SECOND EDITION

WOMEN’S HEALTH CARE IN ADVANCED PRACTICE NURSING

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Women’s Health Care in Advanced Practice Nursing
Ivy M. Alexander, PhD, APRN, ANP-BC, FAANP, FAAN, is clinical professor of nursing and director of Advanced Practice Programs at the University of Connecticut (UConn) School of Nursing. She maintains a clinical practice at UConn Health Internal Medicine in downtown Storrs. Her clinical, scholarly, and research interests are in midlife women's health care. She has worked extensively with menopause and osteoporosis management and has published and presented widely regarding these subject areas, including two books, which have been translated into Spanish, Greek, and Italian. She has been principal investigator on studies evaluating women's relationships with their primary care providers; Black women's perceptions of menopause, midlife health risks, and self-management techniques used to manage menopause symptoms and reduce health risks; and osteoporosis risks and management. She has consulted for national and international companies such as Athena Medical Products, Medscape, Wyeth-Ayerst, Duramed Pharmaceuticals, Pfizer, Eli Lilly, Roche, Venus Medical Communications, Amgen, and Datamonitor.

Versie Johnson-Mallard, PhD, ARNP, WHNP-BC, FAANP, FAAN, is a Robert Wood Johnson Nurse Faculty Scholar alumna, is a National Certification Corporation board-certified women's health nurse practitioner, faculty, and chair of Family, Community and Health System Science at the University of Florida College of Nursing. Scientific discovery and funding were with the Robert Wood Johnson Foundation, Department of Health and Human Services Office on Women's Health, National Institute of Nursing Research (NINR), and National Cancer Institute (NCI) under the National Institutes of Health (NIH). Sexual and reproductive health clinical inquiry was the impetus to advance scientific knowledge about innovative educational interventions designed to promote reproductive health and cancer prevention among young adults.

Dr. Johnson-Mallard's teaching, clinical practice, research, and publications are in the area of women's health, sexual and reproductive health promotion, human papillomavirus (HPV)/cancer screening/prevention/vaccination, and behavior change in response to culturally appropriate educational interventions. Dr. Johnson-Mallard provides consultation to partners who share interest in the development of education material, clinical guidelines, and policy around reproductive health and cancer prevention.

Elizabeth A. Kostas-Polston, PhD, APRN, WHNP-BC, FAANP, FAAN, is a Robert Wood Johnson Foundation Nurse Faculty Scholar alumna and board-certified women's health nurse practitioner who holds a dual appointment as assistant professor in the Daniel K. Inouye Graduate School of Nursing at the Uniformed Services University of the Health Sciences, and Saint Louis University School of Medicine, Department of Otolaryngology, Head and Neck Surgery. She received her bachelor of science in nursing from Arizona State University, a master of science in nursing with specialization in women's health (obstetrics, gynecology, and primary care of women) from the University of Florida, and a doctor of philosophy from Loyola University Chicago. As a nurse scientist and Robert Wood Johnson Foundation Nurse Faculty Scholar, her scholarship is focused on ensuring the effective translation of knowledge for new approaches to health promotion, disease prevention, and the diagnosis, treatment, and management of HPV-related cancers. In support of her training, she was selected as a fellow and completed postdoctoral studies in genetics, genomics, and molecular biology at the National Institutes of Health/National Institute of Nursing Research. The primary aim of Dr. Kostas-Polston's clinical practice is to improve the health of women and their families. Toward this end, she works with others interested in the development of health promotion and disease-prevention strategies, evidence-based clinical guidelines, and health policy focused on sexual and reproductive and HPV-related cancer prevention.

Catherine Ingram Fogel, PhD, RNC, FAAN, is a research professor emeritus at the University of North Carolina at Chapel Hill School of Nursing. She is the author of several texts on women's health, including the award-winning Women's Health Care and the first edition of Women's Health Care in Advanced Practice Nursing, and has authored numerous research and clinical articles on women's health. For more than 33 years, she has had both a sustained research program and clinical practice with incarcerated women. Her research has increased nursing's awareness and understanding of the health problems of incarcerated women and their complicated lives. Fogel was the principal investigator on one National Institutes of Health (NIH)-funded grant focusing on prevention of sexually transmitted infections and HIV in women prisoners; another NIH-funded grant exploring the experiences of parenting from prison; a Centers for Disease Control and Prevention (CDC)-funded grant to deliver a sexually transmitted infection (STI) risk reduction intervention to HIV-infected women living in the Southeast, and an additional CDC-funded grant to adapt a proven HIV risk-reduction intervention to incarcerated women. Dr. Fogel was also a coinvestigator on a federally funded grant to determine if a comprehensive intervention, supporting seek--test--and--treat, can result in significant reduction in the potential for HIV-infected prisoners to retransmit their virus after release.

Fogel is a member of the American Nurses Association and Sigma Theta Tau and a fellow of the American Academy of Nursing. She was certified as a women's health care nurse practitioner in 1982. She received a North Carolina Community Service Award for her work with women prisoners and the 1993 Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) National Excellence in Clinical Practice Award.

Nancy Fugate Woods, PhD, RN, FAAN, is professor in the Department of Family and Child Nursing at the University of Washington. Since the late 1970s, she has led a sustained program of research in the field of women's health. Her collaborative research has resulted in an improved understanding of women's transition to menopause, including physical and emotional factors; has advanced nursing care for midlife women; and has provided women with a better understanding of their health. In 1989, Dr. Woods helped establish the Center for Women's Health Research at the University of Washington.

Dr. Woods has served as president of the American Academy of Nursing, the North American Menopause Society, and the Society for Menstrual Cycle Research. She helped set research agendas as a member of the National Institutes of Health (NIH) Women's Health Task Force and Office of Women's Health Research Advisory Council. Her honors include election to the Institute of Medicine of the National Academies and to the American Academy of Nursing. She received the American Nurses Foundation Distinguished Contribution to Nursing Research Award and, in 2003, received the Pathfinder Award from the Friends of the National Institute for Nursing Research. She earned a BS in nursing from the University of Wisconsin, Eau Claire, in 1968; an MN from the University of Washington in 1969; and a PhD in epidemiology from the University of North Carolina, Chapel Hill, in 1978.
The editors dedicate this book to the nurse practitioners who provide excellent, individualized care to women.
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Foreword

If you picked up Women’s Health Care in Advanced Practice Nursing, Second Edition, to advance your “learning curve,” I congratulate you. After reading it, I am certain you will agree with me that this text represents a must-read for advanced practice nurses and other providers who deliver health care to women—at any age and at any stage. The importance of this new edition of Women’s Health Care in Advanced Practice Nursing cannot be overstated. It is edited by long-standing noted icons in our field of nursing (Catherine Ingram Fogel and Nancy Fugate Woods), along with new members of the editorial team: Ivy M. Alexander, Versie Johnson-Mallard, and Elizabeth A. Kostas-Polston, each of whom brings unique clinically informed scholarship to the team. As an adult nurse practitioner clinician scholar, Ivy M. Alexander has focused on midlife women’s health and health care, especially menopause and osteoporosis. In her scholarly emphases, Versie Johnson-Mallard, a women’s health nurse practitioner, sheds new light on women’s sexual and reproductive health, including HPV/cancer screening and prevention and behavioral change in response to culturally appropriate educational interventions. In the laboratory as well as the clinic, Elizabeth A. Kostas-Polston, a women’s health nurse practitioner, addresses health-promotion and disease-prevention strategies focused on sexual and reproductive health and HPV-related cancer prevention. This next generation of leaders in women’s health and health care has identified contributors who are scholars in many areas important to women’s health; all are not only knowledgeable, but passionate about women’s health knowledge discovery and its application to transformative health care.

For almost any advancement, I believe that three aspects help move the needle toward positive change: seeing possibilities, framing, and timing. This book is visionary, leading, and timely. Regarding the importance of seeing possibilities, the foundational editors were way ahead of the curve in mainstream health care by focusing on women and their health. Fogel and Woods conceived of the first version of this book in the early 1980s, when women’s health was narrowly defined for health care (it was mostly about the reproductive phase, and biomedicine dominated), and the study of women’s health lacked popularity and certainly was not comprehensive. Regarding the impact of framing for the book, the editors departed from the typical biomedical approach and articulated a framework that speaks directly to us in nursing, focusing on what I call health ecology (women within their environments or what some refer to as the context of their lives). In this new edition of the book, you will be immersed in this frame in Part I. Regarding the influence of timing, with their early grasp on what would come to be a widespread emphasis on women and their health, the editors focus their own discovery and practice scholarship over time, becoming notable experts who are able to interprofessionally network and link with other prominent experts. Thus, the authors of this book represent the “best in class” for conveying contemporary and futuristic perspectives.

Several of the contributing authors to this book have participated, as I do, in the Women’s Health Expert Panel (WHEP) of the American Academy of Nursing. These are peer-nominated and elected nurse scholars from academia and health care practice who focus on applying knowledge to shape policy and clinical practice. They and the other chosen contributors are the thought leaders who are most informed about women’s health and whose analytic thinking is the most informative. Collectively, as members of the WHEP, we have published and spoken publicly on what is crucial to the health of women and critiqued expositions written by those in other disciplines to call attention to missing links within the national women’s health research and clinical services policy agendas. Linking to the transformations spurred by the Patient Protection and Affordable Care Act (ACA), attention has swung toward a national prevention strategy as articulated especially by the National Prevention Council, U.S. Preventive Services Task Force, and the Institute of Medicine. Part II of this book brings to you the most well-versed current perspectives for the application of preventive care (and health-promotion care) for women across the life span. We all know that, generally, women often seek health care for bothersome symptoms associated with chronic physical or emotional conditions, reproductive (pregnancy) or sexual health–related conditions, and the consequences of violence. In Part III, you can update your knowledge on the most prominent women’s health issues that engage health care providers.

I am sure you can sense by my comments in this Foreword that I feel fortunate to be able to urge you to read this most forward-looking book. In today’s health care delivery world, and as epitomized in this book, I am inspired to see that for knowledge to be applied to women’s health, a health ecology frame is becoming increasingly valued. Regional politics aside, everywhere I look, be it in
acute or community settings, advanced practice registered nurses (APRNs) are being sought after, I believe, because they bring the value added of a holistic approach. No group is better positioned to model the elements brought forward by this book than women’s health APRNs. So whether you are a passionate advocate for, thinking about becoming, on the path to becoming, or actually are an APRN in women’s health, this book should be your provocative and affirming handbook—an accelerant for helping ensure that you are an influential women’s health provider, scholar, leader, policy maker, and spokesperson.

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Women’s health has been defined from a variety of perspectives. Women themselves describe articulately what it means to be healthy. Often their descriptions allude to experiencing the absence of illness or symptoms but more often to being able to perform their roles in life, having the capacity to respond to stress and strain, and experiencing high-level wellness.

This text originated in the 1970s as Catherine Ingram Fogel and Nancy Fugate Woods recognized the need for resources for nurses and nursing students who were interested in the emerging area of women’s health. The grandmother of this text was first conceived and birthed in 1981, revised and updated in 1995 and again in 2008, and has paralleled the history of the original editors and contributors, as we moved from our young adult years in the midst of the Women’s Health Movement of the 1970s and 1980s to our more mature years as we prepared this edition of *Women’s Health in Advanced Practice Nursing* and forged a new collaborative with editors of a younger generation.

Over the past four decades, nursing scholars have studied women’s health through the lenses of feminist theory, nursing theory, and now through critical, postcolonial, and womanist theory. In a relatively short period of history, and propelled by a fusion of the U.S. feminist movement of the late 20th century and the popular health movement, scholars redefined *women’s health* as more than women’s reproductive health to include a holistic view of what it means to be a healthy woman. Indeed, women’s health as a discipline has been transformed from gynecology to “Gyn Ecology,” an understanding of women’s health in the context of everyday life. An ecological perspective implies that the multiple environments in which women live their lives, including the influence of the society, culture, institutions, community, and families, need to be considered. During this period, women’s health scholars engaged women in redefining their own health as inclusive of well-being and not simply a compendium of women’s diseases. Clinicians and researchers alike redefined being healthy as the processes of attaining, regaining, and retaining health, consistent with the nursing theories of the time. Moreover, a life-span view became imperative as scholars came to appreciate that women’s health at one part of the life span influenced their chances for health later in life.

Thinking about women’s health from this new perspective implied putting women at the center of clinical services as well as research, focusing on women’s health in the context of their lives. New frameworks for understanding women’s health shaped by feminism and feminist theory now guide research and clinical scholarship. Scholars of revisionist views of feminist theory challenged investigators to consider the intersectionality of women’s identities and the consequences for health. One’s gender is only one component of who one is: gender, race/ethnicity, social class, sexual orientation and gender identity, and disability/ability all intersect in influencing one’s chances for health. In addition, frameworks prompted by globalization reinforce the need to use many different lenses in viewing the health of women around the world. The efforts of the 1980s and 1990s to integrate women’s health literature across disciplines enlarged the perspectives with which communities of nurse scholars and clinicians have come to view women and their health.

Over the past four decades, we have seen dramatic changes in the nature of nursing practice, including that of advanced practice nurses. A rarity in the 1970s, advanced practice nurses are now an essential part of the health care workforce, providing an ever-increasing proportion of primary care for women. As educational programs transition, the push for educating all advanced practice nurses about women’s unique health care problems and appropriate models of care has escalated.

Part I, Women’s Lives, Women’s Health, views women’s health as inextricably linked to the context in which women live their lives, making it impossible to understand women’s health without appreciating the challenges and opportunities they face in everyday living. Understanding women’s lived experiences has become key to understanding their well-being and chances for health. In this section of the text, we consider women and their health as viewed from a population perspective, using national data to paint a picture of morbidity, mortality, health, and well-being, as well as the use of health care. Women have long been attracted to work in health care, and both their distribution and the challenges associated with being a health care provider and practicing in one of the many health professions is explored. The emergence of a clinical scholarship of women’s health, in contrast to gynecology and obstetrics, gave rise to a need to transform women’s health research as well as models of care and health policy. Women-sensitive models of care have emerged over the past two decades; some of these have been influential in shaping the delivery of services in a variety of health care settings. Recognition of the
diversity of U.S. society prompted consideration of health care for special populations of women, and appreciation of women’s rights to health care warrants our attention to the legal aspects of women’s health care, especially as the legal aspects of women’s health care continue to be contested. Feminist frameworks for women’s health offer an updated view of the many lenses through which we can understand women’s health as we care for women.

Part II, Health Promotion and Prevention for Women, draws attention to the work of health promotion and prevention, reflected both in women’s own self-care as well as professional services. Viewed through the lenses introduced in Part I, women’s health is a multidimensional experience, most of which is managed by women themselves, with occasional encounters with health professionals. What women do to stay healthy has been studied by numerous disciplines with a wide range of activities. Women often assume the role as agents of health for their families and demonstrate a high level of interest in health-related information. Indeed, they frequently justify paying attention to their own health in relation to their need to care for their families. They manage their own and family members’ illnesses, often simultaneously providing illness-related care to their children, partners, and parents. The everyday activities that create health are often the purview of women’s work; these include meal planning and preparation, family activities, sleep and rest patterns, and the like. Women are active in obtaining information about their health and often express a desire to work with a health professional who respects their knowledge about their own health and how to promote it. At the same time, women seek health-promotion advice from professionals to help sort out valid information and recommendations about keeping healthy. Women experience their health as embodied: We are and simultaneously live in our bodies. From the early days of the feminist movement of the 20th century, when women used plastic speculums to view their vaginas and cervices, demystification of women’s bodies became part of women’s health care. As women, we continue to be attentive to some of the unique aspects of our bodies, such as the menstrual cycle and menopause. In Part II, we trace experiences of health and health promotion in young, midlife, and older women as a foundation for understanding well-woman’s health. The emergence of the emphasis on the well woman in wellness visits prompts us to consider the questions: What is a healthy woman? What is a mentally healthy woman? How does one attain and maintain optimal health? Health practices span nutrition, exercise/activity, and sleep, each of which demonstrably shapes our health. In an era of personalized health care, we examine the influence of the contemporary “omics” sciences as a foundation for understanding emerging approaches to diagnosis and delivery of health care. Women’s multiple roles in society commonly include employment, in addition to their family roles, and the majority of family caregivers are women: We examine both of these contexts for women’s health and the implications for health care. Women’s sexual health, including special considerations for women who are lesbians, transgender, bisexual, and questioning, warrants special attention of health care providers, as does the management of fertility. As women anticipate having children, both preconception health promotion and prenatal care are essential.

Part III, Managing Symptoms and Women’s Health Considerations, includes an array of problems that account for a growing portion of advanced nursing practice. Women may find that health professionals do not take their complaints seriously, promoting their frustration and dissatisfaction with health care. Part III includes information about topics that touch women’s lives and about which many seek information and validation from health professionals. Although women’s uniquely experienced reproductive health problems are important, so also are health problems that are not unique to women but may be experienced uniquely, such as heart disease. A variety of reproductive-related health problems, as well as general problems such as chronic illnesses, are the focus of many health care visits.

In Part III, we address an array of health problems that are unique to women (such as women’s reproductive health problems), are more prevalent in women (such as breast cancer), and are diagnosed and managed in different ways for women (such as thyroid disorders, diabetes, and heart disease). Among these considerations are those that are linked most directly to reproductive health care, including breast health, care for transgender and gender reassignment, sexual health problems and dysfunctions, vulvar and vaginal health problems, perimenstrual and pelvic symptoms and syndromes, urological and pelvic floor health problems, sexually transmitted infections, women’s experiences of HIV/AIDS, human papillomavirus, gynecologic cancers, menopause, osteoporosis, unintended pregnancy, infertility, high-risk childbearing, and intrapartum and postpartum care. In this section, we also recognize that many women’s health problems are not only those related to reproductive system function, but also those that include mental health challenges, substance abuse, violence against women, cardiovascular diseases, endocrine-related problems, chronic illness, and disability.

