



CHAPTER 6

Preconception and Prenatal Care: Part of the Continuum

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KEY ABBREVIATIONS

American Academy of Pediatrics	AAP
American Congress of Obstetricians and Gynecologists	ACOG
Azidothymidine	AZT
Centers for Disease Control and Prevention	CDC
Computed Tomography	CT
Cytomegalovirus	CMV
Diethylstilbestrol	DES
Electronic Medical Record	EMR
Group B Streptococcus	GBS
Human Chorionic Gonadotropin	hCG
Human Immunodeficiency Virus	HIV
Last Menstrual Period	LMP
Magnetic Resonance Imaging	MRI
National Institutes of Health	NIH
Neural Tube Defect	NTD
Nuchal Translucency	NT
Pregnancy-Associated Placental Protein	PAPP-A
Rapid Plasma Reagin Test	RPR
Recommended Dietary Allowances	RDA
Restless Legs Syndrome	RLS
Rhesus Immune Globulin	RhIG
Routine Antenatal Diagnostic Imaging with Ultrasound Study	RADIUS
Vaginal Birth after Cesarean Delivery	VBAC
Women, Infants, and Children Program	WIC

Pregnancy and childbirth are major life events. **Preconception and prenatal care are not only part of the pregnancy continuum that culminates in delivery, the postpartum period, and parenthood, but they should also be considered in the context of women's health throughout the life span.**^{1,2}

This chapter reviews pertinent considerations for prenatal care using the broader definitions espoused by the U.S. Public Health Service and the American College of Obstetrician Gynecologists.³ Specifically, prenatal care should consist of a series of interactions defined as visits and contacts with caretakers that includes three components: (1) early and continuing risk assessment; (2) health promotion; and (3) medical and psychosocial interventions and follow-up.⁴ The overarching objective of prenatal care is to promote the health and well-being not only of the pregnant woman, fetus, and newborn, but also the family. Hence, the breadth of prenatal care does not end with delivery but rather includes preconception care, postpartum care, and up to 1 year after the infant's birth.³ Importantly, this introduces the concept of interconception care, and the notion that almost all health care interactions with reproductive-age women are opportunities to assess risk, promote healthy lifestyle behaviors, and identify, treat, and optimize medical and psychosocial issues that could affect pregnancy.

Prenatal care is an excellent example of preventive medicine. In 1929, the Ministry of Health of Great Britain issued a memorandum on the conduct of prenatal clinics. In 1942, vitamin tablets were provided for all British women in the last 6 months of pregnancy. United Kingdom maternal mortality rate declined from 319 per 100,000 live births in 1936 to 15 per 100,000 live births in 1985. In the United States, the maternal mortality rate was 13.2 per

100,000 live births in 1999.⁴ The decline in maternal mortality rate was partly attributed to prenatal care and partly to medical and public policy advances such as maternal mortality reviews with attention to preventable causes of maternal death, shift to hospital births, improvements in anesthesia, widespread availability of blood transfusions, antibiotics, and access to safe and legal abortion services. Recent guidelines addressing the content and efficacy of prenatal care have focused on the medical, psychosocial, and educational aspects of the prenatal care system. Prenatal care satisfies the definition of primary care from the Institute of Medicine as “integrated, accessible health care services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the context of family and community.” In fact, prenatal care services can be used by obstetricians/gynecologists and other primary care providers as a general model for primary care. Prenatal care satisfies other criteria for primary care in that it is comprehensive and continuous, and provides coordinated health care. Preconception care—planning to ensure the healthiest possible pregnancy outcome—is consistent with this model. We will further argue that the preconception and prenatal care periods—just as labor, delivery, the puerperium, and postgestation and interconceptional periods—must be seen as episodes in a woman’s life and that they provide important opportunities to advance wellness and prevention. It must be recognized that for pregnant women all these events are part of a life continuum with birth leading to the multiple challenges of parenting. They are opportunities to introduce and reinforce habits, knowledge, and life-long skills in self-care, health education, and wellness, to inculcate principles of routine screening, immunization, and regular assessment for psychological, behavioral, and medical risk factors.^{1,5} Phelan argues that clinicians are not taking advantage of pregnancy as a “teachable moment”—a naturally occurring life transition that motivates people to spontaneously adopt risk-reducing behaviors.⁶ Pregnancy qualifies as a teachable moment because it meets the following criteria proposed by McBride and colleagues⁷:

- There is increased perception of personal risk and outcome expectancies.
- The perceptions are associated with strong affective or emotional responses.
- The event is associated with a redefinition of self-concept or social role.

