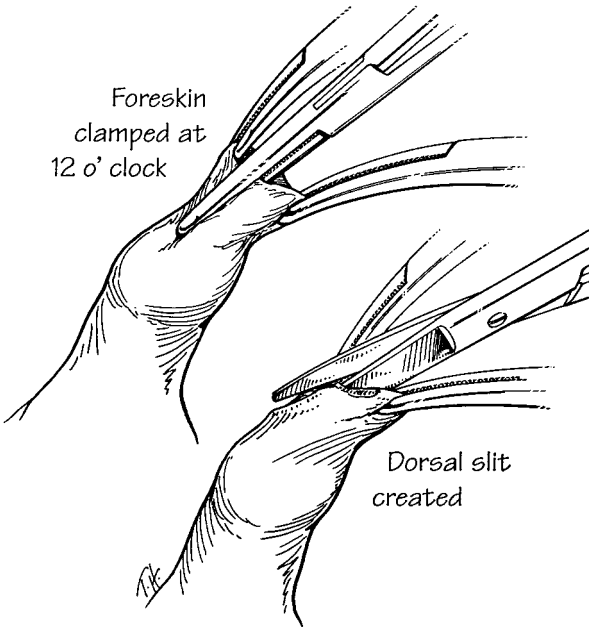

FIGURE 81-8 Gomco technique (Step 14): Cutting the dorsal slit.

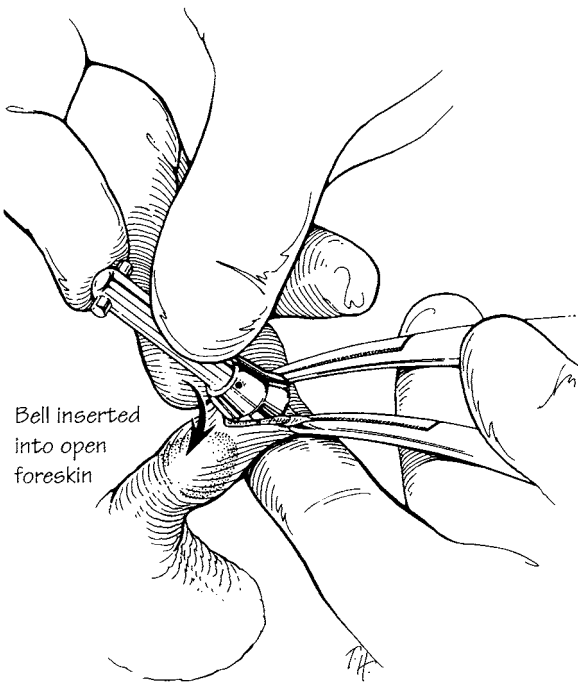

FIGURE 81-9 Gomco technique (Step 16): Inserting the bell of the Gomco clamp inside the foreskin and over the glans of the penis.

Procedure	Rationale
16. Hold the two hemostats in one hand. Insert the bell of the Gomco clamp over the glans of the penis, placing it first inside the anterior foreskin then inside the posterior foreskin (Figure 81-9).	**16.** The bell of the Gomco clamp protects the glans of the penis from amputation.
17. One of two techniques can be used to slip the foreskin through the hole of the Gomco clamp. The midwife has the choice of using a hemostat or one stitch of silk suture. Either technique should enable the midwife to fit the Gomco clamp over the bell.	**17.** Either technique holds the bell in place and also facilitates pulling the foreskin through the hole of the Gomco clamp.
a. *Hemostat technique:* With the mosquito hemostat, secure the two edges midway between the top and the bottom of the incision so the bell of the Gomco is held in place. Take the other two hemostats off the foreskin. Place the opening of the Gomco clamp over the tip of the penis. With another hemostat, grasp the two edges of the anterior foreskin (which is being held by the hemostat) through the opening of the clamp (Figure 81-10). Remove the lower hemostat before pulling the foreskin through the base plate.	
b. *Suture technique:* Using 1.0 or 2.0 silk suture, make one stitch on the anterior inner aspects on each side of the incision, so the bell of the Gomco is held in place. Tie a	

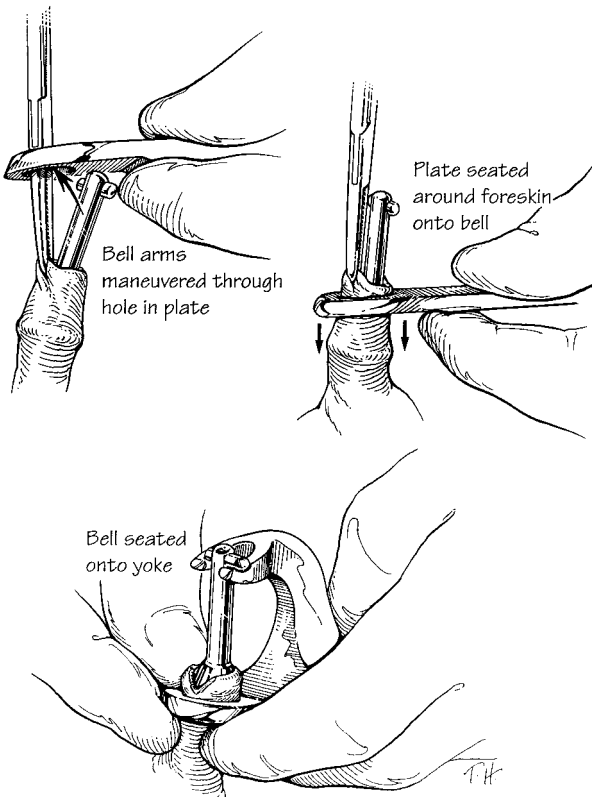

FIGURE 81-10 Gomco technique: (Step 17a) Hemostat technique of slipping the foreskin through the hole in the Gomco clamp. (Step 18) Securing the arms of the bell into the yoke of the top plate.