Several exciting online resources are available for each chapter. Case studies provide real-world application of the materials. Resources are available for literature, websites, and smartphone applications to access further information. Test bank review questions reflect the most salient points of the content. Additionally, PowerPoint presentations for each chapter can be used as instructional aids or for review of content. This ancillary material is available to qualified instructors by emailing Springer Publishing Company at textbook@springerpub.com.
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Maternal mortality in 1920 was 690 per 100,000 births and dropped to eight per 100,000 births in 2008. Cunningham et al. (2010) attribute this decline in maternal mortality to prenatal care. Prenatal care was designed to decrease the morbidity and mortality of mothers and infants alike (Cunningham et al., 2010; Lockwood & Magriples, 2015). This is achieved by early and accurate dating of gestational age, early risk identification, continued monitoring of maternal and fetal well-being, recognition of problems with appropriate interventions, and patient education (Lockwood & Magriples, 2015). Prenatal care provides opportunities for education to assist the new mother and family in adjusting to the physical changes of pregnancy as well as the psychological adjustments required in an expanding family unit.

This chapter discusses prenatal care of the pregnant woman and her fetus. Common discomforts of pregnancy are introduced and described, and the etiology, risk factors, and treatment discussed. The structure and composition of clinic visits are defined to include screening tests, fetal well-being monitoring strategies, and patient education topics. Finally, medical conditions affecting pregnancy are outlined with strategies to manage them and points at which referral is necessary.

Discomforts of Pregnancy

NAUSEA AND VOMITING

Nausea and vomiting of pregnancy (NVP) are complaints shared by nearly 70% of women in the United States (Einarson, Piwko, & Koren, 2013). Undertreatment of NVP frequently results because of the conviction that nausea and vomiting are an expected course of pregnancy, the fear of medications harming the fetus, or the historical lack of effective pharmacological management (Niebyl & Briggs, 2014). As a result, pregnant women often experience negative impact on their quality of life (QoL) as well as adding to the economic burden on society in increased health care costs and loss of work productivity.

The cause of NVP is unclear; however, multiple theories have been proposed. Rapid rises in hormone concentrations such as estrogen and human chorionic gonadotropin (hCG); delayed or dysrhythmic gastric motility; Helicobacter pylori infection; and mental/emotional disturbances and stress response are all thought to contribute to nausea and vomiting in pregnancy (Smith, Refuerzo, & Ramin, 2015; Thomson, Corbin, & Leung, 2014).

Pregnancy-related risk factors include hydatidiform mole, multiple gestation, and history of previous NVP. Nonpregnancy associated causes encompass a history of nausea and vomiting while taking estrogen-derived medications, the absence of a multivitamin regimen before pregnancy, and a history of gastroesophageal reflux disease (GERD; Taylor, 2014; Thomson et al., 2014).

There are no clear diagnostic criteria for NVP, thus the diagnosis is determined by clinical presentation. Average onset of NVP is between 5 and 9 weeks of gestation and usually resolves by 20 weeks (Niebyl & Briggs, 2014; Smith et al., 2015; Thomson et al., 2014). Although symptoms may only occur in the morning, they frequently take place throughout the day. Symptoms can include “nausea, gagging, retching, dry heaving, vomiting, odor and/or food aversion” (Niebyl & Briggs, 2014, p. S31).

Initial evaluation begins with a review of weight, orthostatic blood pressure measurements, heart rate, and a urinalysis. Comparing the weight from this visit to that of the last visit reveals any weight loss sustained by the patient. Orthostatic blood pressure, heart rate, and specific gravity of the urine can indicate hydration status and need for possible IV fluids. Ketosis confirms lack of adequate food intake and must be addressed if present.

A thorough patient history related to the symptoms is paramount in determining the difference between pregnancy and nonpregnancy-related causes of nausea and vomiting. Obtain and document from the patient the onset, timing, severity, aggravating and alleviating factors, and appearance of the vomitus (Niebyl & Briggs, 2014). Emesis should not
contain bile or blood if pregnancy is the cause. Often, NVP is elicited by motion, heartburn, certain foods and odors. Ask about fever, abdominal pain, change in bowel habits, headache, neck stiffness, and changes in vision (Niebyl & Briggs, 2014). What has she tried to alleviate the nausea and vomiting herself?

Physical examination encompasses assessing for signs of dehydration, such as skin turgor and mucous membrane quality; evaluation of skin and sclera color for signs of jaundice; auscultation of bowel sounds; palpation of the abdomen for masses (other than a gravid uterus), distention, elicited pain, and hepatosplenomegaly; and evaluating for costovertebral angle tenderness (CVAT).

Simple interventions such as changes in diet, avoidance of triggers, and complementary and alternative therapies should be first-line treatment for NVP (Smith et al., 2015). If her prenatal vitamin or iron preparation are contributing to nausea and vomiting, reassure her that they may be safely discontinued until her symptoms abate. She may also substitute a children’s chewable vitamin that contains folic acid (FA). Encourage the patient to discover what foods she can tolerate and build her menu around these items. Avoiding things such as coffee, spicy, acidic, or high fat foods, and fried foods may be helpful. Protein-containing foods have proven to decrease nausea and should be consumed before rising from bed (Jednak et al., 1999). Several small meals, every 1 to 2 hours, should be ingested slowly throughout the day. Chilled, transparent, sour, and carbonated beverages are easier to tolerate in small amounts between meals and snacks. With a lack of research into the efficacy of diet changes on NVP, surveys given to affected women who did make dietary adjustments described moderate relief of their symptoms (Ebrahim, Maltepe, & Einarson, 2010).

Many things may act as triggers for nausea and vomiting and should be identified and avoided. Odors such as foods, perfumes, and chemicals; optical or physical motion such as flashing lights and driving; rapid positional changes; excessive heat; and left-side lying after eating can elicit NVP (Smith et al., 2015). Efficacy of this simple technique has not been well studied.

Vitamin B₆ improves mild to moderate nausea when 25 mg is taken orally every 6 to 8 hours (Smith et al., 2015). Over-the-counter (OTC) antihistamines, such as meclizine, dimenhydrinate, and diphenhydramine, have been shown to be both safe and effective in significantly reducing nausea and vomiting in pregnancy (Smith et al., 2015). Table 23.1 contains dosing recommendations for these medications. The combination of vitamin B₆ and the antihistamine doxylamine is modestly effective for symptom relief and is available both OTC (in the form of half a tablet of Unisom and the vitamin as recommended previously) and as a prescription medication. This regimen is recommended by the American College of Obstetricians and Gynecologists (ACOG) as first-line pharmacotherapy for NVP (ACOG, 2004).

Acupressure, a mode of treatment used in Chinese medicine, has demonstrated the ability to decrease the sensation of nausea. Devices using this technique, such as Sea Bands, are available in most drug stores and are easy to use (Why Sea Bands?, 2013). Systematic review of available research suggests that acupressure significantly reduces nausea in NVP (Lee & Frazier, 2011). Sucking on peppermint candy or consuming ginger in the form of supplements, biscuits, tea, or candy can reduce the symptoms of nausea (Smith et al., 2015; Thomson et al., 2014). Ginger capsules containing 250 mg taken by mouth four times daily are recommended. Ginger is more effective than placebo and as effective as vitamin B₆ in reducing NVP (Ding, Leach, & Bradley, 2013).

Second-line therapy can be considered in women with NVP refractory to first-line treatments. This includes the dopamine antagonists promethazine, prochlorperazine, and metoclopramide and the serotonin antagonist ondansetron (Smith et al., 2015). Metoclopramide, promethazine, prochlorperazine, and ondansetron are equally efficacious in treatment of NVP (Archer, Steinvoort, Larson, & Oderda, 2014; Smith et al., 2015). Table 23.2 demonstrates recommended dosages for these medications.

One possible risk reduction strategy is to ensure the patient is taking a daily prenatal vitamin before conception. Continuing appropriate management of preexisting GERD may forestall nausea and vomiting in some women with this condition.

**TABLE 23.2** Dopamine and Serotonin Antagonist Dosing

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prochlorperazine</td>
<td>5–10 mg by mouth or IM every 6 hours</td>
</tr>
<tr>
<td></td>
<td>25 mg rectally twice daily</td>
</tr>
<tr>
<td>Metoclopramide</td>
<td>10 mg by mouth or IM every 6–8 hours</td>
</tr>
<tr>
<td>Promethazine</td>
<td>12.5–25 mg by mouth, rectally, or IM every 4 hours</td>
</tr>
<tr>
<td>Ondansetron</td>
<td>4–8 mg every 8 hours</td>
</tr>
</tbody>
</table>

IM, intramuscular.

**HEARTBURN**

Up to 85% of women describe symptoms of heartburn during pregnancy and 50% have symptoms beginning in the first trimester (Clark, Dutta, & Hankins, 2014). These symptoms have adverse effects on a pregnant woman’s QoL and capability to work (Law, Maltepe, Bozzo, & Einarson, 2010; Naumann, Zelig, Napolitano, & Ko, 2012).

Heartburn manifests as many symptoms such as retrosternal pain or burning, indigestion, regurgitation, belching, and the taste of acid in the mouth (Clark et al., 2014; Malfertheiner, Malfertheiner, Kropf, Costa, & Malfertheiner, 2012). These symptoms are similar to those...
of myocardial infarction and panic attack and, therefore, must be differentiated from those diagnoses.

Decreased lower esophageal sphincter (LES) pressure is caused by increased progesterone, the growing uterus increasing intra-abdominal pressure, abnormal gastric emptying, and delayed small bowel transit (Clark et al., 2014; Phupong & Hanprasertpong, 2014). Estrogen and progesterone decrease the LES tone by 50% (Clark et al., 2014; Naumann et al., 2012).

Although the majority of pregnant women experience heartburn, there are risk factors that make this discomfort more likely. A prior history of heartburn will almost certainly guarantee its occurrence in pregnancy. Elevated prematurity body mass index (BMI), multiparity, advancing gestational age, and Caucasian ethnicity all increase the risk of heartburn in pregnancy (Naumann et al., 2012; Phupong & Hanprasertpong, 2014).

There are no existing diagnostic criteria for heartburn, it is diagnosed based on the clinical picture (Phupong & Hanprasertpong, 2014). Physical exam is typically normal; however, some patients may experience mid-epigastric pain (MEP) with or without palpation. History can reveal retrosternal pain, often characterized as a burning sensation; frequent burping; regurgitation of acid or stomach contents into the esophagus or mouth; or a “bad” acidic taste in the mouth. Patients may report they have tried OTC antacids such as TUMS or Maalox with or without relief.

Making the same dietary changes as are recommended in NVP can help decrease its occurrence. Lifestyle changes including elevating the head of the bed (helps diminish gastric secretion and reflux), chewing gum (stimulates saliva, helps neutralize acid), and not eating late at night are all ways to help eliminate this pregnancy discomfort (Phupong & Hanprasertpong, 2014).

OTC preparations can be used to enhance the self-management of heartburn in pregnancy. Three classes of medications that are available without a prescription and can be used safely in pregnancy are antacids, histamine-2 antagonists (H-2 blockers) and proton pump inhibitors (PPIs). Aluminum, calcium, and magnesium-containing antacids neutralize stomach acid. Histamine-2 receptor antagonists work to reduce acid production in the stomach by the parietal cells. PPIs stop the production of acid in the stomach by the proton pumps. One final OTC preparation, Gaviscon, is an alginate-based reflux suppressant and in one study showed an efficacy of 91% (Strugala et al., 2012).

Beginning pregnancy with a healthy BMI is one way to mitigate heartburn. Good medical management of heartburn before pregnancy may reduce its severity during the gestational period.

BACK PAIN
Musculoskeletal discomfort is a common complaint in pregnancy with back pain constituting the majority of those complaints. Low back pain during or after pregnancy contributes to driving up health care costs. In Scandinavian countries, one fifth of women who are pregnant take up to 7 weeks of sick time during their pregnancies as a result of back pain. Of women who experience back pain in their first pregnancy, 94% will have back pain in succeeding pregnancies and two thirds of these women become temporarily disabled and are on leave from work (George et al., 2013).

In pregnancy, low back pain is caused by the enlarging uterus pulling the abdomen and spine forward, straining the supporting back muscles. It can also occur because the gravid uterus is exerting pressure on the nerve roots, causing sciatica. Professions requiring lifting, pushing, pulling, sitting, and twisting for long periods of time increase the risk of incurring low back pain. Other risk factors include obesity, increasing age, cigarette smoking, depression/anxiety, tall height, and decreased abdominal and spinal muscular strength.

There are no diagnostic criteria for back pain in pregnancy. The diagnosis is based on the symptoms described by the patient. To ensure there are no other physiologic causes of back pain, exploration of symptomatology and a physical exam should be done. Questions should focus on the following: onset of symptoms (abrupt or gradual); prior history of back pain and its course; history of back surgery; history of recent fall, motor vehicle accident, or other trauma; any heavy lifting, to include lifting of children; or recent fever or chills. Characterize the pain using OLDCAART: onset; location; duration; characteristic of pain; aggravating, associated, and relieving factors; and treatments done. Inspect the skin of the back for signs of bruising or trauma. Palpate the area of concern for any masses that may indicate possible muscle spasms.

Stretching exercises can be recommended for low back pain, especially in early pregnancy. Yoga is safe in pregnancy and can help strengthen back muscles. A maternity belt or band can be used to support the gravid uterus, thus relieving stress on the back muscles. These garments are readily available at department stores, maternity shops, and places such as Target and Walmart. Wearing shoes with low (not flat) heels and good arch support helps ease back pain. Using a board under a too-soft mattress can relieve back pain as can sitting in a chair with good back support or a pillow in the small of the back. Heat, cold, and massage are alternative methods to ease back pain. TYLENOL may be recommended in the lowest dose that provides relief, using no more than 4 g in 24 hours. Referral for physical therapy can be given for those whose symptoms interfere with their ability to work and perform activities of daily living (ADL).

PELVIC PAIN
Pelvic pain is described in one fifth of pregnant women and becomes worse as the pregnancy advances, affecting work, ADL, and sleep (Pennick & Liddle, 2013). Many times, the etiology is musculoskeletal; however, more serious causes such as ectopic pregnancy, appendicitis, and spontaneous abortion (SAB) need to be ruled out.

In pregnancy, pelvic pain can be attributed to the stretching of any of the supporting structures in the pelvis, including the round ligaments. As the gravid uterus enlarges, it puts additional weight and therefore stress on the supporting apparatus. Ligaments resist stretching and, as a result, cause symptoms of pain such as burning, stabbing, pinching, or soreness. Other structures of the abdomen and
pelvis are tested as well as the ligaments. Muscles must stretch to accommodate the growing uterus and occasionally result in a widening of the gap between the diastasis recti. The symphysis pubis begins to relax because of the effects of the hormone relaxin at about 10 to 12 weeks of gestation. Rearrangement of the pelvic organs can trigger pain and is self-limiting. Other causes of pelvic pain, which require immediate attention, are infection, appendicitis, ectopic pregnancy, ovarian mass, ovarian torsion, and SAB. Nonemergent sources of pelvic pain in pregnancy may also come from the bowels. Gas passing through the intestines can cause significant pain, as well as constipation. Advancing gestational age is the highest risk factor for pelvic pain related to pregnancy.

The clinical picture supplies the diagnosis. A history of bowel movements, recent diet, travel outside of the country, and exposure to illnesses should be elicited. Again, OLDCAART is used to assess the pain. Auscultation for bowel sounds can differentiate between gastrointestinal (GI) and other causes of pelvic pain. Palpation of the abdomen and pelvis can localize the pain and reveal any abnormal masses that may be present. A pelvic exam must be performed to detect any abnormal masses not palpable externally. Note the color and consistency of the cervical discharge and the condition of the cervix itself. Collection of a wet prep and specimen for chlamydia and gonorrhea testing is done at this time. During both external and internal palpation, distract the patient with conversation unrelated to her pain. If she is distractable, the etiology is unlikely to require a surgical response. Severe and exquisite pain requires further evaluation. An emergent ultrasound (U/S) can rule out ectopic pregnancy, ovarian masses, and ovarian torsion. It can also inform of the viability of the pregnancy if it is beyond 8 weeks.

Treat any signs of infection. The presence of numerous white blood cells in the wet prep, with or without mucopurulent discharge, warrants treatment for chlamydia and gonorrhea to protect both the mother and the fetus. Treatment of infections is discussed further in this chapter. Tylenol is the only OTC medication that can be prescribed for pain in pregnancy. If pain is severe enough for anything stronger, a referral to an OB/GYN is necessary. Most of the time, education and reassurance is all that is needed to ease the fear of pelvic pain in pregnancy. The pregnant woman should be given anticipatory guidance about how the growing uterus will affect her body. If she is aware there is a normal cause, the pain can be better understood and tolerated.

**SLEEP DISTURBANCE**

In 2013, Nodine and Matthews, through a literature review, described three sleep disorders in pregnancy: breathing-related sleep disorders, restless legs syndrome (RLS), and insomnia. Interrupted sleep is common in pregnancy, affecting up to 97% of women. This has traditionally been thought of as a common discomfort of pregnancy and not much effort has been put into its treatment. New research has associated sleep disturbance with negative outcomes in pregnancy, thus increasing the need for effective management strategies of these complaints.

Breathing-related sleep disorders include snoring, upper airway resistance syndrome, and obstructive sleep apnea (OSA). Diagnosis of these conditions requires a sleep study done overnight in a sleep lab. Hormonal and physiologic adaptations in pregnancy contribute to these conditions as well. Weight gain and an enlarging gravid uterus cause a rising level of the diaphragm and less space for lung expansion. The swelling of mucous membranes by the action of estrogen can lead to nasal congestion and restricted pharyngeal area. As it has been well established that these disorders are linked to hypertension in adults, increasing evidence supports an association between breathing-related sleep disorders and gestational hypertension and preeclampsia. Management of these disorders is related to the extent of the condition. For simple upper airway resistance, nasal strips have been shown to be efficacious in the nonpregnant population. Other recommendations include regulation of weight gain, elevation of the head, refraining from sleeping in the supine position, and limited ingestion of sedatives and alcohol. Efficacy of these interventions has not been evaluated in pregnancy. Management of OSA relies on continuous positive air pressure (CPAP) which is well tolerated, safe, and effective in pregnancy.