The goal of prenatal care is to help the mother maintain her well-being and achieve a healthy outcome for herself and her infant. Education about pregnancy, childbearing, and childrearing is an important part of prenatal care, as are detection and treatment of abnormalities. This process is best realized when begun even before pregnancy. Many services provided traditionally during the intrapartum hospital stay will be provided at prenatal and postpartum outpatient visits.⁸ Too often, hospitalization for childbirth has been seen as an opportunity for education about self-care, child care and parenthood rather than as a time to ensure safe passage. Educational interventions have been targeted for the intrapartum stay, when they can better and more cheaply be performed in the preconceptional, antenatal, or home care environment.⁸⁻¹⁰ However, more

recently, contemporary models of prenatal and childbirth education have been criticized because research has not shown a strong association between class attendance and childbirth experiences or parenting expectations. In fact, among first-time mothers, there has been a decline in childbirth class attendance from 70% in 2002 to 56% in 2005.^{11,12}

MATERNAL MORTALITY

Maternal and neonatal mortality rates are the most widely used indicators of the health of a nation. Maternal death is the demise of any woman from any pregnancy-related cause while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of pregnancy. A direct maternal death is an obstetrical death resulting from obstetrical complications of the pregnancy state, labor, or puerperium. An indirect maternal death is an obstetrical death resulting from a disease previously existing or developing during the pregnancy, labor, or puerperium; death is not directly due to obstetrical causes but may be aggravated by the physiologic effects of pregnancy. A nonmaternal death is an obstetrical death resulting from accidental or incidental causes unrelated to the pregnancy or its management.

The maternal mortality rate is the number of maternal deaths (direct, indirect, or nonmaternal) per 100,000 women of reproductive age but, since this denominator is difficult to determine precisely, most clinical and research entities use the maternal mortality ratio defined as the number of maternal deaths (indirect and direct) per 100,000 live births.

Direct obstetrical deaths have six major causes: hypertensive diseases of pregnancy, hemorrhage, infections/sepsis, thromboembolism, and, in developing countries, obstructed labor and complications from illegal abortion. There are other direct causes of death, such as ectopic pregnancy, complications of anesthesia, and amniotic fluid embolism. The main causes of indirect obstetrical deaths are asthma, heart disease, type 1 diabetes, systemic lupus erythematosus, and other conditions that are aggravated by pregnancy to the point of death.

Maternal mortality has been an underrecognized issue worldwide despite an estimated 600,000 maternal deaths per year from pregnancy-related causes.¹³ Put in numerical perspective, this is equivalent to six jumbo jet crashes per day with the deaths of all 250 passengers on board, all of them women in the reproductive years of life. Or, put in a time perspective, every minute of every day a woman dies from pregnancy-related causes.¹⁴ There is also a marked inequity in geographic distribution, because 95% of these deaths occur in developing countries (Figure 6-1). Maternal mortality is the health indicator with the greatest disparity between wealthy and poor countries (and wealthy and poor women in developed countries). Maternal mortality is highest in Africa, Asia, Latin America, and the Caribbean.¹⁵ The World Health Organization estimates that over 80% of maternal deaths could be prevented through actions that have been proven to be effective and affordable. Specifically, providing maternal health services defined as trained birth attendants, aseptic birth environments, identification