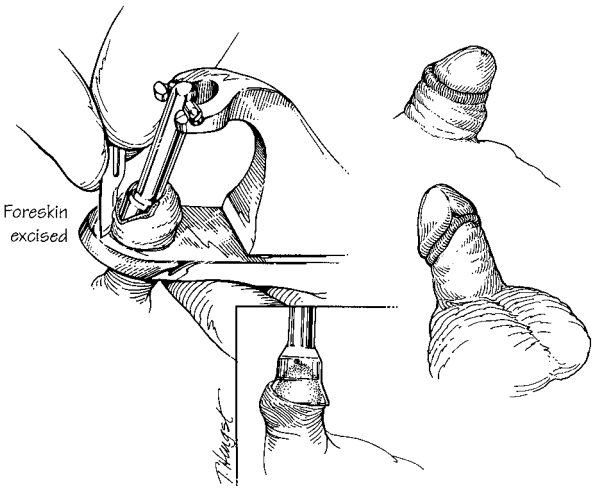

FIGURE 81-11 Gomco technique: (Step 19) Excising the foreskin. (Step 21) Removing the bell. (Step 22) The completed circumcision.

Procedure	Rationale
loose knot. Place the opening of the Gomco clamp over the tip of the penis. With a hemostat, pull the silk suture (which is holding the incision of the foreskin) through the bevel opening of the clamp.	
18. Set the base of the clamp in place by securing the arms of the bell into the yoke of the top plate (Figure 81-10) and the top plate in alignment with the notch in the base plate. The apex of the incision should be visible anteriorly at the front of the Gomco clamp. The base of the clamp should be angled slightly upward on the ventral side. Make sure that the foreskin above the base plate is even all around. When the clamp is in proper position, turn the screw on the clamp until it is as tight as possible.	**18.** If the Gomco clamp is not correctly aligned, there is risk of cutting the foreskin incorrectly and of the clamp slipping in the middle of the procedure. The ability to see the apex of the dorsal slit assures the midwife that the excision of the foreskin will be accurate. Angling the clamp ensures that less foreskin will be cut from the posterior aspect, which protects the frenulum and decreases the risk of bleeding. The tightness of the clamp will affect the degree of hemostasis.
19. Cut the foreskin from around the plate of the Gomco clamp (Figure 81-11). The blade of the scalpel should be above the base plate. Holding the scalpel securely, be attentive to the position of the blade. The cut should be made with a smooth technique that removes all of the foreskin above the base plate of the Gomco clamp.	**19.** The midwife should be focused and conscious of where the blade is in relation to the baby's body to maintain safety. The skin incision should be smooth, with no irregular edges so that it will heal well.

Procedure	Rationale
20. Leave the Gomco clamp on for another minute. Hold the base of the clamp without moving it. If you note any bleeding, leave the clamp on for 2 more minutes. Have a 2 × 2 gauze ready to apply pressure to the area if needed after the Gomco is removed.	**20.** This enhances hemostasis and also allows the midwife to observe for bleeding. If any bleeding is noted, the midwife should be prepared to manage the situation in a timely manner.
21. Unscrew the clamp to release the base from the bell. Remove the base of the Gomco clamp and put it back on the sterile tray. To remove the foreskin from the bell, moisten a cotton ball with a small amount of povidone-iodine and gently push the foreskin away from the bell (Figure 81-11).	**21.** The inner membrane of the foreskin may adhere to the bell, in which case pulling the bell off will hurt the baby.
22. When the bell is removed, inspect the penis, especially the posterior area, for bleeding.	**22.** There should not be any bleeding visible. The glans of the penis will have a very reddened, raw appearance and the edges of the foreskin should fall just below the glans (Figure 81-11).
a. If there is any active bleeding, apply pressure to the area with a gauze pad. If the bleeding does not stop with a minute or two of pressure, put a small amount of epinephrine on a gauze pad and apply it with pressure to the area.	**a.** Pressure to the area of bleeding affords time for the blood to clot. Epinephrine enhances the clotting of blood but also may have cardiovascular effects if absorbed [27].
b. The midwife should not hesitate to request assistance if the above measures do not stop the bleeding. A pediatrician or consulting doctor should be contacted if the bleeding continues.	**b.** Most bleeding is minor and can be stopped by applying pressure or topical epinephrine. If the bleeding is significant, the midwife should consult to determine if any other treatment will be necessary.

When bleeding occurs it is usually related to (1) cutting too much foreskin from the posterior aspect of the penis (severing the frenulum or a blood vessel near it), or (2) the Gomco clamp's not being tightened enough to attain hemostasis.