Approximately 30% of women who are pregnant experience RLS, which contributes to sleep deprivation and fatigue during waking hours (Nodine & Matthews, 2013). Diagnosis of RLS is made through data collected from a sleep history and must include all four of the following International Classification of Sleep Disorders (ICSD)-2 criteria: a strong urge to move the legs, usually accompanied by discomfort; the urge to move and discomfort occur during inactivity; movement such as stretching or walking immediately relieves the symptoms, but they recur with subsequent inactivity; and symptoms occur primarily in the evening/night (Nodine & Matthews, 2013). Iron or folic acid deficiencies are well-known causes of RLS, a condition which is exacerbated during pregnancy. Management strategies include sleep hygiene and lifestyle changes; massage and acupuncture; treatment of folic and iron deficiencies; and medications such as codeine, gabapentin, and zolpidem. As with any opioid, codeine should be used with caution and as a last resort for severe symptoms.

More than 80% of women suffer from insomnia at some time in their pregnancy, with complaints more prevalent in the third trimester (Nodine & Matthews, 2013). Consequences of insomnia consist of daytime sleepiness, irritability, decreased energy levels, adverse moods, increase in work accidents, car mishaps, and sick leave time. Late pregnancy insomnia has been shown to increase pain perception in labor, increase labor time, and increase rates of operative deliveries. Discomforts of pregnancy, such as back pain, nocturia, active fetal movement, breast tenderness, and leg cramps contribute to insomnia. Increases in estrogen and progesterone decrease the rapid eye movement sleep stage, increase release of cortisol (which increases arousal), and change nocturnal breathing patterns. Diagnosis is made using a sleep history and careful documentation in a sleep diary. Management of insomnia involves sleep hygiene and lifestyle changes; acupuncture; relaxation techniques such as yoga and massage; light therapy; treatment of depression; and medications such as codeine, zolpidem,
diphenhydramine, and doxylamine. Again, codeine should be a last resort and used carefully in pregnancy.

SHORTNESS OF BREATH

Shortness of breath (SOB) is experienced by 60% to 70% of women during pregnancy. For the majority of women, this is a common discomfort. However, a small percentage of pregnancies can be affected by other disorders that manifest as dyspnea and must be evaluated to ensure the health and safety of the mother and fetus (Weinberger, 2015).

The onset of SOB is gradual, begins in the first or second trimester, increases in frequency in the second trimester, and stabilizes in the third trimester. It is not associated with exercise, coughing, wheezing, or pain, and is at its worst with sitting. A careful history and auscultation of the lungs will guide diagnosis. The etiology is not well known, but is likely caused by progesterone-mediated hyperventilation. Increased blood volume and cardiac output, physiologic anemia, and changes in respiratory physiology also contribute to dyspnea in pregnancy. Evaluation of dyspnea must be accomplished to differentiate between dyspnea of pregnancy and other underlying conditions such as peripartum cardiomyopathy, asthma, anemia, pulmonary embolism or edema, and preeclampsia/eclampsia.

Discussion of normal physiologic changes in pregnancy and reassurance will help the patient understand this process and reduce anxiety related to this normal discomfort of pregnancy. Advice to minimize SOB during pregnancy can include not overeating and taking frequent breaks when exercising.

Clinic Visits

INITIAL VISIT

The initial visit should occur before 10 weeks gestation to allow for recommended screening to be performed and provide early identification of risk factors that may negatively affect the pregnancy. This is an optimum time to deliver health and safety information, offer anticipatory guidance, and answer patient questions, for both first-time mothers and multiparous women.

A complete history should take place at this visit and include personal, family, and father of the baby (FOB) information. Obtain demographic data such as patient name, birth date, race, address and phone number, emergency contact information, marital status, occupation, education, primary language spoken, and FOB name and phone number. Document prior pregnancies by including gravida, full term, premature, induced abortion, SAB, ectopic, multiple births, and living children. Record menstrual history with date of last menstrual period (LMP), whether known, approximate, or unknown. Continue with a description of how many days between cycles, age of onset of menses, whether a birth control method was used at the time of conception, and the date of the first positive pregnancy test. Gather a history of prior pregnancies, noting date of delivery, gestational age, length of labor, birth weight of infant, type of delivery, whether anesthesia was used or not, place of delivery, whether it was a preterm delivery, and list any complication of the pregnancy and/or deliveries.

It is essential to complete a comprehensive medical history of the patient and family. Although not exhaustive, Table 23.3 lists items to be included in this history. There are many patient history templates that can be used in gathering these data. ACOG offers an obstetrical history and antepartum record for sale on their bookstore website, listed in the web resources in this book's ancillary materials. The March of Dimes has made available free tablet-based software that provides screening and risk assessment of the pregnant patient. The questionnaire is quite thorough and can be downloaded from www.nchpeg.org.

Risk assessment incorporates genetic/hereditary, environmental, occupational, and recreational exposures that may pose a risk to the pregnancy. Genetic and hereditary risk factors are considered within the medical history.

<table>
<thead>
<tr>
<th>TABLE 23.3</th>
<th>Patient and Family Medical History</th>
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</thead>
<tbody>
<tr>
<td><strong>Cardiovascular Disease</strong></td>
<td><strong>Blood Dyscrasias</strong></td>
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<tr>
<td>Hypertension</td>
<td>Anemia</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>Thrombophilia</td>
</tr>
<tr>
<td>Congenital anomalies</td>
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<tr>
<td>Thromboembolic disease</td>
<td></td>
</tr>
<tr>
<td><strong>Endocrine Disorder</strong></td>
<td><strong>Infectious Diseases</strong></td>
</tr>
<tr>
<td>Diabetes, including gestational</td>
<td>Herpes</td>
</tr>
<tr>
<td>Thyroid</td>
<td>Gonorrhea</td>
</tr>
<tr>
<td><strong>Gastrointestinal Disease</strong></td>
<td>Chlamydia</td>
</tr>
<tr>
<td>Hepatitis</td>
<td>HIV</td>
</tr>
<tr>
<td>Gallbladder</td>
<td>Syphilis</td>
</tr>
<tr>
<td>Inflammatory bowel</td>
<td></td>
</tr>
<tr>
<td><strong>Kidney Disease</strong></td>
<td><strong>Gynecologic History</strong></td>
</tr>
<tr>
<td>Pyelonephritis</td>
<td>Diethylstilbesterol (DES) exposure</td>
</tr>
<tr>
<td>Urinary tract infections</td>
<td>Abnormal Pap history and treatment</td>
</tr>
<tr>
<td>Congenital anomalies</td>
<td>Genital tract disease or procedures</td>
</tr>
<tr>
<td><strong>Neurologic/Muscular Disorders</strong></td>
<td><strong>Substance Use</strong></td>
</tr>
<tr>
<td>Seizures</td>
<td>Alcohol</td>
</tr>
<tr>
<td>Aneurysm</td>
<td>Tobacco</td>
</tr>
<tr>
<td>Arteriovenous malformation</td>
<td>Illicit or recreational drugs</td>
</tr>
<tr>
<td>Headaches</td>
<td></td>
</tr>
<tr>
<td><strong>Psychiatric Disorders</strong></td>
<td><strong>Other Indicators</strong></td>
</tr>
<tr>
<td>Eating disorder</td>
<td>Breast disorders</td>
</tr>
<tr>
<td>Depression, including postpartum</td>
<td>Cancer</td>
</tr>
<tr>
<td>Psychosis</td>
<td>Mental retardation</td>
</tr>
<tr>
<td><strong>Autoimmune Disorder</strong></td>
<td>Birth defects/genetic disorders</td>
</tr>
<tr>
<td>Lupus</td>
<td>Trauma/violence/abuse</td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>Blood transfusion</td>
</tr>
<tr>
<td><strong>Pulmonary Disease</strong></td>
<td>Surgical procedures</td>
</tr>
<tr>
<td>Asthma</td>
<td>Hospitalizations</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>Allergies</td>
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<tr>
<td></td>
<td>Medications</td>
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<td></td>
<td>Nutrition</td>
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</tbody>
</table>
but occupational, environmental, and recreational factors are not always explored there. The type of work the patient performs and the work environment can give clues to hazards she may not be aware of. A factory worker may be exposed to elevated noise and vibration levels or be required to do heavy lifting. Health care and child care workers risk exposure to infectious diseases. Cosmetologists work with chemicals that may be breathed in or absorbed through the skin. The location and type of housing a person dwells in can also contribute to unforeseen dangers such as airborne toxic chemicals and lead. Some hobbies and recreational activities can be dangerous. Sky and underwater diving are contraindicated in pregnancy. Any contact sport should be avoided. Painting, soldering, glass fusing, and welding all produce fumes, which should be well ventilated or avoided altogether. Modifiable risk factors include smoking, drug and alcohol use, and dangerous sports or activities. A discussion about smoking, drug, and alcohol cessation is warranted if these are current risk factors. Make appropriate referrals for assistance in discontinuing these behaviors.

The physical exam performed on the initial visit is similar to a well-woman exam (see Chapter 11). Vital signs are examined at every prenatal visit, before the exam, and include height, weight, temperature, respiratory rate, blood pressure, and pulse. Auscultate lung and heart sounds and a heart murmur may be appreciated. A grade II systolic ejection murmur is the physical manifestation of increased plasma volume and cardiac output and is normal in pregnancy. Palpate the thyroid for nodules; a slight increase in size typically occurs. Perform a gentle breast exam as the breasts and nipples can be very tender. Palpate the abdomen for masses; assess for CVAT. Conduct a pelvic exam, beginning with visual evaluation of the vulva. Examine for lesions, abnormal discharge, and varicosities. Palpate for masses and lymphadenopathy. Insert a speculum, noting the condition of the vaginal walls. Examine the cervix for masses, blood, and discharge. The cervical os should be closed, although in a multiparous woman, it may be gaping. This is the opportunity to take samples for a Pap smear and human papillomavirus (HPV) testing if indicated, wet prep, and testing for chlamydia and gonorrhea. Gently remove the speculum and insert two lubricated fingers into the vagina. Abdominally palpate the gravid uterus and determine its size. Palpate the adnexa for masses and tenderness. It is not necessary to search for fetal heart tones (FHT). Before 10 to 12 weeks of gestation, heart tones are not audible with a portable Doppler. The timing and elements of subsequent prenatal visits are listed in Table 23.4.

Laboratory tests usually done in addition to those gathered during the physical exam include urinalysis with culture and sensitivity, urine pregnancy test, serum rubella and varicella titers, complete blood count, ABO/Rh and antibody screen, rapid plasma reagin (RPR), HIV, hepatitis B&c, sickle cell screen, and other labs as indicated by the patient’s history. A history of a first-degree relative with diabetes, patient BMI in the obese category, or a prior diagnosis of gestational diabetes warrants an early 1-hour glucose tolerance test (1hGTT). Laboratory tests performed during later visits are listed in Table 23.5.

Continued physical activity or activity begun early in the prenatal course contributes to decreased weight gain and better delivery outcomes. Any physical activity that does not involve contact such as walking, jogging, swimming, and cycling can be a part of an exercise program for the pregnant woman. Care must be taken when engaging in these activities as the center of gravity changes with increased uterine size, and the hormones relaxin and progesterone loosen the body’s tendons and ligaments, rendering the patient prone to tripping. The heart rate should be kept below 140 bpm. Safety devices appropriate to the activity, such as eye protection and helmets, should be used. Sexual activity can continue during pregnancy, as long as there is no risk of preterm labor. A well-balanced diet is essential in fueling both the mother and the growing fetus. Avoid shark, swordfish, king mackerel, white or albacore tuna, and tilefish, which contain high levels of mercury. Eat no more than 12 oz of other fish and shellfish weekly. Avoid eating unpasteurized milk and soft cheeses; hot dogs, deli, and luncheon meats (unless cooked to steaming hot); and raw meat and eggs. The craving for unusual substances such as chalk, clay, laundry detergent, laundry starch, and others is called pica. Discourage the ingestion of these substances and ask the patient to inform you if she is having these cravings as they may be manifestations of iron deficiency.

Discuss the care plan with the patient. Visits will be every 4 weeks until 28 weeks. Talk to her about nausea and vomiting, heartburn, and dizziness that she may experience and strategies to treat them. Let her know you will offer her fetal aneuploidy screening at her next two visits, depending on her risk factors. Warning signs that should be discussed are bleeding and abdominal pain. She should not be experiencing any vaginal bleeding and should be evaluated either in the office or the nearest emergency room (ER) if bleeding occurs. Persistent abdominal pain should also be evaluated to rule out appendicitis or an ectopic pregnancy.

Patient vaccination status, ideally, is determined during preconceptional counseling. Often, women do not avail themselves of this service and may not be sufficiently protected from certain diseases. All women should be immunized against influenza during the recommended season. The flu is most dangerous to the young, the elderly, and pregnant women. No live vaccines are given during pregnancy because of their teratogenic effects.

Iron and FA supplementation are necessary to both maternal and fetal health. Often, the mother cannot tolerate iron early in pregnancy because of constipation and/or nausea and vomiting. Some clinicians will recommend chewable children’s vitamins to help decrease these side effects. OTC docusate sodium is helpful in reducing constipation. If iron is not at all tolerated because of nausea and vomiting, taking it can be suspended until NVP subsides.

10 TO 12 WEEKS
At this and each subsequent visit, the following data should be obtained and assessed: patient weight, blood pressure, pulse, and FHT; signs of depression and domestic violence; and iron and FA intake. After the initial pelvic exam, there is no need to do another one unless there are signs of infection, bleeding, or abdominal pain/contractions. If a first
<table>
<thead>
<tr>
<th>TABLE 23.4</th>
<th>Elements of Prenatal Visits</th>
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<tbody>
<tr>
<td><strong>PRENATAL VISIT</strong></td>
<td><strong>INITIAL VISIT</strong></td>
</tr>
<tr>
<td><strong>History</strong></td>
<td>Complete</td>
</tr>
<tr>
<td><strong>Physical Exam</strong></td>
<td>Complete</td>
</tr>
<tr>
<td>BP</td>
<td>*</td>
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<tr>
<td>Weight</td>
<td>*</td>
</tr>
<tr>
<td>Pelvic/cervix exam</td>
<td>*</td>
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<tr>
<td>Fundal height</td>
<td>*</td>
</tr>
<tr>
<td>Fetal heart rate/position</td>
<td>*</td>
</tr>
<tr>
<td><strong>Labs</strong></td>
<td>Hct or Hgb</td>
</tr>
<tr>
<td>ABO/Rh</td>
<td>*</td>
</tr>
<tr>
<td>ABS</td>
<td>*</td>
</tr>
<tr>
<td>Pap smear</td>
<td>Offer</td>
</tr>
<tr>
<td>GTT</td>
<td>*</td>
</tr>
<tr>
<td>Fetal aneuploidy screen</td>
<td>*</td>
</tr>
<tr>
<td>CF screen</td>
<td>*</td>
</tr>
<tr>
<td>Urinalysis/culture</td>
<td>*</td>
</tr>
<tr>
<td>Urine protein</td>
<td>*</td>
</tr>
<tr>
<td>RPR</td>
<td>*</td>
</tr>
<tr>
<td>Rubella titer</td>
<td>Offer</td>
</tr>
<tr>
<td>GC/CT</td>
<td>*</td>
</tr>
<tr>
<td>Hep B</td>
<td>*</td>
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<tr>
<td>HIV</td>
<td>*</td>
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<tr>
<td>Group B strep</td>
<td>*</td>
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<tr>
<td><strong>Psychosocial</strong></td>
<td>Barriers to care</td>
</tr>
<tr>
<td>Housing</td>
<td>*</td>
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<tr>
<td>Nutrition</td>
<td>*</td>
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<tr>
<td>Smoking</td>
<td>*</td>
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<tr>
<td>Substance abuse</td>
<td>*</td>
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<tr>
<td>Depression</td>
<td>*</td>
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<tr>
<td>Safety</td>
<td>*</td>
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</tbody>
</table>

*aBimanual exam.*

*First trimester screen 11 to 14 weeks.

*Retest in third trimester if high risk.

*Some states require third trimester screen.

ABO/Rh, blood types A, B, AB, and O or Rhesus blood type + or –; ABS, amniotic band syndrome; BP, blood pressure; CF, cystic fibrosis; GC/CT, gonorrhea/chlamydia trachomatis; GTT, glucose tolerance test; Hct or Hgb, hematocrit or hemoglobin; Hep B, hepatitis B; RPR, rapid plasma reagin.
A second trimester fetal aneuploidy screen, also known as the quad screen, can be done between 15 and 22 weeks of gestation. Maternal blood is drawn and using demographic data such as age, weight, gestational age, and race, serum factors are analyzed and the risk of aneuploidy calculated and reported. A fetal anatomic survey is performed after 18 weeks of gestation and reports normal versus abnormal fetal anatomy.

A common concern for mothers at this stage of pregnancy is fetal movement. Quickening is the first time a mother can feel her fetus moving. This feeling can be described as bubbles, gas, or flutters. The time when quickening occurs varies with each individual and pregnancy. It can begin as early as 16 weeks to as late as 22 weeks. Reassurance that with good FHT, the absence of fetal movement is not concerning, is often enough to satisfy an anxious mom. Discuss any lab results from the last visit and follow up on modifiable risk factors. Ensure the patient is taking prenatal vitamins and FA; review nutrition in pregnancy.

**22 WEEKS**

Beginning with this visit, measure the fundal height. This is done with a disposable measuring tape, marked in centimeters. The zero point of the tape is placed and held on the upper edge of the symphysis pubis and pulled taut over the abdomen until the fundus is palpated. The measurement recorded is known as the fundal height and is usually within 2 cm of the estimated gestational age (EGA). Three or more centimeters greater or less than the EGA warrants an U/S to observe fetal growth.