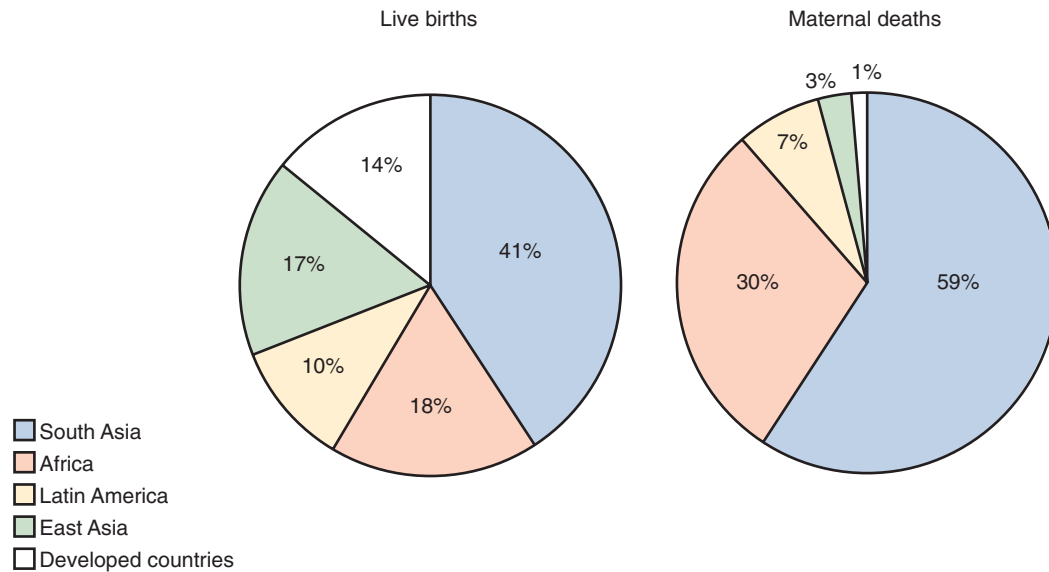


FIGURE 6-1. Worldwide distribution of live births and maternal deaths by region. (From WHO 861663.)

of maternal/fetal/neonatal complications, and transport to a higher level of care when indicated.^{14,16} Even in developed countries, the changing demographic profile of childbearing women (e.g., older women and/or women with chronic medical conditions) has contributed to an increase in maternal mortality, and many argue that these too are preventable—requiring rapid recognition and response to treatable emergency conditions.¹⁴ Worldwide, we are far from achieving the international Safe Motherhood goal of reducing maternal mortality by 50%.¹⁶ **Similarly, nationwide, the Centers for Disease Control and Prevention (CDC) reported a maternal mortality rate of 12.1 per 100,000, indicating we have not achieved the *Healthy People 2010* goal of 3.3 per 100,000 and emphasizing that it will take an integrated, multifaceted, multidisciplinary public health approach to achieve these goals for 2020.**^{17,18}

The CDC and the American Congress of Obstetricians and Gynecologists (ACOG) have introduced the concept that *pregnancy-associated mortality* is defined as death of a woman, from any cause, while pregnant, or within 1 year of termination of pregnancy.¹⁹ Unfortunately, the United States is seeing an increase in nonmaternal deaths of pregnant women resulting from trauma and violence, many of these related to illegal drugs (Figure 6-2).

In North Carolina from 1992 to 1994, 167 deaths of pregnant and postpartum women were identified through an enhanced surveillance system. When all deaths of pregnant women were categorized, direct and indirect obstetrical deaths (classically defined maternal deaths) accounted for only 37% of deaths of pregnant and postpartum women. Injuries accounted for 38% of deaths with homicide being the most common (36%), followed by motor vehicle accidents (32%), drug-related death (13%), other (11%), and suicide (8%). Acceptance of pregnancy-associated mortality as the appropriate measure will lead to increased recognition of these important problems. The prenatal care provider can play a role in preventing these common causes of death in women by advocating use of seat belts

and screening for alcohol use, drug use, depression, and violence.

Significant disparities exist between the maternal mortality rates of white and black women. In the United States, maternal mortality occurs four times more often in black women than in white women. In a *Morbidity and Mortality Weekly Report* review of maternal deaths from 1991 to 1999, the pregnancy-related mortality rate for white women was 8.1; for black women it was 30. On a state-by-state basis, maternal mortality rates for black women were higher in every state.^{20,21} Many of the tenets espoused to bring about safe motherhood internationally could arguably be applicable to help understand and eradicate the maternal health disparities seen in poor urban and rural environments in the United States. Specifically, they are health education and promotion, identification of maternal/fetal/neonatal complications, transport to a higher level of care, and rapid responses to acute obstetrical emergencies. For example, one study demonstrated an inverse relationship between the maternal mortality rate and the state density of maternal-fetal medicine specialists after controlling for state-level measures of maternal poverty, education, race, age, and interactions.²² Similarly, regionalization of perinatal services has been a cornerstone for improved neonatal outcomes.²³