Application of the Dressing

23. Wrap the Vaseline gauze loosely around the glans and edges of skin. Put a 2 × 2 gauze covered with a small amount of Vaseline (approximately $^1/_2$ teaspoon) over the Vaseline gauze. Loosen the baby from any restraints and put on a clean diaper.	**23.** The Vaseline gauze enhances healing and prevents irritation and infection. Urinary retention may be caused by a tightly wrapped dressing. The additional gauze helps to keep the area protected.
24. Hold the baby and soothe him with a gentle voice and rocking. When the baby appears calm, wrap him in a blanket and put him in a crib. The baby may be comforted by the parents, if they are present.	
25. Put the scalpel blade and any needles used in a sharps disposal container and then separate all the equipment that needs sterilization.	**25.** This prevents accidents, especially for nurses or technicians who may be assisting in the cleaning and sterilizing of the equipment
26. Take the baby to the parents if they were not present for the circumcision. The following information should be offered to the parents orally and in writing:	**26.** When the midwife offers clear explanations and information, the parents will be able to understand it and will feel secure about caring for their newborn. A translator should be requested if the midwife does not speak the parents' language. If written material is given to the parents, it should also be in a language they understand.
a. how the baby seemed to tolerate the procedure	
b. the appearance of the dressing and the penis	

Procedure	Rationale
c. that the baby will probably need comfort in the next 24 hours (swaddling and being held) and may feel discomfort during voiding or when the diaper is changed	
d. that the baby may need to suck more often after the circumcision but should have normal feeding patterns	
e. that even though it may take a while for the baby to urinate after the circumcision (4–6 hours) the baby should continue to have 6 to 8 wet diapers a day	
f. how and when to change the dressing (It's very supportive to be present the first time the mother changes the diaper, so you can show her what the penis looks like and provide reinforcement for her ability to care for the baby.)	
g. procedure for bathing the baby	
h. normal healing and signs and symptoms of infection	
i. how to contact the midwife with any questions and/or concerns regarding the circumcision	
Answer any questions that the parents may have now and provide them with written information.	
27. When the parents' questions have been answered, write a note in the baby's chart documenting the procedure, including an assessment of the genitalia, the size of the Gomco clamp used, how the baby tolerated the procedure, whether bleeding was present, what was done to stop any bleeding, the dressing used, and all teaching that was done with the parents. The midwife should sign her or his name and credentials legibly.	**27.** Documentation of the procedure communicates to other health professionals what was done, the outcome, and the identity of the midwife who performed the circumcision. From a medical legal viewpoint, making the information in the note comprehensive provides a basis for review.
Follow-up	
28. The midwife should talk to the mother 24 to 48 hours after the circumcision to assess how the baby is doing, how the circumcision looks, and how the mother is feeling about caring for the circumcision.	**28.** A visit or phone call supports the mother in providing postcircumcision and normal newborn care. A postoperative assessment also decreases the risk of serious complications.

Postcircumcision Care and Parental Instruction

The midwife should provide the parents with the information needed to help them care for the baby and to feel confident to know that the circumcision is healing well. This includes the length of time that it normally takes for the penis to heal, what it will look like, when to change the dressing, and how to bathe the baby.

After the circumcision, the glans of the penis appears to be reddened and the remaining foreskin is at the level of or just below the coronal sulcus. Within 24 hours there may be some edema of the foreskin and a small amount of serosanguinous drainage. Healing should be apparent after one to two days; by then the glans and edges of the skin are less reddened and most babies have much less discomfort when diapers are changed. It usually takes a week for healing to be complete. Let the

parents know that the baby may be irritable for the first 24 hours, especially when the diaper is changed. The baby may be soothed by wrapping him in a blanket (swaddling) and holding him.

Parents should be reminded that hand washing before and after changing the diaper is necessary to decrease the risk of infection. The initial Vaseline gauze dressing should be left on for the first 24 hours. If it falls off or is soiled when the diaper is changed, the Vaseline gauze should be replaced. After 24 hours the Vaseline dressing from around the penis should be removed. Each time the diaper is changed, a clean 2 × 2 gauze pad with approximately 1 teaspoon of Vaseline spread on it should be put over the penis. The dressing should stay moist to help the circumcision heal and to prevent it from sticking to the diaper. The midwife should make sure that the parents have all the supplies they need to change the dressings for one week (an extra Vaseline gauze dressing, 2 × 2 gauze pads, and Vaseline).

The midwife should explain to the parents that if they see any signs of infection or sense there is something wrong with the baby that may be related to the circumcision, they should call the midwife who performed the circumcision. If they are unable to contact the midwife, the baby's pediatric nurse practitioner or pediatrician should be called. Signs and symptoms that may indicate an infection include redness, swelling, a pustular drainage from the penis, fever (over 101° F), lethargy, or not feeding or voiding as expected. The parents should be reassured that complications are rare, but they should call for any questions or concerns.

If the parents call, the midwife needs to determine whether the baby needs to be seen or not. In most cases it is safe practice for the midwife to see the baby to determine if there is a complication or a need for consultation and to recognize the parents' concern. In some situations, healing is slower than usual or there is more drainage than expected. Warm water gauze soaks on the penis twice a day or more frequent dressing changes may be needed to enhance healing.