Preterm labor education and prevention continue at this visit. Signs of preterm labor, prevention strategies, and when to seek emergency care should be discussed with the patient. Anticipatory guidance about expected body changes and fetal growth is appropriate during this visit as well. Discussion about how this family unit plans to integrate the coming new member should begin. Exploring emotions, changes in couple relationship, daily schedules, parental responsibilities, and expectations has likely already begun. Encourage continued evaluation of these topics to help ease the transition to parenthood and a new family dynamic. Continue to inquire about modifiable risk factors and attempt to mitigate any that exist. Suggest considering and enrolling in breastfeeding and childbirth education classes. Prepare the patient for the hospital stay by discussing items to bring, length of stay, and hospital policies such as number of people allowed in the delivery room, use of recording devices, and presence of children.
28 WEEKS
At this visit, a 1°GTT is ordered to screen for gestational diabetes. The only instruction for testing is that the patient needs to be fasting for the first blood draw. Inform the patient that if the test is abnormal, she will be sent for a 3°GTT that will diagnose whether she is affected by gestational diabetes. Anti-D immune globulin is given to women who are Rh(D) negative. If needed, Tdap (tetanus, diphtheria, and pertussis) vaccination is ideal for the infant if given between 27 and 36 weeks.

Continue preterm labor education and prevention, physiology of pregnancy, modifiable risk factor, and fetal growth discussions. Hospital preregistration and tour of the labor and delivery (L&D) unit can relieve some of the burden of delivery day. Discuss plans for work, such as plans to stop work before delivery, how long maternity leave will be, and even the possibility of no longer working after delivery. Teach the patient the rationale behind and how to do fetal kick counts. Give guidance on when she should seek emergency care if she is not feeling fetal movement.

32 WEEKS
Warning signs related to preeclampsia and eclampsia are given at this visit. Educate on acceptable travel restrictions for the upcoming weeks. Continue preterm labor education and prevention, physiology of pregnancy, modifiable risk factors, and fetal growth discussions.

Prompt the patient to begin considering what type of contraception she desires after delivery, where she will obtain child care, and who will be her pediatrician. Introduce the possibility of an episiotomy during delivery and reassure her about her continued ability to participate in and enjoy sex. This is also an opportunity to inform her about changing sexuality for her, her partner, and their relationship. If lab results from the last visit have not been reviewed, it can be done during this visit. Mothers with prior cesarean sections may want to discuss their desire for a vaginal birth for this pregnancy. A referral to an obstetrician will help inform her of this possibility.

36 WEEKS
At this visit, some providers will begin cervical examinations to determine the readiness for delivery. Others will not do a sterile vaginal exam unless there is an indication there will be cervical change. The fewer vaginal exams, the less likely it is to introduce infection. Leopold's maneuvers are performed during the examination to confirm fetal position. If there is any doubt of the presenting part of the fetus, a quick look with an US can offer confirmation. A culture of the vagina and anus is taken for group beta streptococcus (GBS) screening. In some states a third trimester HIV test is mandatory and can be done at this visit. If the patient is high risk, a repeat gonorrhea/chlamydia trachomatis (GC/CT) and RPR is recommended at this time.

Loss of the mucus plug can occur at any time, but is more likely to occur between now and delivery. Discussion that this is not a sign of imminent delivery is appropriate. Continue preterm labor education and prevention, physiology of pregnancy, modifiable risk factors, and fetal growth discussions. Introduce education about routine postpartum care and management of late pregnancy symptoms. Reiterate observing for symptoms of preeclampsia and give L&D warnings. Postpartum depression can occur as early as late third trimester; the patient should be aware of these signs and when she should seek emergency care.

38 TO 41 WEEKS
A sterile vaginal exam for cervical dilatation can be performed at this visit if the patient desires. At term, some providers will offer to “strip” or “sweep” the membranes in an attempt to induce labor. Other providers will offer advice for natural ways to induce labor. Semen contains prostaglandins, a hormone used to ripen the cervix. Intercourse, if comfortable at this point, can bring about labor. Some recommend rides down bumpy roads, drinking raspberry leaf tea, and eating borscht, based on anecdotal reports. None of these methods have been proven to bring about labor.

Discuss postpartum vaccinations for the mother, post-term pregnancy management, and breastfeeding. Preeclampsia warnings should continue to be given along with L&D warnings. Discuss GBS results and, if positive, antibiotic use in labor. Advise patient that this would be an ideal time to learn infant cardiopulmonary resuscitation (CPR) and recommend resources for classes.

POSTPARTUM (4–6 WEEKS)
Vital signs, weight, height, and BMI calculation are examined. The patient will want a baseline postpregnancy weight to evaluate her weight loss efforts. A depression screening tool such as the Edinburgh Postpartum Depression Screen (EPDS) should be administered to assess the extent, if any, of postpartum depression. A score of 12 or greater warrants referral to a mental health professional. History at this visit should include information about the delivery: infant sex and weight, EGA at time of delivery, hours of labor, type of delivery, whether anesthesia was used, and complications, if any, of the delivery. Document current state of vaginal bleeding (i.e., has her bleeding stopped, has her menses returned). A full well-woman exam is done as a postpartum exam with a few additions. The breasts are examined for redness, excessive warmth, hard, painful masses, and cracked nipples. Assess breastfeeding success and refer as needed to a lactation consultant for any breastfeeding problems. During the pelvic exam, assess the perineum for healing of any tears and/or repairs that may have been done and document. Chart any lochia that is present. Evaluate that the uterus has nearly or fully involuted. If the patient had GDM, a 6-week postpartum 2-hour GTT should be ordered to evaluate normalization of glucose tolerance.

As long as any lacerations are healed, it is okay to resume intercourse at this time. Determine the type of contraception desired, and education the patient on its use. Postpartum depression is possible up until 6 months after delivery. The mother should be aware of signs and notify her provider if any of these are present. Optimally, the infant’s pediatrician...
will be evaluating the mother for postpartum depression at the well-baby visits.

**Medical Conditions During Pregnancy**

**ASTHMA**

Asthma is often seen in pregnancy as it is a common disease among younger females, affecting 4% to 8% of all pregnancies (Cunningham et al., 2010). Asthma in pregnancy follows the rule of thirds: one third of affected women will get better, one third will remain the same, and one third will get worse. This disease should be carefully monitored in pregnancy, as it increases the chances of SAB, vaginal hemorrhage, preeclampsia, hypertension, and prematurity (Schatz & Weinburger, 2015).

Asthma is usually a preexisting condition in which the patient is either on medication or has not been affected by the symptoms since childhood. New-onset asthma can be diagnosed with history of sudden onset when exposed to a trigger with wheezing, coughing, and/or dyspnea. Auscultation of the lungs will reveal global, high-pitched expiratory wheezing. In severe attacks, tachypnea, tachycardia, and use of accessory muscles may also be appreciated. Pulmonary function tests are used to evaluate suspected asthma. Spirometry measures forced expiratory volume in one second (FEV₁) and forced vital capacity (FVC). A decrease in the FEV₁/FVC below normal demonstrates airflow obstruction. The measured FEV₁, compared with normal predicted value describes the degree of airflow limitation. Bronchodilator response can be assessed with repeat spirometry 10 to 15 minutes after administration of a rapid-acting bronchodilator, two to four puffs. A 12% or greater increase in FEV₁ with an absolute rise in FEV₁ of a minimum of 200 mL indicates a positive response.

Initial management of asthma consists of identifying and avoiding triggers, monitoring peak expiratory flow rate (PEFR) twice daily, and education about recognizing when to seek emergency care. Pharmacological therapy may be required in pregnancy and is a stepwise approach as recommended by the Working Group on Asthma and Pregnancy of the National Asthma Education Program. Table 23.7 describes this recommended therapy. Acute exacerbations of asthma not relieved by self-treatment require immediate medical attention.

**DIABETES**

Diabetes affected nearly 6% of females in the United States in 2011 (Centers for Disease Control and Prevention [CDC], 2013). It is thought that the rate of diabetes has increased because of the poor Western diet and lack of exercise in the population. Certain ethnic groups tend to have higher rates, such as Hispanics and Native Americans (Ackerman et al., 2012). Lower socioeconomic status contributes because patients may not be able to afford lean meats, fresh fruits, and vegetables. Women who have preexisting diabetes must be counselled and carefully monitored during pregnancy. Some women may develop diabetes during pregnancy caused by the change in carbohydrate metabolism. Untreated diabetes in pregnancy results in stillbirth, macrosomia, increased cesarean delivery rates, birth trauma, and infant hypoglycemia, and exposes the child to future risks of childhood obesity, gestational diabetes mellitus (GDM), diabetes mellitus (DM) type 2, and metabolic syndrome (Federico & Pridjian, 2012).

Autoimmune destruction of pancreatic beta-cells results in complete insulin deficiency and is known as DM type 1 (DM1). This form of diabetes is responsible for about 5% to 10% of the disease (American Diabetes Association, 2014). Risk factors for DM1 are genetic predisposition and ill-defined environmental factors.

Type 2 DM (DM2) is characterized by insulin resistance and relative insulin deficiency. The etiology of DM2 is unknown, likely multifactorial, and does not involve beta-cell destruction. This form accounts for 90% to 95% of all diabetes. Risk factors include genetic predisposition, history of gestational diabetes, hypertension, hyperlipidemia, obesity, increased age, and lack of exercise (American Diabetes Association, 2014).

Insulin resistance is a normal physiological occurrence in pregnancy that begins in the second trimester. When the pancreas cannot overcome this resistance, gestational diabetes (GDM) occurs (Petragna & D’Antona, 2014). The incidence of GDM is between 1% and 14% of all pregnancies (American Diabetes Association, 2014). Women are at increased risk for GDM if they have a personal history of GDM; Hispanic, African or Native American, South or East Asian, or Pacific Islander; first-degree relative with diabetes; BMI of greater than 30; age greater than 25; delivery of a baby more than 9 pounds; unexplained fetal loss or infant with birth defect; maternal birth weight

<table>
<thead>
<tr>
<th>TABLE 23.7</th>
<th>Pharmacological Management of Asthma in Pregnancy</th>
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</thead>
<tbody>
<tr>
<td>SEVERITY</td>
<td>THERAPY</td>
</tr>
<tr>
<td>Mild intermittent</td>
<td>Inhaled beta-agonist such as albuterol as needed</td>
</tr>
<tr>
<td>Mild persistent</td>
<td>Low-dose inhaled corticosteroid such as budesonide</td>
</tr>
<tr>
<td></td>
<td>Other safe choices: cromolyn, leukotriene antagonists, or theophylline</td>
</tr>
<tr>
<td>Moderate persistent</td>
<td>Low-dose inhaled corticosteroid such as budesonide and long-acting beta-agonist such as salmeterol (preferred)</td>
</tr>
<tr>
<td></td>
<td>OR Medium-dose inhaled steroids and long-acting beta-agonist if needed</td>
</tr>
<tr>
<td></td>
<td>Other safe choices: low-dose (or medium if needed) inhaled steroids and theophylline or leukotriene antagonists</td>
</tr>
<tr>
<td>Severe persistent</td>
<td>High-dose inhaled corticosteroids and long-acting beta-agonist and oral steroids if needed</td>
</tr>
<tr>
<td></td>
<td>Other safe choices: high-dose inhaled corticosteroids and theophylline and oral steroids</td>
</tr>
</tbody>
</table>
greater than 9 pounds; glucosuria; and medical conditions associated with diabetes such as polycystic ovary syndrome, metabolic syndrome, glucocorticoid use, or hypertension (Coustan & Jovanovic, 2015).

Although 90% of women who are pregnant carry at least one risk factor for impaired glucose tolerance, nearly 3% to 20% of women diagnosed with GDM have no risk factors (Coustan & Jovanovic, 2015). As a result, screening for gestational diabetes is routinely done between 24 and 28 weeks of gestation in women who are at low or no risk of diabetes. For women who carry GDM risk factors, an early GTT should be performed during the first trimester. Diagnosis of GDM can be made based on serum glucose testing. A 1°GTT consists of a 50-g glucose-containing liquid administered orally irrespective of last oral intake. At 1-hour post-ingestion, serum glucose is measured and patients with results equal to or greater than 140 mg/dL are scheduled for a 3°GTT. The American College of Obstetricians and Gynecologists (ACOG) recommends a threshold of 135 mg/dL for patients who are ethnically at higher risk for diabetes (American Diabetes Association, 2014). In a 3°GTT, the patient drinks a 100-g glucose-containing liquid after an initial fasting blood draw. Every hour after ingestion of the glucose, blood is taken and the serum glucose level evaluated. Table 23.8 describes the diagnostic criteria required to diagnose GDM from a 3°GTT. A diagnosis of overt diabetes can be made with results of fasting glucose levels of 126 mg/dL or greater.

Risk reduction for gestational diabetes focuses on the overweight or obese patient. Weight loss and increased physical activity, during and before pregnancy, have both been demonstrated to reduce the risk of GDM in several observational studies (Artal, 2015; Coustan & Jovanovic, 2015). A healthy diet can lead to weight loss and, therefore, decrease GDM risk. The efficacy of exercise and healthy diet in reducing GDM risk increases when these two interventions are combined (Artal, 2015).

Women who have DM1 must be counselled before pregnancy and carefully monitored during the gestational period. Tight glucose control is key to a healthy pregnancy with positive outcomes. Establishing normal blood glucose levels before conception is the first step. Diet and exercise can help maintain this normal equilibrium along with correct insulin dosing. These women are typically managed with insulin therapy by an obstetrician or maternal–fetal medicine physician.

Women with DM2 and GDM must also monitor their blood glucose levels. This is done four times daily (fasting and 1–2 hours postprandial), documented, and brought to the provider for evaluation. Goals for glycemic control should be 90 to 99 mg/dL fasting, less than 140 mg/dL 1-hour postprandial, and 120 to 127 mg/dL 2 hours postprandial (Federico & Pridjian, 2012). Treatment modalities for GDM are similar to those used for risk reduction. Dietary restriction and moderate-intensity physical activity are recommended, although carbohydrate restricting that results in ketosis starvation is to be avoided (Federico & Pridjian, 2012). For those women who cannot maintain glycemic control with lifestyle interventions, referral to an obstetrician for initiation of oral glyburide, metformin, or insulin therapy is recommended.

Women with preexisting diabetes and those with poorly controlled GDM undergo regular antepartum fetal testing because of the higher risk of fetal death. U/S for fetal growth starts at 28 weeks of gestation and is reevaluated every 3 to 4 weeks. Beginning at 32 to 34 weeks of gestation, bi-weekly to weekly biophysical profile (BPP) and nonstress testing (NST) is performed. The frequency of this testing increases to twice weekly beginning at 36 weeks until delivery.

**HYPERTENSION**

Hypertension (HTN) is one of the most common medical conditions seen in pregnancy, affecting 5% to 10% of total pregnancies, and is the second leading cause of maternal death in the United States (Cunningham et al., 2010; National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy, 2000). This disease is a major factor in the incidence of stillbirths and the morbidity and mortality of the neonate. Hypertension in pregnancy contributes to the occurrence of abruptio placentae, acute renal failure, cerebral hemorrhage, disseminated intravascular coagulation, and hepatic failure. Etiology of hypertensive disorders in pregnancy is not well known and is likely multifactorial. Risk factors for hypertension include obesity, advancing age, race, family history,

<table>
<thead>
<tr>
<th>TABLE 23.8 Diagnostic Criteria: GDM Using the 3-Hour GTT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PLASMA OR SERUM GLUCOSE LEVEL</strong></td>
</tr>
<tr>
<td>mg/dL</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Fasting</td>
</tr>
<tr>
<td>One hour</td>
</tr>
<tr>
<td>Two hours</td>
</tr>
<tr>
<td>Three hours</td>
</tr>
</tbody>
</table>

GDM, gestational diabetes mellitus; GTT, glucose tolerance test.
Adapted from (a) Coustan and Jovanovic (2015) and (b) the National Diabetes Data Group (1979).
decreased adult nephron mass, high sodium diet, physical inactivity, excessive alcohol intake, diabetes, dyslipidemia, certain personality traits, and depression (Basile & Bloch, 2014).


By definition, gestational hypertension is “blood pressure elevation detected for the first time after midpregnancy without proteinuria” (National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy, 2000, p. S3). This elevation is either systolic blood pressure (SBP) equal to or greater than 140 mmHg or diastolic blood pressure (DBP) equal to or greater than 90 mmHg. If preeclampsia syndrome does not manifest and blood pressure returns to normal before 12 weeks postpartum, the diagnosis is transient hypertension of pregnancy. However, if the blood pressure remains elevated after 12 weeks postpartum, chronic hypertension is the diagnosis (National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy, 2000). Management of gestational hypertension is dictated by severity, gestational age, and whether or not preeclampsia is present. Pharmacologic treatment is begun when SBP reaches 160 mmHg or greater. Methyldopa is generally the first-line therapy used by most providers. If the patient cannot tolerate the sedative side effects or blood pressure cannot be maintained below 160 mmHg systolic on methyldopa, labetalol, nifedipine, and hydralazine may be safely used. Diuretics are not used because of the risk of decreased plasma volume in the mother. Angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), and direct renin inhibitors are absolutely contraindicated in pregnancy. See Table 23.9 for dosing schedules related to these antihypertensives in pregnancy.

Preeclampsia affects every organ system with reduced perfusion associated with vasospasm and initiation of the coagulation cascade. It is diagnosed when the patient with gestational hypertension also presents with proteinuria (greater than or equal to 0.3 g of protein in a 24-hour urine specimen). Complaints of headache, visual disturbances, and epigastric or right upper quadrant pain in the presence of gestational hypertension without proteinuria should lead the clinician to be highly suspicious of preeclampsia. Laboratory studies such as liver enzymes and platelet count should be monitored with this diagnosis (Table 23.10).