Last, although much attention has been focused nationally and internationally on maternal mortality, perhaps of greater concern is the less well documented prevalence of maternal morbidity, or “near misses,” defined as “pregnant women with severe life-threatening conditions who nearly die but, with good luck or good care, survive.” Wen and colleagues found that the overall rate of severe maternal morbidity was 4.4 per 1000 deliveries, but many believe it is significantly underreported.²⁴ Severe morbidity was defined as thromboembolism, eclampsia, pulmonary, cardiac or central nervous system complications of anesthesia, cerebrovascular disorders, uterine rupture, acute respiratory distress syndrome, pulmonary edema, myocardial

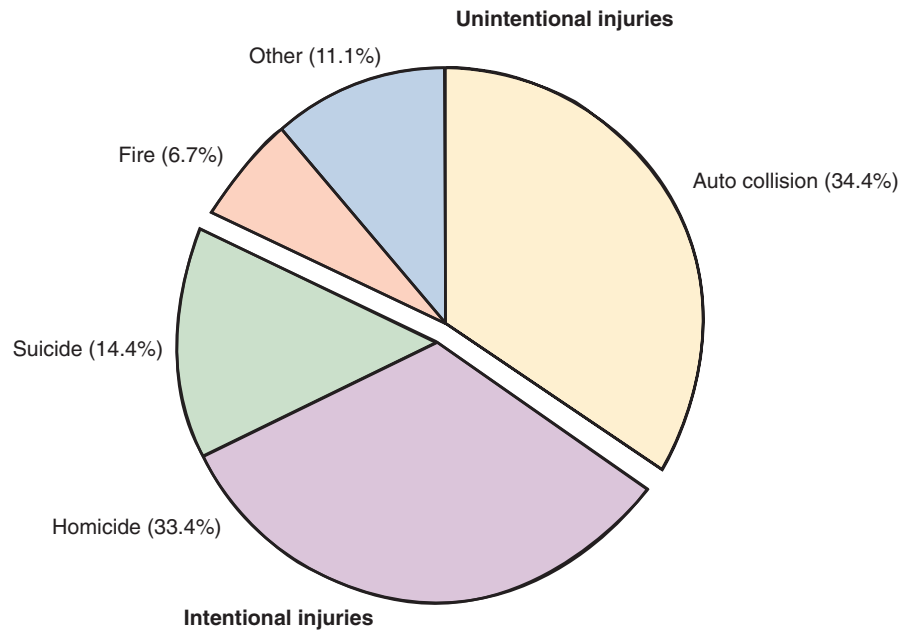


FIGURE 6-2. Distribution of deaths due to injury in the United States, 1980-1985 ($N=90$). (From MMWR Morb Mortal Wkly Rep 37[SS5]:26, 1988.)

infarction, acute renal failure associated with delivery, cardiac arrest, severe postpartum hemorrhage requiring hysterectomy, and assisted ventilation. Rates of venous thromboembolism, uterine rupture, acute respiratory distress syndrome, pulmonary edema, myocardial infarction, severe postpartum hemorrhage requiring hysterectomy, and assisted ventilation all appear to be increasing in incidence since 1991.²⁴ The concept of “near misses” and rates of adverse pregnancy-related complications have taken on new significance as payers and providers look for ways to demonstrate safety and quality in health care systems.

Finally, presence of preexisting chronic conditions (e.g., systemic lupus, cystic fibrosis, chronic renal disease, hypertension, diabetes, pulmonary hypertension, and congenital, rheumatic, and ischemic heart disease) also appears to be increasing among pregnant women, and this is significant since the presence of preexisting conditions increases the risk of both maternal morbidity (sixfold increase) and mortality (158-fold increase).²⁴⁻²⁷

NEONATAL MORTALITY AND MORBIDITY

Historically, in developed countries, when decreased maternal mortality was achieved, attention was then turned to infant mortality, and then neonatal mortality and later fetal mortality. The stillbirth rate (fetal death rate) is the number of stillborn infants per 1000 infants born. The neonatal mortality rate is the number of neonatal deaths (deaths in the first 28 days of life) per 1000 live births. The perinatal mortality combines these two—the number of fetal deaths (stillbirths) plus neonatal deaths per 1000 total births.