Sponge baths are recommended for the first two weeks and parents should be taught how to sponge bathe their baby. The parents should be told that for the first few days the circumcised penis should be cleansed with warm water only and kept dry. Nothing other than Vaseline or A & D ointment should be put on the penis, unless an antibiotic ointment is prescribed. They should avoid using soap or alcohol near the penis, since these are especially irritating before the circumcision is fully healed. Tub baths can be done when the umbilical cord has fallen off and the circumcision is well healed.

The last part of the instruction should include time for the parents to ask questions concerning the care of their newborn. Parents should be reassured that they will be able to provide the best of care to their baby, that if something is wrong they will know it, and not to hesitate to call if they have any questions or concerns. Review with them the support that is available through family, friends, and health care providers.

References

1. American College of Nurse-Midwives. *Guidelines for the Incorporation of New Procedures into Nurse-Midwifery Practice*. In *Standards for the Practice of Nurse-Midwifery*. Washington, DC: ACNM, 1992.
2. American Academy of Pediatrics, Task Force on Circumcision. Circumcision Policy Statement (RE9850), *Pediatrics* 103, (3), 686–693 (March) 1999.
3. Gee, W. F., and Ansell, J. S. Neonatal circumcision: a ten-year overview, with comparison of the Gomco clamp and the plastibell device. *Pediatrics* 58(6):824–827, 1976.
4. Wiswell, T. E. Circumcision circumspection. *N. Eng. J. Med.* 336(17):1244–1245, 1997.
5. Niku, S. D., Stock, J. A., and Kaplan, G. W. Neonatal circumcision. *Urol. Clin. North Am.* 22(1):57–65 (February) 1995.
6. Anderson, G. Circumcision. *Pediatr. Ann.* 18(3):205–213 (March) 1989.
7. Schoen, E. J., and Fischell, A. A. Pain in neonatal circumcision. *Clin. Pediatr.* 30(7):429–432 (July) 1991.
8. Stang, H. J., Gunnar, M. R., Snellman, L., et al. Local anesthesia for neonatal circumcision: effects on distress and cortisol response. *JAMA* 259(10):1507–1511 (March 11) 1988.
9. Talbert, L. M., Kraybill, E. N., and Potter, H. D. Adrenal cortical response to circumcision in the neonate. *Obstet. Gynecol.* 48:208–210, 1976.
10. Rawlings, D. J., Miller, P. A. and Engel, R. R. The effect of circumcision on transcutaneous PO2 in term infants. *Am. J. Dis. Child* 134:676–678, 1980.
11. Williamson, P. S., and Williamson, M. L. Physiologic stress reduction by a local anes-

thetic during newborn circumcision. *Pediatrics* 71(1):36–40 (January) 1983.

12. Lander, J., Brady-Fryer, B., Metcalfe, J. B., et al. Comparison of ring block, dorsal penile nerve block, and topical anesthesia for neonatal circumcision: a randomized clinical trial. *JAMA* 278(4):2157–2162 (December) 1997.

13. Broadman L. M., Hannallah, R. S., Belman, A. B., et al. Post-circumcision analgesia: a prospective evaluation of subcutaneous ring block of the penis. *Anesthesiology* 67(3):399–402 (September) 1987.

14. Alkalay, A. L., and Sola, A. Analgesia and local anesthesia for nonritual circumcision in stable healthy newborns. *Neonatal Intensive Care* 132(2):19–22 (March/April) 2000.

15. Miller, R. D. *Anesthesia*, 5th ed. New York: Churchill Livingstone, 2000.

16. Wilder, R. T. Local anesthetics for the pediatric patient. *Pediat. Clin. North Am.* 47(3):545–555 (June) 2000.

17. Kirya, C., and Werthmann, M. W. Neonatal circumcision and dorsal penile nerve block—a painless procedure. *J. Pediatrics* 92:998–1000, 1978.

18. Snellman, L.W., and Stang, H. J. Prospective evaluation of complications of dorsal penile nerve block for neonatal circumcision. *Pediatrics* 95(5) (May) 1995.

19. Masciello, A. Anesthesia for neonatal circumcision: local anesthesia is better than dorsal penile nerve block. *Obstet. Gynecol.* 75(5):834–838 (May) 1990.

20. Mudge, D., and Younger, J. The effects of topical lidocaine on infant response to circumcision. *J. Nurse-Midwifery* 34(6):335–340 (November/December) 1989.

21. Benini, F., Johnston, C. C., Faucher, D., and Aranda, J. V. Topical anesthesia during circumcision in newborn infants. *JAMA* 270(7):850–853 (August 18) 1993.

22. Taddio, A., Pollack, N., Gilbert-MacLeod, C., Ohlsson, K., and Koren, G. Combined analgesia and local anesthesia to minimize pain during circumcision. *Arch. Pediatr. Adolesc. Med.* 154:620–623 (June) 2000.

23. Marchette, L., Main, R., Redick, E., et al. Pain reduction interventions during neonatal circumcision. *Nurs. Res.* 40(4):241–244 (July/August) 1991.

24. Blass, E., and Hoppmeyer, L. Sucrose as an analgesic for newborn infants. *Pediatrics* 87(2):215–218 (February) 1991.

25. Howard, C. R., Howard, F. M., and Weitzman, M. L. Acetaminophen analgesia in neonatal circumcision: the effect on pain. *Pediatrics* 93:641–646, 1994.