<table>
<thead>
<tr>
<th>MEDICATION</th>
<th>DOSE/TIMING</th>
<th>SIDE EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methyldopa</td>
<td>250–300 mg 2–3 times daily; increase every 2 days as needed (maximum dose: 3 g daily)</td>
<td>Slow onset of action, sedative effect, mild antihypertensive</td>
</tr>
<tr>
<td>Labetalol</td>
<td>100 mg twice daily; may increase as needed every 2–3 days by 100 mg twice daily until desired response is obtained</td>
<td>Dizziness, fatigue, nausea</td>
</tr>
<tr>
<td>Nifedipine</td>
<td>30–90 mg once daily as sustained release tablet, increase at 7- to 14-day intervals, maximum dose 120 mg/d</td>
<td>Nausea, heartburn, headache, dizziness, peripheral edema</td>
</tr>
<tr>
<td>Hydralazine</td>
<td>10 mg 4 times daily for the first 2 to 4 days; increase to 25 mg 4 times daily for the balance of the first week; further increase by 10 to 25 mg/dose daily (every 2 to 5 days) to 30 mg 4 times daily (maximum: 300 mg daily in divided doses)</td>
<td></td>
</tr>
</tbody>
</table>

Preeclampsia superimposed on chronic hypertension offers a poorer prognosis than either chronic hypertension or preeclampsia alone. This hypertensive disorder can be difficult to recognize, but because of its prognosis, a high degree of suspicion is warranted. The chronic hypertensive pregnant woman garners close monitoring for and early treatment of preeclampsia.

Chronic hypertension is defined as hypertension existing before pregnancy or is diagnosed before 20 weeks of gestation (Cunningham et al., 2010). Women with chronic hypertension require prenatal counseling and lifestyle modification in order to prepare for a safe and healthy pregnancy. Patients may remain on prepregnancy pharmacotherapy as long as the medication is not contraindicated for pregnant women. DBP should be maintained below 90 mmHg in these patients.

Monitoring for fetal well-being in hypertensive pregnant women is essential in producing positive birth outcomes. Accurate dating must be performed in the event that early delivery is required. A baseline fetal measurement should also be obtained to monitor growth. An U/S done between
Bleeding in pregnancy

Although alarming to the mother, bleeding is quite common throughout pregnancy (Norwitz & Park, 2014). Despite its frequent occurrence, bleeding in pregnancy must be evaluated when it occurs.

First trimester vaginal bleeding often does not have a known etiology. Evaluation is directed toward a definitive diagnosis, if there is one, and elimination of serious pathology. A history of the current episode of bleeding is gathered, including the onset, duration, and characteristics of bleeding (pad count, clots, and size of clots); associated symptoms such as lightheadedness, pain, and/or cramping; and passage of tissue. Prior obstetric and medical history should contain past ectopic pregnancies or miscarriages, pelvic inflammatory disease, current use of an intrauterine device (IUD), medication use, and blood dyscrasias. Obtain a serum hCG, Rh(D) typing with antibody screen, and hematocrit or hemoglobin level. Vital signs can often point to the severity of bleeding; evaluate for tachycardia, hypotension, orthostatic hypotension, and dizziness.

Physical evaluation begins with checking FHT in a gestation of greater than 10 to 12 weeks. Detection of a fetal heartbeat with a portable Doppler is reassuring of fetal well-being. Inability to locate the FHT at this gestation or greater requires further evaluation with an obstetric ultrasound. Examine the vulva for presence of blood, clots, and tissue. Insert a speculum to evaluate the vaginal walls and cervix. Look for tears, lesions, warts, abnormal discharge, and polyps. Remove any tissue visible in the vault or extruding from the cervix. All recovered tissues, whether brought in by the patient or removed by the clinician, are sent to pathology for evaluation for products of conception. Take and send specimens for chlamydia/gonorrhea testing and perform a wet prep. Visible lesions of the cervix warrant a Pap smear. An open cervical os indicates impending abortion. Perform a bimanual exam for estimation of gestational age, presence of uterine and/or adnexal masses and pain, and palpate the internal cervical os to estimate the amount of dilatation, if any.

An obstetric U/S can help direct treatment of the woman with bleeding in pregnancy. If the pregnancy is determined to be nonviable because of lack of cardiac activity, an abortion is likely. Refer to the section on SAB for further information. An ectopic pregnancy may be detected via U/S; this is discussed in one of the following sections. Evaluation of the wet prep may reveal a large amount of white blood cells, yeast, or trichomonads. Treatment of these findings is outlined in the Vaginal Infections and STIs section. If no etiology has been found for bleeding, the patient should be reassured that the cause of bleeding is likely nothing that will jeopardize her or the baby. Regardless of the etiology, all Rh(D) negative women who bleed in pregnancy require anti-D immune globulin for protection against alloimmunization.

ECTOPIC PREGNANCY

Implantation of the blastocyst outside of the uterine cavity, known as an ectopic pregnancy, occurs in about 2% of all pregnancies, and results in 6% of deaths related to pregnancy (Cunningham et al., 2010). Until definitively excluded, all bleeding and pelvic pain in early pregnancy is thought to be an ectopic pregnancy.

Tubal damage related to sterilization, corrective surgery, or prior ectopic pregnancy gives the highest risk for an ectopic pregnancy. Other risk factors are failed contraceptive method, IUDs, prior genital/pelvic infection, smoking, prior cesarean section, multiple sex partners, history of abortion, infertility, and assistive reproductive technology.

Clinical presentation of ectopic pregnancy is diverse and is contingent on rupture of the gestation. Signs and symptoms include pelvic pain, vaginal bleeding, abdominal or pelvic tenderness. Severe sharp, stabbing, or tearing lower abdominal/pelvic pain, cervical motion tenderness, bulging of the vaginal cul-de-sac, dizziness, syncope, and neck or shoulder pain indicate a ruptured ectopic pregnancy. Frequently, women will have very elusive or no signs or symptoms of an ectopic pregnancy. Vital signs may be normal or pulse may be tachycardic and blood pressure may drop.

History concentrates on risk factors and the characteristic of bleeding and pain. A serum beta-hCG, blood typing with antibody screening, and a hematocrit must be drawn. Physical exam includes blood pressure for postural changes, abdominal palpation for tenderness and distention, speculum exam to assess bleeding, bimanual exam of the uterus for size and careful examination of the adnexa for masses and tenderness, and check for cervical motion tenderness.

Diagnosis is made using a combination of the beta-hCG levels and transvaginal ultrasound (TVUS). The U/S may reveal a frank ectopic pregnancy, an adnexal mass suggestive of an ectopic pregnancy, an intrauterine pregnancy (IUP), or no sign of pregnancy at all. Management of a frank ectopic or adnexal mass is left to the obstetrician. An

<table>
<thead>
<tr>
<th>TABLE 23.10 Hypertensive Lab Tests in Pregnancy</th>
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<tbody>
<tr>
<td><strong>LABORATORY TEST</strong></td>
</tr>
<tr>
<td>Hemoglobin and hematocrit</td>
</tr>
<tr>
<td>Platelet count</td>
</tr>
<tr>
<td>Urine protein</td>
</tr>
<tr>
<td>Serum creatinine</td>
</tr>
<tr>
<td>Serum uric acid</td>
</tr>
<tr>
<td>Serum transaminase</td>
</tr>
<tr>
<td>Serum albumin, lactic acid</td>
</tr>
<tr>
<td>dehydrogenase, blood smear, and coagulation profile</td>
</tr>
</tbody>
</table>
IUP with bleeding and or pain should follow the work-up for vaginal bleeding and pelvic pain. If there is no ultrasonographic evidence of a pregnancy with levels of beta-hCG equal to or greater than 2 mIU/mL, the diagnosis of pregnancy of unknown location is made with scheduled serial beta-hCG and TVUS performed under the supervision of an obstetrician. As in all cases of vaginal bleeding in an Rh(D) negative woman, ensure anti-D immune globulin is administered.

**SPONTANEOUS ABORTION**

Also known in lay terms as a miscarriage, a spontaneous abortion (SAB) is the premature delivery of a fetus before the age of viability. SAB incidence is highest in the first trimester with 80% occurring during this time.

Chromosomal anomalies are responsible for 55% of these early pregnancy failures (Cunningham et al., 2010). Other causes include teratogens, uterine anomalies, maternal infections, hypothyroidism, diabetes, radiation, and thrombophilias. Increased risks for SAB are advanced maternal age, a history of SAB, smoking, moderate to high alcohol use, high caffeine intake, and cocaine use.

A woman having an SAB generally presents with either vaginal bleeding and cramping or with absent FHT, via portable Doppler, in a pregnancy with an established presence of FHT. The history concentrates on the presenting symptoms and gestational age. Baseline beta-hCG and hematocrit are drawn, along with blood typing and antibody screen. A pelvic exam is performed to assess the amount of bleeding, search for fetal tissue, and assess the condition of the cervical os. Bimanual exam determines the size of the uterus and gentle probing of the internal cervical os reveals whether it is open or not. TVUS is completed in order to detect cardiac activity, first seen at about 5.5 to 6 weeks of gestation. The presence of a gestational sac with its EGA, yolk sac, and fetal pole are also components of the TVUS report.

There are five categories of SAB based on the dilatation of the internal cervical os and the whereabouts of the products of conception. A threatened abortion is one in which there is still fetal cardiac activity, the internal cervical os is closed, but the mother is suffering from vaginal bleeding. This bleeding may or may not be accompanied by pelvic pain or cramping. Watchful waiting is the intervention used in this instance. Most cases of vaginal bleeding in a threatened abortion subside and the pregnancy advances normally. In a missed abortion, the cervical os is closed and the products of conception are retained in the uterus. There may or may not be vaginal bleeding and pelvic pain in this type of abortion. Inevitable abortion is characterized by vaginal bleeding, pelvic cramping, and a dilated cervical os. Often, products of conception can be seen or felt in the os. Management of the missed and inevitable abortion can be expectant, medical, or surgical, based on the preference of the mother. In an incomplete abortion, the internal cervical os remains open while some or all products of conception remain in the uterus. Management of this type of SAB tends to be more conservative. An internal os that is open for prolonged time periods can result in uterine infection and retained products may produce hemorrhage. In a hemodynamically stable woman with a closed os, a period of expectant management of 3 to 4 weeks can be used. If products are not expelled or hemorrhage occurs, immediate surgical management is performed. In a woman with an open cervical os that does not close within 1 to 2 hours of observation, surgical evacuation is recommended (Cunningham et al., 2010; Tulandi & Al-Fozan, 2014). In addition to the aforementioned management strategies, if the patient is Rh(D) negative, anti-D immune globulin should be administered.

**VAGINAL INFECTIONS AND STIs**

The same vaginal infections and STIs that affect any woman and discussed in Chapter 29 can affect a pregnant woman. Etiology, risk factors, diagnostic criteria, assessment, and patient education remain the same. There are a few medication restrictions in pregnancy for treatment of vaginal infections and STIs, which are discussed here.

Yeast infections pose no danger to mother or fetus if left untreated, but can be quite uncomfortable for mom. Intravaginal imidazoles for 7 days is safe in pregnancy as well as 100,000 units of nystatin intravaginally for 14 days (obtainable from a compounding pharmacy). Terconazole has not been well studied in pregnancy and safety information regarding this treatment in pregnancy is minimal. Fluconazole should be avoided in pregnancy as it has been demonstrated to produce birth defects in women who took high doses of the drug in the first trimester of pregnancy (Sobel, 2015).

Asymptomatic bacterial vaginosis (BV) was once treated to prevent preterm labor in pregnant women; however, ACOG no longer recommends this as routine practice as it has no effect on decreasing the incidence of preterm labor in infected women (ACOG, 2012a). The three treatment options for BV in pregnancy are metronidazole 500 mg orally twice daily for 7 days, metronidazole 250 mg orally three times daily for 7 days, or clindamycin 300 mg orally twice daily for 7 days. The CDC has removed its recommendation for restriction of metronidazole in the first trimester; however, some clinicians still avoid its use in early pregnancy (Sobel, 2015).

Maternal infection with syphilis can cause fetal infection at any stage, although it is uncommon before 18 weeks of gestation (Cunningham et al., 2010). This can lead to preterm labor, fetal demise, and neonatal infection. Treatment for the pregnant woman is the same as benzathine penicillin G treatment for the nonpregnant woman. Infection discovered in the second trimester warrants referral to a maternal–fetal medicine specialist for sonographic evaluation of the placenta and fetus (Workowski & Berman, 2010). Treatment in the latter half of pregnancy can result in preterm labor and/or fetal distress if treatment triggers a Jarisch–Herxheimer reaction. Patient education should include seeking care for contractions, decreased fetal movements, and fever.

Gonorrhea in pregnancy can result in preterm labor, premature rupture of membranes, chorioamnionitis, and postpartum infection and affects all stage of pregnancy. Treatment is the same as that for nonpregnant women with the exception of doxycycline, which is contraindicated in pregnancy (Cunningham et al., 2010).
Chlamydial infection in pregnancy does not carry the risk of abortion or preterm delivery, but vertical transmission to the fetus can cause pneumonia and ophthalmia neonatorum. Treatment with azithromycin, amoxicillin, or erythromycin is safe in pregnancy at the same doses as for nonpregnant patients (Cunningham et al., 2010).

Primary herpes simplex virus (HSV) infection in the first half of pregnancy and recurrent infection near delivery offer the least risk for neonatal transmission of the disease. Risk is highest with primary infections close to delivery. That being said, treatment for outbreaks during pregnancy and prophylactic treatment beginning at 36 weeks gestation for any HSV-infected woman will provide shortened course of disease manifestation and prevent outbreaks near time of delivery. Acyclovir and valacyclovir are the only antivirals safe in pregnancy (Cunningham et al., 2010).

Genital warts, caused by the HPV, tend to grow in number and size during pregnancy and may prevent vaginal delivery by blocking the vaginal outlet. Although rare and benign, vertical transmission of HPV to the neonate can cause juvenile-onset recurrent respiratory papillomatosis. Because transmission risk is so low, the current recommendation is not to deliver infants of affected mothers via cesarean section unless the vaginal outlet is blocked, preventing vaginal delivery. Treatment of genital warts in pregnancy is limited to trichloracetic acid (TCA) or bichloracetic acid (BCA) weekly, cryotherapy, laser ablation, or surgical excision (Cunningham et al., 2010).

The care of the woman who has HIV in pregnancy, whether diagnosed previously or during pregnancy, can be complicated and is best done in consultation with a physician who has experience in treating this disease. Treatment is advised for all pregnant women infected with HIV as it decreases the risk of transmission to the fetus. If the patient is already on highly active antiretroviral therapy (HAART), she may remain on it as long as it is successful in suppressing the viral load and the treatment does not contain efavirenz (a teratogen) (Cunningham et al., 2010). Newly diagnosed pregnant women will need counseling to decide on the best course of HAART for them.

**HYPEREMESIS GRAVIDARUM**

Although nausea and vomiting is a common discomfort of pregnancy, when it is severe and recalcitrant to antemetic therapy and dietary modification, it can adversely affect both mother and fetus. Hyperemesis gravidarum is severe prolonged nausea and vomiting resulting in weight loss, dehydration, and ketosis (Miller & Gilmore, 2013). Complications from this illness include rapid, excessive weight loss, esophageal rupture, Mallory–Weiss tears, hypoprothrombinemia, renal failure, and Wernicke encephalopathy (a neurologic condition resulting from thiamine deficiency that requires immediate treatment to prevent death) (So, 2015).

Elevated or rapidly increasing levels of hormones of pregnancy seem to be the cause of hyperemesis gravidarum. A woman is at increased risk for this complication with prior history of hyperemesis, a GI illness, nonsmoker, race other than Caucasian, hyperthyroidism, current or prior molar pregnancy, multiple gestation, depression or psychiatric disorder, younger age, female fetus, or diabetes (Cunningham et al., 2010; Graham, Devarajan, & Datta, 2014).

Diagnosis is based on clinical picture and laboratory results. Other underlying illnesses should be ruled out using the same work-up as recommended in NVP discussed earlier in this chapter. A weight loss of 10% or greater, ketonuria, and a urine specific gravity of greater than 1.030 are laboratory indicators of hyperemesis. Treatment involves hospitalization with IV rehydration, thiamine supplementation, IV antiemetics or corticosteroids, and in some cases, parenteral nutrition therapy (Miller & Gilmore, 2013).

**ANEMIA**

Anemia is defined as a drop in hemoglobin levels less than 11 g/dL (hematocrit less than 33%) in the first and last trimesters and less than 10.5 g/dL (hematocrit less than 32%) in the second (Bauer, 2014). This blood condition causes fatigue, dizziness, mild dyspnea, and weakness (Freil, 2014). In pregnancy, anemia increases the risk for venous thromboembolism, preterm delivery, and postpartum infections in the mother (Bauer, 2014; Freil, 2014; Cunningham et al., 2010).

Hematologic changes in pregnancy are responsible for creating physiologic anemia of pregnancy (Bauer, 2014). As the plasma volume increases, red blood cell production also increases, but at much smaller volume. This disproportion is at its height during the second trimester. Iron requirement in pregnancy is near 1,000 mg for a singleton gestation. With iron deficiency affecting nearly 8 million childbearing aged women in the United States, most pregnancies begin with lower iron stores than needed for support of both the mother and fetus (Cunningham et al., 2010).

Replacement of iron stores is accomplished with daily oral iron preparations, which contain 200 mg of elemental iron. Iron can cause nausea and constipation, further complicating normal discomforts of pregnancy. Docusate sodium 100 mg twice daily will avert constipation and iron may be avoided if NVP is an issue, but should be reinstated as soon as tolerated by the patient. In a patient with severe iron deficiency anemia who cannot tolerate oral iron, parenteral therapy is given. Blood transfusion for anemia is rarely recommended.

Prepregnancy administration of iron supplements can build iron stores and decrease the incidence of iron deficiency anemia in pregnancy. Supplementation should begin 3 months before conception.

**SICKLE CELL TRAIT AND DISEASE**

Worldwide, 300 million people have sickle cell trait; it affects people of African, Mediterranean, Middle Eastern, Indian, and Hispanic descent (Vichinsky, 2015). Sickle cell trait does not confer sickle cell disease; however, pregnant women with this carrier condition do require prenatal counseling and increased monitoring during pregnancy. Sickle cell disease, on the other hand, increases the risk of complications for both mother and fetus. Because of the seriousness
of these complications, care of the pregnant woman with sickle cell disease is best left to an experienced obstetrician.

Women with sickle cell trait are at twice the risk for asymptomatic bacteriuria and urinary tract infections (UTIs) than nonaffected pregnant women (Cunningham et al., 2010). Urinalysis should be conducted during each trimester and a symptom history obtained at each visit. History, physical, and diagnostic criteria are discussed in the next section.