In 1990, the U.S. infant mortality rate was 9.2 per 1000 live births, ranking the United States 19th internationally.¹³ However, there are international differences in the way live births are classified, as some countries exclude

infants weighing less than 1 kg and those with fatal anomalies. Final vital statistics data for 2005 indicate that the United States met the *Healthy People 2000* goal of decreasing the infant mortality rate to 7 per 1000 live births, but has not met the 2010/2020 goal of 4.5 per 1000 live births.^{17,28} Infant mortality varies by maternal demographic and health characteristics. Rates are higher in the extreme reproductive ages (teens and over 40 years old). Other maternal characteristics associated with increased risk for infant mortality include unmarried, poorly educated, little or no prenatal care, smoking, or illicit substance use. Pregnancy-related complications include but are not limited to multiple births and preterm delivery. There are significant racial differences in infant mortality, with African Americans having a 2.5-fold increased risk.²⁸ Infant mortality rates in Hispanics are comparable to those of Caucasians; however, variation exists between country of origin and amount of acculturation.

PRENATAL CARE

Historically, the primary goal of prenatal care was to minimize maternal and neonatal mortality. During the past 40 years, new technology has been introduced to assess the fetus antepartum, including electronic fetal monitoring, sonography, amniocentesis, and other in utero interventions, with the fetus emerging as a patient in utero. Prevention of morbidity as well as mortality is now the goal. This has made the task of the prenatal care more complex, since mother and fetus now require an increasingly sophisticated level of care. At the same time, pregnancy is basically a physiologic process, and the normal pregnant patient may not benefit from application of advanced technology.

Prenatal care is provided at a variety of sites, ranging from the private office, to the public health and county hospital clinics, to the patient's home. Obstetricians must optimize their efforts by resourceful use of other

professionals and support groups, including nutritionists, childbirth educators, public health nurses, nurse practitioners, family physicians, nurse-midwives, and specialty medical consultants. Most pregnant women are healthy, with normal pregnancies, and can be followed by an obstetrical team including nurses, nurse practitioners, and nurse-midwives, with an obstetrician available for consultation. These women can be followed by practitioners who have adequate time to spend on patient education and parenting preparation, while physicians can appropriately concentrate on complicated problems requiring their medical skills. This also provides for improved continuity of care, which is recognized as extremely important for patient satisfaction.^{29,30}

There have been no prospective controlled trials demonstrating efficacy of prenatal care overall. Two documents addressing the content and efficacy of prenatal care have suggested changes in the current prenatal care system.^{2,29-34} Since publication of these recommendations, several well-designed randomized clinical trials and cost-benefit analyses have been reported using alternative visit schedules^{33,34} (Table 6-1). There was no difference in outcomes for patients undergoing reduced frequency of visits as measured by rates of preterm birth and low birth weight, and the reduced frequency model has been shown to be cost-effective. However, fewer visits have been associated with decreased maternal satisfaction with care, as well as increased maternal anxiety.^{33,34} Some studies support the concept of reduced antenatal visits for selected women.^{10,33,34}

Efficacy of prenatal care also depends on the quality of care provided by the caretaker. If a blood pressure is recorded as elevated and no therapeutic maneuvers are recommended, this will not change the outcome. Recommendations must be made and must be carried out by the patient, whose compliance is essential to alter outcome. Kogan and colleagues,³⁵ using national survey data, reported that women received only 56% of the procedures and 32%

of the advice recommended as part of prenatal care content, and that poor women and African American women received fewer of the recommended interventions. Site of care was also an important determinant, suggesting that infrastructure must be geared to address population-specific needs.³⁵

RISK ASSESSMENT

The concept of risk in obstetrics can be examined at many levels. All the problems that arise in pregnancy, whether common complaints or more hazardous diseases, convey some risk to the pregnancy, depending on how they are managed by the patient and her care provider. Risk assessment has received detailed attention in the past. It has been shown that most women and infants suffering morbidity and mortality will come from a small segment of women with high-risk factors; by reassessing risk factors before pregnancy, during pregnancy, and again in labor, our ability to identify those at highest risk increases. Most of the emphasis for screening, risk assessment, and associated trials for therapeutic interventions have focused primarily on preeclampsia and preterm birth prevention; Table 6-2 lists representative examples of other clinical conditions that have been proposed to be included as part of routine screening and/or risk assessment during the antepartum period since 1989. Many of these conditions are part of current routine screening programs, but few were implemented as routine care as a result of evidence-based criteria. Most have been implemented as a result of expert or consensus opinion, cost/benefit, and/or risk management decisions. Still others have yet to be commonly accepted and await definitive research trials demonstrating efficacy as a screening test, or more importantly, effective treatment options. For example, cervical length assessment and fetal fibronectin evaluation have been proposed to assess risk of prematurity (see Chapter 28), yet definitive trials proving effectiveness of screening and efficacy of treatment have yet to be done.