26. Stang, H. J., Snellman, L. W., Condon, L. M., et al. Beyond dorsal penile nerve block: a more humane circumcision. *Pediatrics* 100(2)E3:1–6 (August) 1997.

27. Kaplan, G. W. Complications of circumcision. *Urol. Clin. North Am.* 10(3):543–549 (August) 1983.

Additional References

Behrman, R. E., Kliegman, R. M., and Jenson, H. B. (Eds.) *Nelson Textbook of Pediatrics*, 16th ed. Philadelphia, PA: W.B. Saunders, 2000.

Boyer, D. Routine circumcision of the newborn: reasonable precaution or unnecessary risk? *J. Nurse-Midwifery* 25(6):27–31 (November/December) 1980.

Gelbaum, I. Circumcision: refining a traditional surgical technique. *J. Nurse-Midwifery* 38(2):18S–30S (March/April) 1993.

Gelbaum, I. Circumcision: to educate, not indoctrinate—a mandate for Certified Nurse-Midwives. *J. Nurse-Midwifery* 37(2):97S–113S (March/April) 1992.

Gray, H. *Anatomy of the Human Body*, 20th ed. Philadelphia, PA: Lea and Febiger, 1985.

Grossman, E., and Posner, N. A. Surgical circumcision of neonates: a history of its development. *Obstet. Gynecol.* 58(2):241–246 (August) 1981.

Houben, K. M. The Adoption of Medical Circumcision in the United States from 1870 to 1920. Master's Thesis. New Haven, CT: Yale University School of Nursing, 1999.

Kaweblum, Y. A., Press, S., Kogan, L., et al. Circumcision using the Mogen clamp. *Clin. Pediatr.* 23(12):679–682 (December) 1984.

Marshall, R. Neonatal pain associated with caregiving procedures. *Pediatr. Clin. North Am.* 36(4):885–903 (August) 1989.

Netter, F. H. *The CIBA Collection of Medical Illustrations*, Vol. 2, *Reproductive System*. Summit, NJ: CIBA, 1977, pp. 9–26.

Pelosi, M. A., and Appuzzio, J. Making circumcision safe and painless. *Contemp. OB/GYN* 42–53 (July) 1984.

Schlosberg, C. Thirty years of ritual circumcisions. *Clin. Pediatr.* 10(4):205–209 (April) 1971.

Schoen, E. J. The status of circumcision of newborns. *N. Eng. J. Med.* 322(18):1308–1312 (May 3) 1990.

Weiss, G. N. Local anesthesia for neonatal circumcision. *JAMA* 260(5):637–638 (August 5) 1988.

Wiswell, T. E. Risks from circumcision during the first month of life compared with those for uncircumcised boys. *Pediatrics* 83(6):1011–1015 (June) 1989.

CHAPTER

82

Endometrial Biopsy

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Endometrial biopsy (EMB) is a cost effective, safe, and simple method of collecting a histologic sample of the uterine endometrium. A variety of clinical circumstances require investigation of the endometrium (see Chapter 14), especially among women who experience unusual vaginal bleeding as well as those undergoing analysis of infertility. The diagnostic dilatation and curettage (D&C) is no longer considered the "gold standard" for this purpose [1], and the evolution of other sampling devices have allowed EMB to be easily accomplished in an office setting by midwives [2]. Devices currently available for EMB include Endocell, Pipelle, GynoSampler, Novak, and Tis-u-Trap curettes.

Sensitivity and specificity have been noted at 95 to 100 percent for detection of endometrial carcinoma, but sensitivity for detection of other uterine pathology, such as polyps or submucosal fibroids, has been found to be relatively weak at 28 to 44.6 percent [3–5]. This limitation is primarily due to the small surface area of the uterine lining (4.5 to 15 percent) that is capable of being sampled using EMB devices [1]. Combining transvaginal ultrasonography and sonohysterography with EMB can assist with the identification of such structural abnormalities. However, EMB remains an effective method for sampling uterine endometrium for evidence of pathology.

Indications for Endometrial Biopsy [1, 2, 6–9]

1. Identify endometrial cancer or its precursors.
2. Examine thickened endometrium (≥5 millimeters) found on transvaginal ultrasound to rule out hyperplasia.
3. Evaluate abnormal or dysfunctional uterine bleeding.
4. Discover luteal phase defects or other uterine pathology during infertility investigation.
5. Assist in evaluation of atypical glandular cells or endometrial cells found in cervical cytology sampling in appropriate women.
6. Assess the effect of hormonal replacement therapy or tamoxifen on the endometrium. (This indication is not considered necessary by some researchers and clinicians.)