**URINARY TRACT INFECTIONS**

The most common bacterial infection in pregnancy affects the urinary tract, and if not treated can evolve into a serious medical complication, pyelonephritis. Bacteriuria, if left untreated, can increase the risk of preterm delivery, low-birth-weight infant, and gestational hypertension (Cunningham et al., 2010; Hooton & Gupta, 2015). Many pregnant women have bacteriuria and are unaware of its presence. Others will complain of the same symptoms experienced by nonpregnant women.

Etiology of urinary tract infections (UTIs) in pregnancy is the same as in nonpregnant women. The gravid uterus exerting pressure on the bladder and relaxation of smooth muscles leading to dilatation of the ureters may assist in movement of bacteria from the bladder to the kidney, increasing the risk of pyelonephritis. Women with diabetes, sickle cell trait, and sickle cell disease are at increased risk for cystitis (Hooton & Gupta, 2015).

Often, a woman will have no complaints at the visit, but a dip of her urine will demonstrate the presence of bacteria. This is known as asymptomatic bacteriuria (ASB) and, as 25% of infected women will progress to UTIs, is treated as a UTI (Cunningham et al., 2010). Patients with frank UTIs present with painful urination. Frequency and urgency are normal physiologic changes in pregnancy and, while may be a presenting symptom, may not be helpful in diagnosis. A history of these symptoms includes timing, characteristics of dysuria, characteristics of the urine, number of times the restroom is used, how many nighttime visits occur, and presence of back or flank pain. The physical exam comprises two elements: suprapubic tenderness and CVAT. Suprapubic tenderness makes the diagnosis of cystitis more likely, but should not preclude empiric treatment if absent. The presence of CVAT accompanied by temperature greater than 100.4 is suspicious for pyelonephritis and requires referral and work-up. Diagnosis is made based on symptoms and/or urinalysis with a culture for sensitivity. A urine specimen is obtained for a urine dip, and a positive nitrite and/or leukocyte reading is indicative of a UTI. A urinalysis will reveal pyuria and bacteriuria. Most clinicians will treat a pregnant patient with complaints of a UTI, whether or not the urine dip is suspicious for infection.

Treatment using a 3-day regimen is 90% effective in curing bacteriuria (Cunningham et al., 2010). Nitrofurantoin 100 mg twice daily for 7 days is used as typical treatment in pregnancy. See Table 23.11 for other pharmacologic treatment options.

**MULTIFETAL GESTATION**

With advancements in infertility treatments, multifetal gestations have risen sharply in the United States in the past few decades. Care of the pregnant woman with sickle cell disease is best left to an experienced obstetrician.

Women with sickle cell trait are at twice the risk for asymptomatic bacteriuria and urinary tract infections (UTIs) than nonaffected pregnant women (Cunningham et al., 2010). Urinalysis should be conducted during each trimester and a symptom history obtained at each visit. History, physical, and diagnostic criteria are discussed in the next section.

**TABLE 23.11 Oral Pharmacological Management of Cystitis in Pregnancy**

<table>
<thead>
<tr>
<th>SINGLE-DOSE TREATMENT</th>
<th>3-DAY TREATMENT</th>
<th>OTHER OPTIONS</th>
<th>TREATMENT FAILURE</th>
<th>SUPPRESSIVE THERAPY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin 3 g</td>
<td>Amoxicillin 500 mg tid</td>
<td>Nitrofurantoin 100 mg qid for 10 days</td>
<td>Nitrofurantoin 100 mg tid for 21 days</td>
<td>Nitrofurantoin 100 mg at bedtime until delivery</td>
</tr>
<tr>
<td>Ampicillin 2 g</td>
<td>Ampicillin 250 mg tid</td>
<td>Nitrofurantoin 100 mg bid for 7 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cephalosporin 2 g</td>
<td>Cephalosporin 250 mg tid</td>
<td>Nitrofurantoin 100 mg q hr for 10 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrofurantoin 200 mg</td>
<td>Ciprofloxacin 250 mg bid</td>
<td>Amoxicillin 500 mg tid for 7 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trimethoprim-sulfamethoxazole 320/1,600 mg</td>
<td>Levofloxacin 250 mg q day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fosfomycin 3 g</td>
<td>Nitrofurantoin 50 to 100 mg qid or 100 mg bid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trimethoprim-sulfamethoxazole 160/800 mg bid</td>
<td></td>
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</tbody>
</table>

bid, twice a day; q, every; qid, four times a day; tid, three times a day.

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25 years (Cunningham et al., 2010). This creates an increased burden on the health care system and society because of the cost of premature births, long-term disability care, and maternal morbidity (Cunningham et al., 2010). Maternal deaths, preeclampsia, and postpartum hemorrhage risk are doubled and the risk of fetal malformation rises with multifetal gestation. Because of the increases in both maternal and fetal risks, multifetal pregnancies are considered high risk.

Outside of assisted reproductive therapy (ART), multifetal pregnancies result from either the splitting of one fertilized ovum or the fertilization of multiple separate ova. Risk factors for dizygotic (two fertilized ova) twinning include black race, maternal history of twins, increased parity, conceiving within 1 month of cessation of oral contraceptive use, obesity, height 65 inches or greater, increasing maternal age, and good nutrition (Chasen & Chervenak, 2015; Mandy, 2013; Cunningham et al., 2010). The only reliable method to diagnose multifetal pregnancy is with ultrasonography (Chasen & Chervenak, 2015). At any time during the pregnancy, demonstration of size greater than dates, based on initial bimanual exam or fundal height measurement, warrants ultrasound examination. Once identified, these high-risk pregnancies should be referred to an obstetrician.

**OBESITY**

In 2014, Ogden, Carroll, Kit, and Flegal reported the 2012 prevalence of obesity in women aged 20 years and greater was 36.1%. Therefore, more than one third of patients who are pregnant may present as obese. According to the CDC, obesity is defined as a BMI of 30 kg/m² or greater (CDC, 2012).

Obesity in pregnancy carries multiple maternal and perinatal risks. Antepartum dangers include gestational diabetes, pregnancy-associated hypertension and/or preeclampsia, postterm pregnancy, multifetal pregnancy, UTIs, OSA, miscarriage, and venous thromboembolism. Problems in labor consist of dysfunctional labor, cesarean section, shoulder dystocia, and both spontaneous and medically indicated preterm delivery. Threats to the fetus and infant are congenital anomalies and death. Postpartum risks involve postpartum infection and postpartum hemorrhage (Cunningham et al., 2010; Nuthalapaty & Rouse, 2014).

Before conception, obese women should lose weight to decrease their BMI below 30 kg/m², thus mitigating some of the risks obesity brings to pregnancy. Losing weight during pregnancy is not recommended. Limiting weight gain in pregnancy is a management strategy that can reduce associated risks. Cunningham et al. recommend gaining no more than 15 to 20 pounds (Cunningham et al., 2010). Meal planning and exercise work together to control weight gain in pregnancy. An early or first trimester GTT can discover an unknown diabetic condition and give providers an opportunity for early intervention. First and second trimester ultrasounds confirm gestational age, number of fetuses, and congenital defects. Routine monitoring of blood pressure will detect the onset of pregnancy-associated hypertension (Nuthalapaty & Rouse, 2014).

Obese women who have had bariatric surgery should wait 12 to 18 months after surgery to become pregnant. If gastric banding was performed, the bariatric provider should monitor the pregnant woman throughout her pregnancy for the need for band adjustments. Nutritional and vitamin deficiencies can be a problem in a patient who has had bariatric surgery and monitoring for these conditions in pregnancy is extremely important (Cunningham et al., 2010).

**IUD IN SITU**

Although failure rates in women who use IUDs or intrauterine systems (IUS) range from 0.2% to 0.8%, pregnancy still does occur. An IUD in situ constitutes a threat to the pregnancy and must be removed.

The majority of the time, pregnancy with IUD use occurs because of a malpositioned device or the pregnancy was undetected before insertion. Risk factors include noncompliance with abstinence before insertion and inexperienced inserting provider. The risk of SAB is higher with the IUD in place, although removing the device does not guarantee there will not be a subsequent pregnancy loss.

Generally, the patient is aware that she has an IUD in place. An ultrasound is performed to understand the position of the device in relation to the pregnancy. The patient is counselled on the risks for removal of the IUD with a current pregnancy versus the risks of leaving the IUD in situ. If the strings are visible, the IUD can be removed from the uterus or endocervical canal and disposed of. The patient should be counseled that some bleeding is normal, but she should return if she soaks two pads in an hours’ time, over 2 hours (Tulandi & Al-Fozan, 2014).

### FUTURE DIRECTIONS

**Reducing the Number of Prenatal Visits**

Typical prenatal care provides 16 prenatal appointments for an uncomplicated pregnancy that lasts at least 41 weeks. The National Institute of Health and Care Excellence (NICE) proposes a decreased schedule that offers 10 visits for first-time mothers and seven visits for multiparous women. This new schedule is supported by a systematic review of randomized trials that compared the outcomes of programs with four to nine appointments to programs with 13 to 14 appointments. The findings revealed that decreased number of appointments was not associated with statistically significant increase in maternal death, preterm delivery, or small for gestational age deliveries. However, there was an increase in perinatal mortality in low- to middle-income women with the decreased appointment program. Furthermore, mothers were found to be less satisfied with fewer visits. These findings prompted a shift in focus to establish which prenatal care elements are evidence based and create a program that includes these components in a manner that is tailored to patient risks (Lockwood & Magriples, 2013).
NONINVASIVE FETAL TESTING

Fetal aneuploidy testing has historically relied on maternal blood tests for screening and either chorionic villi sampling or amniocentesis for confirming diagnosis. Screening via maternal serum required multiple markers, resulting in expensive and very time-consuming testing. Newer technology has allowed the ability to analyze samples for anomalous DNA in days, more accurately than ever before. Results can be obtained at a gestation as early as 10 weeks, 1 week after sample submission, with an ability to detect 98% of Down syndrome cases and a less than 0.5% false-positive rate (ACOG, 2012b).

GROUP PREGNATAL VISITS

For first time mothers and women who have had babies alike, as long as the pregnancy is progressing normally without any complications, group prenatal care can provide more patient education and improved outcomes. Centering Healthcare Institute developed CenteringPregnancy as a vehicle to provide prenatal care, highlighting education and support, to help decrease preterm births by 33% (Garretto & Bernstein, 2014). This form of prenatal care gives the provider the opportunity to provide education while encouraging family member participation, support among group members, and self-reliance. Typical total time spent on prenatal care over the course of a pregnancy is roughly 2 hours (Garretto & Bernstein, 2014). With CenteringPregnancy, about 20 hours are devoted to education in health promotion and self-management, performing prenatal examinations, and fostering peer support. This model does not affect provider productivity and allows for more in-depth discussion of pregnancy-related issues.

REFERENCES


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Osteoporosis (OP) is the most common bone disease in humans, representing a major public health problem (U.S. Department of Health and Human Services, 2004). Fracture attributable to OP is a significant health problem that women face, especially after menopause. As estrogen and progesterone levels fall, bone strength also declines. OP is a disorder of the skeletal system characterized by a reduction in bone strength and increased risk for fracture (U.S. Department of Health and Human Services, 2004). Osteopenia is similar to OP except that there is a lesser amount of bone lost. Two factors contribute to bone strength: bone mineral density (BMD) and bone quality. BMD refers to the thickness and volume of the bone. Bone quality refers to the bone architecture, mineralization, rate of turnover, and accumulated damage (Cosman et al., 2014; National Osteoporosis Foundation [NOF], 2014; U.S. Department of Health and Human Services, 2004). BMD is easily measured using densitometry testing such as the dual-energy x-ray absorptiometry (DEXA). Bone quality is more difficult to assess as simple measurement devices are not readily available.

Kyphosis causes a permanently stooped appearance, and may be recognized when a woman has a documented loss of height. Kyphosis also causes the rib cage to slump downward, eventually coming to rest on the ischial spines, thus minimizing thoracic and abdominal cavity space for organs. This restriction frequently leads to gastrointestinal problems, such as gastric reflux, anorexia, and constipation, and to respiratory disorders, such as shortness of breath. Self-image can also be negatively affected because of body changes and difficulty in finding clothing that fits properly over the kyphotic deformity.

Once the woman has an established diagnosis of OP or is at risk of the disease, other factors need to be considered by the clinician caring for these women. In a cross-sectional population-based study of persons aged 50 years or older using the Korea National Health and Nutrition Examination Survey, low socioeconomic status (SES) was associated with a greater need for health care, health outcomes, and health inequities (Kim, Lee, Shin, & Park, 2015). SES was also reported to affect health behavior and adherence to medication regimens. While primary prevention for OP can be managed, other factors, such as low SES, education, resources to promote recommended screenings, and the money to pay for OP medications, need to be addressed with these women by their provider as part of the conversation in OP prevention, screening, and treatment (Kim et al., 2015).

**DEFINITION**

OP is defined by BMD at the hip or lumbar spine that is 2.5 or more standard deviations below the mean BMD of a young-adult reference population (Report of a WHO Study Group, 1994). OP is a risk factor for fracture, just as hypertension is a risk factor for stroke.

Primary OP occurs because of causes related to age, gender, and family history. It occurs with aging and accelerates in women at menopause. By age 60 years, half of the White women in the United States have low bone mass or OP (Watts et al., 2010). Low BMD at the femoral neck (T-score of −1.0 or below) is found in 21% of postmenopausal (PM) White women, 16% of PM Mexican American women, and 10% of PM African American women. More than 20% of PM women have prevalent vertebral fractures (Watts et al., 2010).

Secondary OP results from medical conditions or treatments that interfere with the attainment of peak bone mass and/or that may predispose to accelerated bone loss (Miazgowski, Kleerekoper, Felsenberg, Stépán, & Szulc, 2012). Apart from the well-defined risk of secondary OP in patients requiring long-term corticosteroid therapy, an increasing list of dietary, lifestyle, endocrine, metabolic, and other causes of bone mass deterioration have been identified, such as smoking, sedentary lifestyle/low physical activity, Cushing’s disease, diabetes, hyperthyroidism, and pregnancy (Cosman et al., 2014; Miazgowski et al., 2012). OP affects approximately 10 million adults in the United States, and 43 million more have low bone mass (Cosman et al., 2014; U.S. Department of Health and Human Services, 2004). Women with OP, and especially low bone mass (which used to be called osteopenia), have an increased risk for fracture (Cosman et al., 2014; U.S. Department of Health and Human Services, 2004). OP is the most common bone disease, yet it is painless and often
remains undiagnosed until a fracture occurs (Cosman et al., 2014; U.S. Department of Health and Human Services, 2004). Approximately 80% of the Americans affected with OP are women, most of them PM (Watts et al., 2010). At age 50, the lifetime risk of developing fractures is about 39% for White women. The U.S. surgeon general estimates that, by the year 2020, half of the adult U.S. population older than 50 years will be at risk of fractures related to OP (U.S. Department of Health and Human Services, 2004). By the year 2050, the number of people older than 65 years will increase from 32 million to 69 million, and more than 15 million people will live longer than 85 years of age (Watts et al., 2010). The incidence of hip and spine fractures increase with advancing age. Investigators estimate that incidences will increase from 2 to 3 million and associated costs will increase from $17 to $25 billion.

The real concerns associated with bone loss are related to fracture. In 2005, 2 million fractures were attributed to OP. Of these, 71% occurred in women; the direct cost was approximately $17 billion, 94% of which was attributable to fractures at nonvertebral sites (Watts et al., 2010). Many more women have osteoporotic fractures than new strokes, myocardial infarctions, or invasive breast cancer combined (Watts et al., 2010). Mortality risk increases by 10% to 25% in the year following a hip fracture (U.S. Department of Health and Human Services, 2004). The mortality during the first year after hip fracture is about 17% for women; more than half of hip fracture survivors will require skilled care away from their homes and many will have some degree of permanent disability (Watts et al., 2010). Among survivors, almost 50% are never able to live independently and approximately 25% require permanent nursing home care. Physical disability and inability to enjoy previous activities add to the burden of the disease by causing isolation and depression, factors that can increase risks for additional bone loss and falls through inactivity.

**ETIOLOGY**

Approximately 90% of bone mass is established by the age of 20 years, and adults achieve their peak bone mass around 30 to 35 years of age (U.S. Department of Health and Human Services, 2004). When peak bone mass is achieved, bone remodeling continues. Osteoclast cells secrete enzymes that digest bone and create microscopic holes, called resorption cavities, along the surface of the bone. Osteoblasts then migrate to the surface and secrete collagen to fill the resorption cavities with newly formed osteoid material. The osteoblasts are eventually replaced with lining cells, and the process repeats. Bone formation and remodeling are regulated by a number of endocrine and hormonal mechanisms. During childhood, when bone mass increases rapidly, the osteoblasts act independently and in response to growth hormones. However, in adulthood, osteoblasts act in response to osteoclast activity and functional load stress that is exerted on bone, such as the stress caused by physical exercise. Low bone mass and OP are caused when the normal processes of bone remodeling are unbalanced and resorption rates exceed bone formation, resulting in reduced bone quality and strength (U.S. Department of Health and Human Services, 2004).

Primary OP is associated with aging and affects women more than men because of the rapid increase in bone loss that accompanies the decline in estrogen and progesterone levels during the menopausal transition (Management of osteoporosis in postmenopausal women, 2010; U.S. Department of Health and Human Services, 2004; Watts et al., 2010). The rate of bone turnover and bone loss accelerate during the 3- to 5-year span preceding and following menopause. During the menopausal transition a woman can have total bone loss of up to 10% (Watts et al., 2010). Age-related bone loss affects both men and women and begins in the sixth decade. It occurs at a slower rate, about 0.5% each year (Watts et al., 2010). Secondary OP is bone loss caused by other disease processes or medications (Box 35.1) that interfere with the normal process of bone formation; secondary OP can affect males or females at any age.

**RISK FACTORS**

Some risk factors for OP can be controlled; others cannot (Box 35.2). Risk factors for fracture and falls are distinct from those for bone loss (Box 35.3).