Contraindications and Precautions [2, 6–9]

Contraindications

1. Pregnancy
2. Known or suspected cervical cancer
3. Infection of the vagina, cervix, or uterus (requires evaluation and treatment prior to procedure)

Precautions

1. Blood dyscrasias, coagulation disorders, or the use of medications that may alter clotting require consultation with a provider knowledgeable in hematological disorders
2. History of prosthetic heart valve (requires cardiologist consultation and probable antibiotic prophylaxis)
3. Fever (Temperature >100.4°F) at the time of procedure
4. Severe cervical stenosis, or atypical uterine anatomy (gynecologist consultation or referral)

Potential Side Effects/Complications and Preventive Measures [2, 6–9]

1. Cramping, uterine spasm, vasovagal response; can be prevented by
   a. prophylactic analgesia with 600–800 mg ibuprofen 60 minutes prior to procedure
   b. eating prior to procedure, thus avoiding hypoglycemic state
2. Uterine perforation; can be prevented by
   a. making sure uterus is nonpregnant or well involuted postpartum
   b. performing thorough pelvic exam prior to procedure to note uterine and cervical size, position and angulation, as well as any structural abnormalities
   c. use of a tenaculum to straighten utero-cervical angle if unable to insert the device into the uterine cavity easily
3. Uterine infection; can be prevented by identification and treatment of any existing genital infections

Procedure and Rationale

Procedure	Rationale
1. Timing of appointment: schedule procedure for day 22 or 23 of menstrual cycle if the purpose of the sample is confirmation of ovulation.	1. Timing is critical when attempting to diagnose luteal phase defects. This is not important when sampling for the detection of cancer or its precursors.
2. Gather equipment needed for the procedure, which includes informed consent, nonsterile and sterile gloves, vaginal speculum of appropriate size, ring forceps and cotton balls or large cotton swabs, antiseptic solution (such as Betadine or Hibiclens), 20 percent benzocaine gel (Hurricaine), scissors, labeled specimen containers with 10 percent formalin, endometrial sampling devices (make sure there are at least two available), and tenaculum.	2. Having all equipment prepared in advance prevents interruption in the flow of care at the time of the procedure.
3. Thoroughly review the health history, which includes date of last menses, contraception and possibility of pregnancy, risk of sexually transmitted infection, known bleeding disorder, medication or supplement use, and allergies.	3. This allows for identification of contraindications or need for further laboratory testing prior to the procedure. Such testing may include pregnancy test, STD diagnostic testing, wet mount, or CBC.
4. Provide education and instruction regarding EMB, and obtain consent. Because this is an invasive procedure, the midwife should spend time with the woman explaining what she should expect.	4. Informing the woman of the reason for the procedure, as well as the risks, side effects, and possible complications, allows her to give informed consent.
5. Offer 600–800 mg ibuprofen 60 minutes before the procedure.	5. Nonsteroidal anti-inflammatory drugs decrease cramping and uterine spasm associated with the procedure.
6. Place the woman in a lithotomy position and perform a bimanual and rectovaginal exam (if needed) for uterine and cervical position and structure (with nonsterile gloves).	6. Knowledge of the anatomic details of size, shape and utero-cervical angulation permits passage of the curette in the appropriate direction minimizing possible perforation of the uterine wall.
7. Insert the appropriately sized speculum.	7. This allows for adequate visualization.
8. Apply antiseptic solution to the cervix with a large swab or cotton ball.	8. The use of an antiseptic solution decreases the risk of infection.
9. Topical anesthetic may be applied to the anterior lip of the cervix and also into the os with a small cotton swab.	9. Anesthetic application lessens pain and cramping associated with the use of the curette or tenaculum.

Procedure	Rationale
10. After changing to sterile gloves, remove the curette (the outer sheath and inner piston) from the sterile package as instructed on the package insert. With the piston fully inserted into the sheath, gently introduce the curette through the cervical os and into the uterine cavity until resistance is felt. (If strong resistance is encountered prior to reaching the fundus, stop the procedure.) If not already in place, a tenaculum placed on the anterior lip of the cervix may be used to straighten the utero-cervical angle. (See Chapter 19, page 503.)	**10.** Maintaining sterile technique minimizes the risk of infection. Gentle introduction of the sampling device, stopping if strong resistance is encountered, and the possible use of a tenaculum to straighten the utero-cervical angle, reduces the likelihood of uterine perforation.
11. If there is difficulty advancing the device through the inner os while using steady, moderate pressure, small cervical dilators can be helpful. Another option is the use of a 3 mm osmotic laminaria, which can be placed in the cervix on the morning of the day of the EMB and removed that afternoon prior to the actual procedure.	**11.** The use of graduated cervical dilators allows access for sampling while preventing trauma or perforation from the use of force. Laminaria provide another means of gentle slow dilation of a stenotic inner cervical os.
12. Once resistance is felt, note the distance the curette has entered the uterus, using the markings located on the sheath. With the tip of the device at the fundus, hold the curette securely and withdraw the inner piston as far as possible.	**12.** Observing the distance the curette has entered the uterus is useful information for determining that the curette has extended beyond the internal os of the cervix. On average, the length of the cervix from external to internal os is 2.5 centimeters, and the total distance from the external os to the wall of the fundus is approximately 6 to 9 centimeters [10–12]. Graduated markings on the sheath indicate insertion depth of the curette. This information can be recorded in any written note that follows the procedure. Withdrawal of the piston creates the suction, or negative pressure, at the tip needed to collect the tissue sample.
13. Move the sheath of the device back and forth, the tip moving from fundus to internal os, while simultaneously rolling it between the thumb and fingers. Avoid having the tip of the device slip back out the internal os into the cervical canal.	**13.** It is important to have a sample that is representative of any pathology existing in the uterus. Movement in all directions allows for collection of cells from the stratum functionalis, as well as stratum basalis of the endometrium.* Prematurely pulling the sheath back through the internal os will result in the loss of suction.