**SYMPTOMS**

OP itself is asymptomatic. The woman cannot tell that her bones are losing density until she loses one inch or more in height (usually due to silent vertebral fractures) or due to the pain associated with a fracture (Cosman et al., 2014).

**EVALUATION/ASSESSMENT**

Office assessment for OP includes a thorough history to identify personal and familial risk factors for bone loss; possible causes of secondary OP (Box 35.3) are also determined to identify any negative effects on bone health that can be eliminated or reduced (Cosman et al., 2014; U.S. Department of Health and Human Services, 2004; Watts et al., 2010).

**History**

Gathering information that will enable risk stratification and identification of potential secondary causes for OP is critical when taking a history. Medications used and health habits such as diet and exercise, smoking, and daily alcohol consumption are all important in understanding a woman’s risk and determining nonpharmacologic treatments. Uncovering symptoms suggestive of systemic conditions that cause OP (e.g., hyperthyroidism) are also essential. Noting nonmodifiable risk factors such as age, ethnicity, history of fractures,
BOX 35.1 POSSIBLE CAUSES OF SECONDARY OSTEOPOROSIS

Medications

- Aluminum-containing antacids (e.g., Amphojel, Maalox, Mylanta)
- Anticonvulsants (e.g., carbamazepine [Carbatrol, Tegretol], divalproex [Depakote], phenobarbital, phenytoin [Dilantin], valproate [Depacon])
- Cholestyramine (e.g., Questran)
- Chemotherapy/immunosuppressors (e.g., Methotrexate [TreXall])
- Glucocorticosteroids (e.g., prednisone [Deltasone, Sterapred])
- Gonadotropin-releasing hormone (GnRH)
- Heparin
- Lithium (e.g., Eskalith, Lithobid)
- Medroxyprogesterone acetate injection (e.g., Depo-Provera)
- Proton pump inhibitors (PPIs, e.g., rabeprazole [AcipHex], esomeprazole [Nexium], lansoprazole [Prevacid], omeprazole [Prilosec])
- Selective serotonin reuptake inhibitors (SSRIs, e.g., paroxetine [Paxil], fluoxetine [Prozac], sertraline [Zoloft])
- Thiazolidinediones (e.g., pioglitazone [Actos], rosiglitazone [Avandia])
- Thyroid hormone (e.g., levothyroxine [Eltroxin, Levoxyl, Levaithroid, Synthroid, Unithroid])
- Warfarin (e.g., Coumadin)

Medical Conditions

- Alcoholism
- AIDS/HIV
- Bone disorders (e.g., acromegaly, ankyllosing spondylitis, osteogenesis imperfecta, posttransplant bone disease)
- Chronic liver disease, cholestatic liver disease, primary biliary cirrhosis
- Chronic renal failure, end-stage renal disease, renal tubular acidosis
- Connective tissue diseases (e.g., lupus, multiple sclerosis, rheumatoid arthritis, sarcoidosis)
- Depression
- Eating disorders (e.g., anorexia nervosa, vitamin D deficiency, calcium deficiency)
- Endocrine disorders (e.g., hypothyroidism, Cushing’s syndrome, diabetes, hyperparathyroidism, hypophosphatasia, thyrotoxicosis)
- Gastrointestinal disorders (e.g., celiac disease, malabsorption syndromes, gastrectomy, gastric bypass surgery, inflammatory bowel disease, pancreatic disease)
- Genetic disorders (e.g., Gaucher’s)
- Hematologic disorders (e.g., hemochromatosis, hemophilia, leukemia, thalassemia)
- Neuromuscular disorders (muscular dystrophy, paraplegia, quadriplegia, proximal myopathy)
- Prolonged immobility
- Respiratory disorders (e.g., cystic fibrosis, chronic obstructive pulmonary disease)
- Seizure disorders (e.g., epilepsy)

aRepresentative list, not exhaustive.

Data from Miazgowski et al., (2012); National Osteoporosis Foundation (2014); U.S. Department of Health and Human Services (2004); Watts et al. (2010).

BOX 35.2 OSTEOPOROSIS RISK FACTORS

Potentially Modifiable Risk Factors

- Amenorrhea (caused by eating disorder or excessive exercise)
- Body weight less than 127 pounds, body mass index less than 21 kg/m²
- Chronic diseases (Box 35.1)
- Cigarette smoking (active or passive)
- Frailty
- Low estrogen level (e.g., menopause)
- Medications (see Box 35.1)
- Nulliparity
- Poor nutrition (e.g., excessive vitamin A, excessive alcohol or caffeine intake, excessive soda intake, excessive sodium intake, inadequate calcium/vitamin D intake, protein deficiency)
- Sedentary lifestyle

Nonmodifiable Risk Factors

- Advanced age
- Dementia
- Delayed puberty
- Endocrine disorders (Cushing’s, thyrotoxicosis, diabetes mellitus)
- Family history of OP
- Female gender
- First-degree relative with history of fracture
- Fracture history (fracture at 40–45 years or older is associated with an increased risk for osteoporosis)
- Genetic factors (variations in or absence of genes that regulate protein receptors or enzymes needed for bone development)
- Race (Caucasian and Asian women at greatest risk, then Hispanic and African American)

Data from Cosman et al. (2014); U.S. Department of Health and Human Services (2004); Watts et al. (2010).

Adapted from Alexander and Andrist (2005).
and family history will help in determining if DEXA scanning is needed in women younger than 65 years of age. Using the fracture risk assessment (FRAX) algorithm scale will help quantify these risk factors (Cosman et al., 2014).

A comprehensive risk assessment for falls is completed in women with established OP, including hearing or vision impairments, neurologic status, and other medical problems or medications that may increase fall risk (Box 35.3).

### BOX 35.3 RISK FACTORS FOR FALLS AND FRACTURE

#### Evaluated in the WHO FRAX Algorithm

- Age (especially greater than 65 years, fracture risk doubles with each 7–8 years after 50 years)
- Current smoking
- Femoral neck raw bone mineral density (BMD) in g/cm²
- Glucocorticoid use
- Body mass index (BMI) (height and weight, BMI less than 21 kg/m²)
- Parent history of hip fracture (increases risk ~130%)
- Personal prior fracture (risk for future fracture doubles)
- Rheumatoid arthritis
- Secondary OP
- Gender (females at greater risk than males)
- Ingestion of three or more units of alcohol per day

#### Selected Other Risk Factors

- Weakness
- History of falls, fainting, off balance
- Poor vision
- Neuropathy, especially lower extremities
- Vertigo
- Impaired mobility
- Use of medications or substances that cause drowsiness, dizziness, lightheadedness, or imbalance; use of multiple medications
- Neurologic disease
- Frailty
- Orthostatic hypotension
- Low vitamin D levels
- Sedentary lifestyle
- Depression

Note: Risk factors have variable influences on fracture or fall risk. In the FRAX algorithm, all variables except age, height, weight, and gender are entered as yes/no. This limits the weighting of some variables that would carry a higher risk for fracture if values were entered on a continuum. For example, a woman with a history of two prior fractures and taking 30 mg of oral steroid daily is at greater risk than a woman with one prior fracture who is taking 5 mg of steroid daily. The FRAX does calculate fracture risk using all of the variables noted in the upper half of Box 35.3; therefore, the presence of multiple risks in one person is recognized.

BMD, bone mineral density; FRAX, fracture risk assessment; OP, osteoporosis.

Data from Cosman et al. (2014); U.S. Department of Health and Human Services (2004); World Health Organization (WHO, 2016).

### Physical Examination

The physical examination includes assessment for physical risk factors, such as low body mass index (BMI) (less than 21 kg/m²) or body weight (less than 127 pounds), kyphosis, tooth loss, or spinal tenderness; signs of low estrogen levels; signs of thyroid abnormalities; and clues to other secondary causes for OP. Height is measured accurately using a stadiometer, not taken via patient report. Reductions in height can be an important first clue for painless (or “silent”) vertebral compression fractures (VCFs) (Cosman et al., 2014). Fall risk can also be assessed by observing gait when the patient is entering or leaving the room. If there is concern for falls, Romberg and orthostatic blood pressure readings can provide additional information.

VCFs can be painless; however, they are often associated with significant pain (Cosman et al., 2014; Watts et al., 2010). In women with OP, VCFs can be caused by normal activities of daily life, such as bending forward to pick up an item. The anterior edge of a vertebral bone crumbles in response to the increase in pressure exerted while bending forward, and changes into a wedge shape. Over time, having multiple wedge-shaped bones on top of one another, instead of the usual square cube shape, causes the spine to curve forward, causing kyphosis.

### Differential Diagnoses

The diagnosis of OP is based on DEXA results, physical exam findings, and laboratory results. A clinical diagnosis of OP is made when the patient has a low-trauma fracture of any type. A low-trauma fracture is a fracture sustained from relatively minor force, such as a fall from a standing height or less. Differentiating primary from secondary OP is important because some causes of secondary OP may be treatable and may rectify the bone loss. For example, some women with BMD test results that indicate OP may have disorders other than OP, such as osteomalacia or multiple myeloma that are treatable once identified. If serum calcium level is low, the cause needs to be identified and treated before an antiresorptive agent is administered, which may exacerbate the problem. If vitamin D levels are low, replacement is necessary.
OP can be missed in patients who sustain a low-trauma fracture. Recognition of OP is critical as medications and a multidisciplinary approach to management are most effective (Skorupski & Alexander, 2013).

## DIAGNOSTIC STUDIES

DEXA is the gold standard for screening and diagnosing OP (Cosman et al., 2014; U.S. Department of Health and Human Services, 2004; Watts et al., 2010). DEXA testing can be done at the spine, wrist, or hip. However, central measures obtained at the hip and spine are used most often because they are most representative of the skeleton as a whole. Quantitative computed tomography (QCT) can also be used to evaluate central BMD. QCT is especially useful in evaluating women with osteoarthritis because it is less likely to detect osteophytes, which can falsely increase BMD measures identified with DEXA.

Other methods for evaluating bone density include peripheral DEXA, single-energy x-ray absorptiometry (SXA), peripheral QCT, radiographic absorptiometry (RA), quantitative ultrasound (QUS), and radiogrammetry. These methods are not used for diagnosis; they may be used when screenings are offered at health fairs. OP can also be incidentally identified on x-rays. However, it is apparent on x-rays only if there is bone loss of 30% to 40%; x-rays are not used to diagnose OP. When bone loss is identified with noncentral measures, the patient is referred for DEXA. See Box 35.4 for the NOF recommendations for DEXA screening.

### BOX 35.4 NATIONAL OSTEOPOROSIS FOUNDATION RECOMMENDATIONS FOR DEXA SCREENING

- All women 65 years old or older
- Women younger than age 65 years who are PM or transitioning to postmenopause who have clinical risks* for OP
- Individuals who sustain a fracture after age 50 years
- Individuals who have a clinical condition or take medications that are associated with bone loss or decreased bone mass

DEXA, dual-energy x-ray absorptiometry.

*The U.S. Preventive Services Task Force identifies as woman as having “clinical risk” for bone loss/osteoporosis if her FRAX score (calculated without bone mineral density value) for a 10-year major osteoporotic fracture is 9.3% or higher (the calculated risk for a 65-year-old White woman without other risks; U.S. Preventive Services Task Force, 2011).

BMD results by DEXA are reported as T-scores and Z-scores (Cosman et al., 2014; U.S. Department of Health and Human Services, 2004; Watts et al., 2010). The T-score indicates the number of standard deviations a woman’s bone density is above or below that of a young adult, gender-matched norm. The WHO has determined classifications for various T-score results (Report of a WHO Study Group, 1994; Table 35.1). The Z-score indicates the number of standard deviations a woman’s bone density is above or below the mean for an age- and gender-matched cohort. The Z-score is most often used for diagnosing bone loss in children or young adults, and is useful in identifying secondary OP. When the Z-score is low, it indicates either that her bone mass is lower than her age cohort due to secondary OP causes or that she did not achieve peak bone mass in young adulthood.

Before a diagnosis of OP is confirmed, even with DEXA results of −2.5 or below, diagnostic studies to identify suspected causes of secondary OP are needed (Cosman et al., 2014). Additionally, fasting serum calcium, serum 25-hydroxyvitamin D (25-OH D), and 24-hour urinary calcium levels are measured. Other helpful studies, which may be conducted for routine care independent of bone issues, include a complete blood count (CBC); creatinine level with calculated estimated glomerular filtration rate (eGFR); phosphorus, thyroid-stimulating hormone (TSH), and alkaline phosphatase levels; and measurement of hepatic enzymes. Other diagnostic studies may be indicated depending on the patient’s presentation.

Serum or urinary by-products of bone turnover can be evaluated to determine rates of turnover (Cosman et al., 2014; U.S. Department of Health and Human Services, 2004). For example, N-teleopeptide crosslinks (NTx) are released into the blood with bone resorption and excreted by the kidneys in the urine. High levels of urinary NTx suggest higher levels of bone resorption. Osteoclastin is released into the bloodstream during bone formation. Higher levels of serum osteoclastin suggest higher levels of bone formation. Serum and urinary markers are not used to diagnose OP; instead, they may be useful for evaluating bone formation rates and thus bone quality (Cosman et al., 2014; U.S. Department of Health and Human Services, 2004). Standardized tests for these markers are not widely available. In the future, they may be more widely used to determine early response.

### TABLE 35.1 World Health Organization T-Score Classifications

<table>
<thead>
<tr>
<th>T-SCORE RESULT</th>
<th>INTERPRETATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>At or above −1.0</td>
<td>Normal</td>
</tr>
<tr>
<td>−1.0 to −2.5</td>
<td>Osteopenia</td>
</tr>
<tr>
<td>At or below −2.5</td>
<td>Osteoporosis</td>
</tr>
<tr>
<td>At or below −2.5 with low-trauma fracture(s)</td>
<td>Severe or established osteoporosis</td>
</tr>
</tbody>
</table>

Data from report of a WHO Study Group (1994).
to therapy rather than waiting 1 to 2 years for follow-up DEXA testing after medications have been initiated.

The FRAX, released by the WHO in 2008, uses data about 11 different risk factors as well as femoral neck bone density levels to provide added information to support clinical decision making for initiating medication therapy, especially among those with osteopenia (see Pharmacotherapeutics section) (WHO, 2016).

**TREATMENT/MANAGEMENT**

The goal of OP management begins early in life with the development of a high peak bone mass and the prevention of bone loss. Once bone loss has occurred, the goal continues with prevention of further bone loss as well as fracture prevention. Strategies for maximizing peak bone mass and bone loss prevention include changes in diet, use of supplements, and initiation of an exercise program. Fall prevention and use of pharmacotherapeutics are the mainstays of fracture prevention. Referral to a specialist is warranted when patients do not respond to pharmacotherapeutics or when comorbid disease makes management complicated.

**Self-Management**

**DIET AND SUPPLEMENTS**

OP prevention needs to start early in life by ingesting a diet rich in calcium, vitamin D, and minerals, which are necessary to achieve peak bone mass. Maintaining adequate intake of both calcium (Table 35.2) and vitamin D (600–1,000 U/d) remains necessary with aging and throughout postmenopause (Management of osteoporosis in postmenopausal women, 2010; U.S. Department of Health and Human Services, 2004; Ross et al., 2010; Watts et al., 2010).

Although ultraviolet sunlight exposure to bare skin can synthesize vitamin D, this is not the recommended modality to obtain adequate levels of vitamin D, both because of the increased risk for skin cancer and because of variables that interfere with a consistent amount of vitamin D production. Thus, supplementation or ingestion of vitamin D-fortified foods is recommended. Individuals with low serum 25-OH D levels (less than 32 ng/mL) require supplementation at higher rates. It may take up to 3 months for serum levels to achieve a steady state after a supplement is started. Calcium or calcium and vitamin D supplementation may reduce risks for all types of cancer (Lappe et al., 2007), including breast cancer (Lin et al., 2007), and inhibit weight gain during postmenopause (Caan et al., 2007).

Other dietary considerations include minimizing ingestion of soda and caffeinated beverages (Cosman et al., 2014; Miazgowski et al., 2012; Watts et al., 2010). The phosphorus in soda and the caffeine in other beverages may interfere with bone formation and remodeling processes if consumed in very high quantities. More important, for most people, is that frequent ingestion of these beverages can replace ingestion of calcium-rich milk, posing a greater harm to developing and maintaining bone strength. Adequate amounts of phosphorus are needed; however, phosphorus intake must be balanced because either excessive or insufficient amounts can interfere with bone formation. Adequate citric acid, protein, and fiber are also needed for proper bone formation. Excessive protein or fiber intake can interfere with normal intestinal absorption of calcium. Moderate alcohol intake can improve bone strength; however, ingestion of more than three alcohol units per day (1 U = 12 oz. of beer, 4 to 5 oz. of wine, or 1 oz. of hard liquor) interferes with normal remodeling processes (Management of osteoporosis in postmenopausal women, 2010; U.S. Department of Health and Human Services, 2004; Watts et al., 2010).

Although supplementation with adequate amounts of calcium will increase bone density, it may not affect fracture risk (Jackson et al., 2006). Calcium from dietary sources is preferred over supplements; however, calcium intake from dietary sources is frequently below daily recommended levels and women with lactose intolerance may not tolerate the dairy products that are richest in calcium, making supplementation necessary (U.S. Department of Health and Human Services, 2004). Taking 1,000 mg of calcium supplement daily was not associated with increased risks for cardiovascular disease or stroke in the Nurses’ Health Study (Paik et al., 2014). The recommended dietary allowances (RDAs) for calcium are based on elemental calcium—the amount of calcium that is actually absorbed from a food or supplement and used in the body. Most supplements now list elemental calcium levels on their labels; therefore, determining the amount of calcium that is absorbed is straightforward. Several different types of calcium supplements are available (Table 35.3).