* The endometrium is the mucosal lining of the uterus; it has two layers: (1) stratum functionalis, which is shed during menstruation, and (2) stratum basalis, which remains throughout the menstrual cycle and from which a new stratum functionalis is regenerated with each cycle. These layers are only millimeters thick, depending on timing in the menstrual cycle, and vary from the fundus through the corpus to the isthmus; therefore, movement of the curette in the manner described enables sampling of both endometrial layers.

Procedure	Rationale
14. Complete the simultaneous moving and rolling of the sheath maneuver until the sheath is filled. Both tissue and some blood should be visible. Remove the device. If only blood can be visibly identified within the sheath, after removing the entire curette, place the contents in formalin, and insert another curette into the uterus, sampling until tissue is obtained.	**14.** It is essential to the procedure that endometrial tissue is actually collected, thus allowing for a meaningful histologic evaluation.
15. Once the tissue has been adequately collected, cut the distal tip from the device and place the tip in the labeled formalin container. Gently press the piston back into the sheath to expel the remaining specimen into the same labeled container.	**15.** Cutting the tip from the device allows the sample to be removed intact, without sustaining cell breakup that can occur when it is forced through the tip. Placing the tip of the catheter in the specimen container ensures that any tissue collected in this portion of the device will be analyzed with the remainder of the specimen.
16. Remove the speculum (and tenaculum, if used), but have the woman remain supine for a few minutes prior to getting up and dressed.	**16.** Lying quietly for a few minutes may prevent a vasovagal response from occurring and allows time for cramping to diminish.

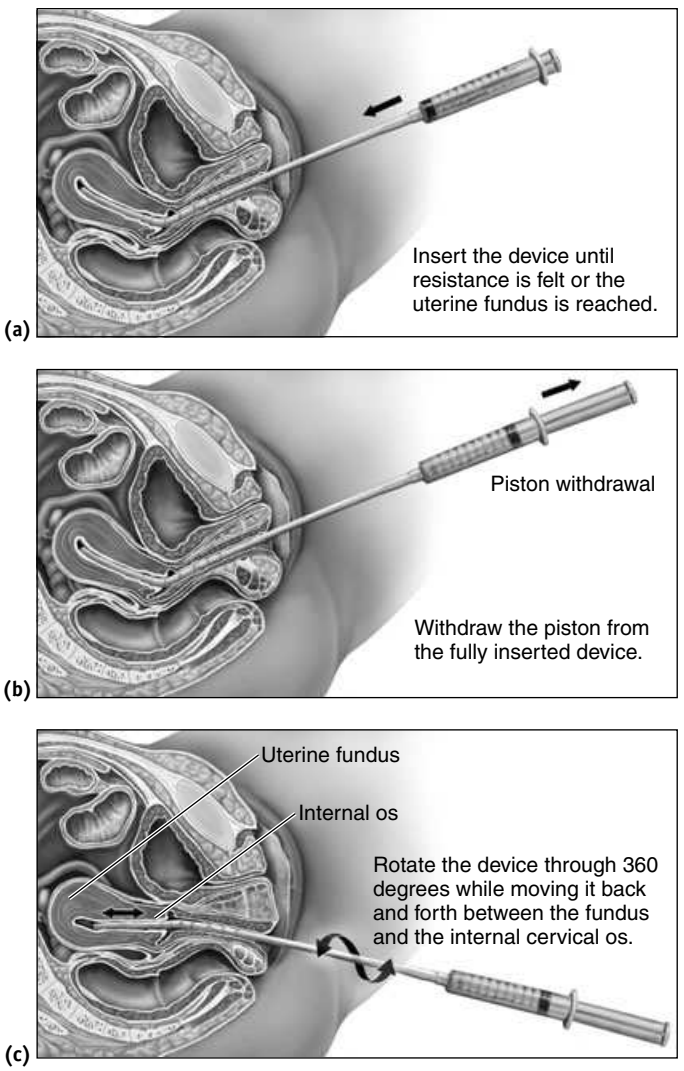

FIGURE 82-1 Endometrial biopsy technique. (a) Insert the device until resistance is felt or the uterine fundus is reached (Step 10). (b) Withdraw the piston from the fully inserted device (Step 12). (c) Rotate the device through 360 degrees while moving it back and forth between the fundus and the internal cervical os.

Procedure	Rationale
17. Instruct the woman to expect some light spotting during the next few days, but to contact the office if she develops bright red or excessive bleeding or clotting, fever, vaginal discharge with a foul odor, pelvic cramping, or pain. She should abstain from sexual intercourse for 2 to 3 days after the procedure.	**17.** Early identification of possible complications (such as endometritis) allows for rapid management and decreased risk of sequelae, such as bacteremia or endocarditis.
18. Document procedure, including any analgesic or anesthetic given, any abnormal findings during examination or procedure, sampling device used, depth of insertion of curette, adequacy of specimen obtained, and the woman's toleration of the procedure.	**18.** Documentation of any procedure is standard of care.

Results and Management

Laboratory findings can vary in language and presentation depending on the laboratory reporting system. In general, the midwife will receive a histology report, which will offer information that can contribute to making a diagnosis regarding the health of the woman's uterine lining. In communicating the findings to the woman, the midwife should ensure that the client understands the results and the possible courses of action to follow. The most common histologic reports received, with suggestions for follow-up, are found in Table 82-1.