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**TABLE 35.2** Daily Calcium Recommendations for Females at Various Ages

<table>
<thead>
<tr>
<th>AGE</th>
<th>DAILY CALCIUM RECOMMENDATION (MG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth to 6 months</td>
<td>210</td>
</tr>
<tr>
<td>7–12 months</td>
<td>270</td>
</tr>
<tr>
<td>1–3 years</td>
<td>700</td>
</tr>
<tr>
<td>4–8 years</td>
<td>1,000</td>
</tr>
<tr>
<td>9–18 years</td>
<td>1,300</td>
</tr>
<tr>
<td>14–18 years and pregnant or lactating</td>
<td>1,300</td>
</tr>
<tr>
<td>19–50 years</td>
<td>1,000</td>
</tr>
<tr>
<td>19–50 years and pregnant or lactating</td>
<td>1,000</td>
</tr>
<tr>
<td>≥ 51 years</td>
<td>1,200–1,500</td>
</tr>
<tr>
<td>Postmenopausal</td>
<td>1,200–1,500</td>
</tr>
</tbody>
</table>

*Postmenopausal women, regardless of age, are counseled to increase calcium intake to 1,200 to 1,500 mg daily.

EXERCISE
Establishing an active lifestyle early in life and maintaining it throughout the older years is crucial to encourage normal bone formation and slow bone loss. The effects of exercise on bone are site specific because osteoblast activity increases locally in response to load stress caused by exercise (e.g., walking supports bone density in the hips, lower spine, and legs; hand weights benefit the arms and wrists; and overhead weights benefit the shoulders, upper arms, wrists, and upper spine) (U.S. Department of Health and Human Services, 2004). Both weight-bearing and resistance exercises are needed to create adequate load on bone tissue (U.S. Department of Health and Human Services, 2004). In addition to improving bone strength and providing overall fitness, exercise helps women maintain their balance, and thus reduces fall risk. Exercises that require forward bending are not recommended for women with established OP of the spine because of the risk of VCFs (U.S. Department of Health and Human Services, 2004). Activities that carry a high risk for falls are also discouraged in women with established OP. Encourage weight-bearing and resistance exercises, such as tai chi, walking, jogging, weight lifting, dancing, modified yoga (without forward bending), Pilates, swimming or water aerobics using resistive water weights, and bicycling against increasing resistance.

SMOKING CESSATION
Avoiding or quitting smoking to maximize peak bone formation and prevent bone loss is crucial (Cosman et al., 2014; U.S. Department of Health and Human Services, 2004; Watts et al., 2010). Nicotine in cigarettes interferes with hormonal functions that assist with balancing bone formation and can augment the negative effects that corticosteroids have on bone.

FALL PREVENTION
Fall prevention becomes more important in women with established bone loss who are at increased risk for fracture. A home assessment is done to determine and remedy the presence of loose rugs, exposed cords, or poor lighting that could increase the risk of falling, especially at night. Some patients can conduct this assessment and rectify problems themselves. In other instances, clinicians or family members need to intervene. Ingestion of sedating medications or substances are also avoided. For those with secondary OP, prevention through managing the underlying cause, changing medications, or reducing dosages can improve bone strength and reduce or reverse bone loss in addition to decreasing the risk of falls (Cosman et al., 2014; U.S. Department of Health and Human Services, 2004; Watts et al., 2010).

Complementary and Alternative Medicine

MASSAGE, RELAXATION THERAPIES, AND CHIROPRACTIC MANIPULATION
Massage may indirectly benefit bone strength because it can relax and assist in muscle flexibility, potentially increasing exercise tolerance. Chair massage is performed with caution because forward bending in women with established OP is not recommended due to the risk of VCFs. Other modalities, such as tai chi, walking, jogging, weight lifting, dancing, and modified yoga (without forward bending), Pilates, swimming or water aerobics using resistive water weights, and bicycling against increasing resistance, are recommended as alternative forms of exercise. Portions of these activities can be performed in a seated position, allowing for a safer exercise regimen for women with established OP.
OP potentially increases the risk of VCFs. Massage does not usually provide enough force to cause fracture with established OP and may provide relaxation that assists with pain reduction.

Other CAM modalities that enhance and encourage relaxation such as aromatherapy, yoga, and meditation may be helpful for pain management in women with OP fractures. Chiropractic manipulation techniques are modified by skilled chiropractors to avoid injury or fracture of weak bones. Some chiropractors do not perform manipulations on those with OP; instead, they counsel patients about dietary needs and safe exercise techniques.

**BOTANICALS AND ACUPUNCTURE**

Research evaluating the use of soy to improve bone density has provided conflicting results. Rimostil and genistein have both demonstrated increases in BMD (Clifton-Bligh, Baber, Fulcher, Nery, & Moreton, 2001; Marini et al., 2007). Epidemiologic studies have also suggested that women who consume high amounts of isoflavones found in soy products are at lower risk for OP (Adlercreutz & Mazur, 1997; Somekawa, Chiguchi, Ishibashi, & Aso, 2001). While a meta-analysis of randomized controlled trials found little overall support for the use of soy supplements to increase bone density (Liu et al., 2009), a systematic review found soy supplements to increase BMD (Wei, Liu, Chen, & Chen, 2012). Most soy products are available over the counter, such as Estroven®, Rimostil®, and Promensil®. Fosteum Rx® is available by prescription.

Treatment results for OP with acupuncture have been mixed. Acupuncture is more often used in combination with Chinese herbs for OP in the practice of traditional Chinese medicine (Guillaume, 1992). Herbs that might be used for OP management are intended to boost estrogen levels, such as cypress, black cohosh, sage, licorice, and ginseng (Decker & Myers, 2001). OsteoSine is a capsule containing minerals, vitamins, and a blend of *Cuscuta chinensis* herb ingredients, which contain flavonoids. Flavonoids are found in red wine and believed to contribute to reducing the risk of heart disease. NuLiv, the OsteoSine manufacturer, advertises the preparation for use in improving bone health; however, no published studies of large clinical trials are available at www.nulivlifestyle.com/index.html.

**Pharmacotherapeutics**

Several prescription medications are available for OP management. Prescription medications are recommended by the NOF and American Association of Clinical Endocrinologists (AACE) for PM women with T-score BMD values in the OP range (−2.5 or lesser) (Cosman et al., 2014; Watts et al., 2010). Most clinicians also agree that treatment is warranted if the T-score is −2.0 or less or if the woman has sustained a low-trauma fracture. The WHO developed the FRAX algorithm to identify 10-year fracture probabilities to assist in determining best practices for initiating medication therapy among patients with T-score BMDs in the osteopenic range (Cosman et al., 2014; WHO, 2016).

The FRAX algorithm is accessible online and applies only to patients who are naïve to OP pharmacotherapy. It is specific to country and in the United States is also categorized according to race/ethnicity. Ten-year fracture risk probability for hip fracture and any major osteoporotic fracture (e.g., forearm, hip, humerus, or vertebrae) is calculated on the basis of 11 risk factors for fracture (Box 35.5) and the femoral neck BMD (WHO, 2016). The calculated FRAX fracture probabilities are now printed on BMD DEXA results in the United States. The U.S. algorithm adapted to clinical scenarios provides the basis for the NOF clinical recommendations for initiating medication therapy for bone loss (Box 35.5) (Cosman et al., 2014; Dawson-Hughes et al., 2008; Tosteson et al., 2008; Watts et al., 2010; WHO, 2016). Another online fracture risk assessment tool, called QFracture, was released in 2009. It may have some improved discrimination over FRAX; however, it was based on data from England and Wales and is only applicable to these patient populations (Hippisley-Cox & Coupland, 2009).

Medication therapies that are currently U.S. Food and Drug Administration (FDA) approved for OP management in the United States include parathyroid hormone, estrogen agonist–antagonist, estrogen therapy (ET) or hormone therapy (HT), calcitonin, monoclonal antibody, and bisphosphonate agents (Table 35.4). There are two general categories among these medications. Antiresorptive agents compose the first category, and include estrogen and hormone therapies, bisphosphonates, estrogen agonist–antagonist (also known as selective estrogen receptor modulators [SERMs]), monoclonal antibody, and calcitonin. These medications inhibit osteoclast function, thus

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**BOX 35.5 NATIONAL OSTEOPOOROSIS FOUNDATION RECOMMENDATIONS FOR INITIATING MEDICATION THERAPY FOR BONE LOSS**

Medication therapy is recommended for postmenopausal women who present with the following:

- **BMD T-scores of the spine, total hip, or femoral neck of −2.5 or less (when causes of secondary osteoporosis have been ruled out)**
- **Hip fracture(s) or clinical or incidental vertebral fracture(s)**
- **T-scores of −1.0 to −2.5 at the femoral neck, total hip, or spine together with a calculated U.S.-adapted FRAX algorithm 10-year probability of hip fracture of greater than 3% or of any major osteoporotic fracture of greater than 20%

BMD, bone mineral density; FRAX, fracture risk assessment.

Data from Cosman et al. (2014).
### TABLE 35.4 Prescription Options for Osteoporosis Management\(^{a,b}\)

<table>
<thead>
<tr>
<th>MEDICATION</th>
<th>FDA-APPROVED USE AND DOSE</th>
<th>CONSIDERATIONS</th>
</tr>
</thead>
</table>
| **Alendronate (Fosamax)** | Prevention: 5 mg by mouth daily or 35 mg by mouth weekly Prevention and treatment: 10 mg by mouth daily or 70 mg by mouth weekly | - Before any food ingestion, take oral doses in morning with 8-oz glass of plain water, remain upright, and ingest no food or drink for at least 30–60 minutes  
- Take oral doses 2 hour before antacids/calcium  
- Caution with oral forms if upper gastrointestinal disease present; clinical association with dysphagia, esophagitis, or ulceration  
- Beneficial effects may last for years after medication is discontinued  
- Fosamax plus D: combined bisphosphonate and vitamin D3 in a single tablet taken weekly  
- Actonel with calcium: blister pack for 28-day use; provides Actonel in one tablet taken on day 1 and calcium in other six tablets taken days 2–7; repeat sequence over 4 weeks  
- IV ibandronate and zoledronic acid are not associated with gastrointestinal side effects: no limitations on timing dose around food, water, calcium, or medication intake  
- Osteonecrosis of jaw (ONJ), exposed bone in mouth for > 3 months with nonhealing lesions, has been associated with high-dose IV bisphosphonate therapy among individuals with cancer-related bone disease (2–10%); cancer patients with dental problems, gum injury, oral bony abnormalities, or taking medications that interfere with healing; and, in very rare cases, healthy individuals with similar risk factors who are taking bisphosphonates for osteoporosis (incidence estimated at 0.001–0.002%). Consider stopping therapy for 2–3 months if invasive dental procedures are required and resume after healing is complete; encourage usual dental care (e.g., cleaning, fillings, crown work) |
| **Alendronate + cholecalciferol (Fosamax Plus D)** | Treatment: 70 mg plus 2,800 U of vitamin D3 or 70 mg plus 5,600 units of vitamin D3 in combined tablet by mouth weekly | - Usually administered as nasal spray  
- Alternate nares for nasal spray  
- Most often used for analgesic effect on acute pain resulting from vertebral compression fractures |
| **Risedronate (Actonel)** | Prevention or treatment: 5 mg by mouth daily; 35 mg by mouth weekly; 75 mg by mouth 2 consecutive days each month; or 150 mg by mouth monthly Treatment: 3 mg IV every 3 months | - Administered by a health care professional  
- Calcium and vitamin D needed  
- Contraindicated with hypocalcemia  
- May increase risk for infection  
- ONJ has been reported |
| **Risedronate + calcium carbonate (Actonel with Calcium)** | Prevention: 35 mg of risedronate day 1, 1,250 mg of calcium carbonate days 2 to 7 | - Also effective in alleviating most symptoms related to menopause (even Menostar, which has a very low dose and was shown to effectively reduce severity and frequency of hot flashes in a 2007 study)  
- Available in several forms (e.g., pills, patch, ring, cream, gel)  
- Use for 2 to 3 years immediately following menopause; may provide some beneficial effects on bone health after discontinuation |
| **Ibandronate (Boniva)** | Prevention or treatment: 2.5 mg by mouth daily or 150 mg by mouth monthly Treatment: 3 mg IV every 3 months | - Medical food  
- Meets FDA standards for GRAS (generally recognized as safe)  
- Not recommended if taking hormone therapy, estrogen agonist–antagonists |
| **Zoledronic acid (Reclast)** | Treatment: 5 mg IV yearly | - Caution with oral forms if upper gastrointestinal disease present; clinical association with dysphagia, esophagitis, or ulceration  
- Beneficial effects may last for years after medication is discontinued  
- Fosamax plus D: combined bisphosphonate and vitamin D3 in a single tablet taken weekly  
- Actonel with calcium: blister pack for 28-day use; provides Actonel in one tablet taken on day 1 and calcium in other six tablets taken days 2–7; repeat sequence over 4 weeks  
- IV ibandronate and zoledronic acid are not associated with gastrointestinal side effects: no limitations on timing dose around food, water, calcium, or medication intake  
- Osteonecrosis of jaw (ONJ), exposed bone in mouth for > 3 months with nonhealing lesions, has been associated with high-dose IV bisphosphonate therapy among individuals with cancer-related bone disease (2–10%); cancer patients with dental problems, gum injury, oral bony abnormalities, or taking medications that interfere with healing; and, in very rare cases, healthy individuals with similar risk factors who are taking bisphosphonates for osteoporosis (incidence estimated at 0.001–0.002%). Consider stopping therapy for 2–3 months if invasive dental procedures are required and resume after healing is complete; encourage usual dental care (e.g., cleaning, fillings, crown work) |
| **Calcitonin (Miacalcin, Fortical NS)** | Treatment: 200 IU of intranasal spray daily (Miacalcin or Fortical NS) or 100 IU subcutaneously every other day (Miacalcin) | - Usually administered as nasal spray  
- Alternate nares for nasal spray  
- Most often used for analgesic effect on acute pain resulting from vertebral compression fractures |
| **Denosumab (Prolia)** | 60 mg subcutaneously every 6 months | - Administered by a health care professional  
- Calcium and vitamin D needed  
- Contraindicated with hypocalcemia  
- May increase risk for infection  
- ONJ has been reported |
| **Estrogen\(^b\)** (i.e., Alora, Climara, Estrace, Estraderm, Menest, Menostar, Premarin, Vivelle, Vivelle-Dot) | Prevention: doses and routes vary | - Also effective in alleviating most symptoms related to menopause (even Menostar, which has a very low dose and was shown to effectively reduce severity and frequency of hot flashes in a 2007 study)  
- Available in several forms (e.g., pills, patch, ring, cream, gel)  
- Use for 2 to 3 years immediately following menopause; may provide some beneficial effects on bone health after discontinuation |
| **Estrogen–progestin combination products\(^b\)** (i.e., Activella, Climara Pro, FemHRT, Prefest, Premphase, Prempro) | Prevention: doses and routes vary | - Also effective in alleviating most symptoms related to menopause (even Menostar, which has a very low dose and was shown to effectively reduce severity and frequency of hot flashes in a 2007 study)  
- Available in several forms (e.g., pills, patch, ring, cream, gel)  
- Use for 2 to 3 years immediately following menopause; may provide some beneficial effects on bone health after discontinuation |
| **Genistein + citrusted zinc bisglycininate + cholecalciferol (Fosteum Rx)** | Prevention: 1 capsule twice daily (each capsule contains 27 mg of genistein, 20 mg of citrusted zinc bisglycininate, 200 IU of cholecalciferol) | - Also effective in alleviating most symptoms related to menopause (even Menostar, which has a very low dose and was shown to effectively reduce severity and frequency of hot flashes in a 2007 study)  
- Available in several forms (e.g., pills, patch, ring, cream, gel)  
- Use for 2 to 3 years immediately following menopause; may provide some beneficial effects on bone health after discontinuation |

\(^a\) Medical food

\(^b\) Meets FDA standards for GRAS (generally recognized as safe)

\(^c\) Not recommended if taking hormone therapy, estrogen agonist–antagonists
reducing bone resorption and increasing bone density by allowing osteoblast activity to surpass osteoclast activity. Anabolic agents compose the second category. Currently, only one agent is U.S. FDA approved for use in this category—teriparatide (Forteo), which is a parathyroid hormone preparation. The mechanism of action of anabolic agents is to increase osteoblast activity and thereby stimulate formation of new bone. Additionally, one other prescription agent, a medical food, is available. Medical foods meet the FDA standard for GRAS, which means “generally regarded as safe.” Fosteum meets this standard and includes a combination of genistein (an isoflavone that is purified from soy), vitamin D, and zinc. Studies evaluating Fosteum show that it does improve BMD; no data on fracture rates are available (Fosteum Prescribing Information).

Women who are treated for OP or low bone mass are monitored to evaluate the efficacy of their treatment. DEXA testing is done every 1 to 2 years until stability is achieved, and then the frequency of monitoring is reduced to every 3 years. In women with normal bone mass at baseline, repeat DEXA testing is done every 3 to 5 years, unless risk factors or history changes occur, prompting a need for earlier reevaluation (Cosman et al., 2014; U.S. Department of Health and Human Services, 2004; Watts et al., 2010).

### Considerations for Special Populations

Temporary secondary bone loss can affect women receiving Depo-Provera injections for contraception and during pregnancy and lactation when calcium is leached from the bone. Bone mass usually reverts to prepregnancy and pre-Ddeo-Provera levels following birth, cessation of breast feeding, or discontinuation of Depo-Provera. A low-dose estrogen patch can be prescribed for women using Depo-Provera to preserve bone mass while taking the medication. Increasing calcium intake before pregnancy and maintenance of appropriate calcium intake during pregnancy and lactation are critical (U.S. Department of Health and Human Services, 2004).

### FUTURE DIRECTIONS

Bone health is a critical issue for women across their lifetimes. Attending to building maximum bone mass during childhood and young adulthood will provide a strong foundation for fracture prevention with aging. Bone loss during midlife is managed for all women through diet, supplementation, and exercise. The FRAX algorithm can assist with determining who may benefit from pharmacologic therapy. Multiple pharmacotherapeutic options are available, making it realistic to tailor a medication plan for an individual woman. Future research is evaluating new delivery methods for existing pharmacotherapeutics as well as additional pharmacotherapeutic agents for bone health.

### REFERENCES


from http://knol.google.com/k/denosumab-prolia-amgen-fda-review