TABLE 82-1 Endometrial Biopsy Findings with Probable Diagnoses and Suggested Management

Histology	Probable Diagnosis	Suggested Management	Need for Referral
Inactive endometrium	Hypoestrogenic state	Dependent on clinical indication for EMB	As per protocol for specific clinical indication
Proliferative (estrogen influenced preovulation) or Secretory (progesterone influenced postovulation)	**1.** Diagnoses traditionally labeled as abnormal uterine bleeding (AUB) or dysfunctional uterine bleeding (DUB) (see Chapter 14)	**1(a)** Transvaginal ultrasonography (TVUS) to rule out structural pathology **(b)** Hormonal therapy such as low-dose oral contraceptives, or cyclic therapy	**1(a)** Women with an abnormal TVUS **(b)** No response to hormonal therapy
	2. Confirmation of ovulatory cycle (as part of infertility assessment)	**2.** Continue with infertility assessment, as per protocol	**2.** Per infertility protocol
Cystic or adenomatous hyperplasia	**1.** Infertility	**1.** Refer to fertility specialist, who may suggest ovulation induction	**1.** See previous column
	2. Peri- or postmenopausal woman	**2.** Oral contraceptives or cycling with progestins; repeat EMB in 6 months	**2.** No response to hormonal therapy
Atypical adenomatous hyperplasia	Rule out endometrial carcinoma or precursor	Refer to specialist (e.g., collaborating physician or gynecologic oncologist)	See previous column
Suspicion of cancer	Rule out endometrial carcinoma	Refer to specialist (e.g., collaborating physician or gynecologic oncologist)	See previous column

References

1. Association of Professors of Gynecology and Obstetrics. *Clinical Management of Abnormal Uterine Bleeding*. APGO Educational Series on Women's Health Issues. Crofton, MD: APGO, May 2002.
2. American College of Nurse-Midwives. Endometrial Biopsy. Clinical Bulletin No. 5. *J. Midwifery Womens Health* 46:321–326 (September/October) 2001.
3. Apgar, B. S., and Newkirk, G. R. Office procedures: endometrial biopsy. *Primary Care* 24:303–326 (June) 1997.
4. Van den Bosch, T. Vandendael, A., Van Schoubroeck, D., et al. Combining vaginal ultrasonography and office endometrial sampling in the diagnosis of endometrial disease in postmenopausal women. Accessed online on December 16, 2002, at www.gyncph.suite.dk/procedur/ref/gyn/post2v~1.htm.
5. van Hoeven, K. H., Zaman, S. S., Deger, R. B., and Artymyshyn, R. L. Efficacy of the Endopap sampler in detecting endometrial lesions. *Acta Cytologica* 40:900–906, 1996.
6. Endometrial biopsy. *Family Practice Notebook.com*. Accessed online on December 11, 2002, from http://aroundrtp.com/GYN129.htm.
7. Mayeaux, E. J. Performing an endometrial aspiration biopsy (EMB). Accessed online on December 11, 2002, from Louisiana State University Health Sciences Center Family Medicine Web site (http://lib-sh.lsumc.edu/fammed/atlases/emb/emb.html).
8. Schnare, S. *Endometrial Biopsy (EMB)*. Paper presented at the Contraceptive Technology Conference, Washington, DC, March 2001.
9. Zuber, T. Endometrial biopsy. *Am. Fam. Physician* (March 15) 2001. Accessed online on December 11, 2002, from www.aafp.org/afp/20010315/1131.html.
10. Moore, K. L., and Dalley, A. F. *Clinically Oriented Anatomy*, 4th ed., Philadelphia, PA: Lippincott Williams and Wilkins, 1999.
11. Hasson, H. Clinical studies of the Wing Sound II metrology device. In Zatuchni, G., Goldsmith, A., and Sciarra, J. (Eds.) *Intrauterine Contraception: Advances and Future Prospects*. Philadelphia, PA: Harper and Row, 1985, pp. 126–141.
12. Hasson, H. Differential uterine measurements recorded in vivo. *Obstet. Gynecol.* 43:400–412, 1974.

Additional References

Ash, S. J., Farrell, S. A., and Flowerdew, G. Endometrial biopsy in DUB. *J. Reprod. Med.* 41:892–896, 1996.

Mihm, L. M., Quick, V., Brumfield, J., et al. The accuracy of endometrial biopsy and saline sonohysterography in the determination of the cause of abnormal uterine bleeding. *Am. J. Obstet. Gynecol.* 186:858–860 (May) 2002.

National Cancer Institute. Screening for endometrial cancer. (n.d.) Accessed online on December 11, 2002, at www.nci.nih.gov/cancerinfo/pdq/screening/endometrial/healthprofessional.

O'Connell, L. P., Fries, M. H., Zeringue, E., and Brehm, W. Triage of abnormal postmenopausal bleeding: a comparison of endometrial biopsy and transvaginal sonohysterography versus fractional curettage with hysteroscopy. *Am. J. Obstet. Gynecol.* 178:956–961 (May) 1998.

Weber, A. M., Belinson, J. L., Bradley, L. D., and Piedmonte, M. R. Vaginal ultrasonography versus endometrial biopsy in women with postmenopausal bleeding. *Am. J. Obstet. Gynecol.* 177:924–929 (October) 1977.

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