TABLE 6-1 COMPARISON OF DIFFERENT RECOMMENDATIONS REGARDING VISIT FREQUENCY AND PROPOSED CLINICAL INTERVENTIONS FOR PRENATAL CARE FOR LOW-RISK WOMEN

WEEKS' GESTATION	ACOG 1997	EXPERT PANEL NULLIPAROUS WOMAN	EXPERT PANEL MULTIPAROUS WOMAN	CLINICAL INTERVENTION
1-4		X	X	Preconception Dating
5-8	X	X	X	Dating
9-12	X	X		*
13-16	X	X	X	*
17-20	X			AFP/multiple marker screening*
21-24	X			
25-28	X	X	X	Glucose tolerance test
31-32	X	X	X	Childbirth education
35-36	X	X	X	Risk assessment
37	X	X		Risk assessment
38	X	X		Growth
39	X			Risk assessment
40	X	X		Risk assessment
41	X	X	X	Post term evaluation

Modified from Gregory KD, Davidson E: Prenatal care: who needs it and why? Clin Obstet Gynecol 42(4):725, 1999.

*Current standard of care would likely include offering first trimester screening and/or some multiple marker screening strategy (integrated or sequential) in the second trimester.

TABLE 6-2 EXAMPLES OF CLINICAL CONDITIONS AMENABLE TO ANTENATAL SCREENING AND/OR RISK ASSESSMENT

Clinical Condition		
SCREENING/DIAGNOSTIC TEST	COMMENT	REFERENCE
Postdates/Multiple Gestation/IUGR		
Early ultrasound	Increased precision of dating; “routine” use unclear benefit yet widely used over 80% of pregnancies	85, 87, 89
IUGR		
Fundal height	Increased identification of small and large infants; fewer ultrasounds, economic benefit	84, 86
Smoking history	Smoking has demonstrated dose-response association with poor fetal growth; smoking cessation/ reduction reverses growth disturbance; likelihood of cessation increased during pregnancy	29, 31, 32, 100-103
Fetal Structural Malformation		
Ultrasound	Ultrasound, MSAFP standard of care for screening for neural tube defects. See text re:	104
Maternal serum AFP	prenatal genetic test	
Drug exposure		
Fetal Chromosomal Aberrations		
Multiple marker screening	Combination of specific maternal serum analytes used to screen for Down syndrome, trisomies 13 and 18, with potential detection rate of 60%-90% when used with targeted ultrasound, see text	23, 105
Genetic Conditions		
Cystic fibrosis	Recommended by ACOG	24
Canavan’s disease, “Jewish panel”	Recommended by ACOG	106
Preterm Birth (PTB)		
Cervical length	No benefit from routine screening; unclear “best practice” and/or benefit of treatment once identified “at risk”	17, 18, 107, 108
Fetal fibronectin	No clear benefit as screening test to predict PTB (poor sensitivity and specificity); potential benefit from high negative predictive value	107, 109
Periodontal disease	May be independent risk factor for PTB; treatment reduced risk	19
Bacterial vaginosis	Independent risk factor for PTB; inconclusive if treatment alters risk but shown to be beneficial in selected populations	110-116
Preeclampsia		
Uterine Doppler	No effective prevention	15, 85
Serum markers	Nonspecific; no effective prevention	16, 94, 117
Thromboembolic Disease		
Pregnancy history	Clinically relevant topic due to association with adverse pregnancy outcome; potential for life-threatening thromboembolic event; disseminating into practice; inconclusive data re: treatment efficacy	78
Clinical history		
Laboratory evaluation for hereditary thrombophilias		
Infections		
Group B streptococcus	Screening and treatment prevents neonatal disease	118
HIV	Routine screening and treatment recommended by ACOG; treatment significantly decreases rate of perinatal transmission	119, 120
Bacterial vaginosis	See PTB	121
Psychosocial Risk		
Demographics	Socioeconomic status, race/ethnicity related to PTB, adverse pregnancy outcomes; not mutable	122-124
Cocaine use	Associated with structural malformations, PTB, abruptions, preeclampsia; comprehensive care deters use	30
Depression		
Screening instruments	Risk/benefit decision re: treatment—not contraindicated; increased likelihood of relapse in postpartum period; related to infection, child development	125
Domestic Abuse		
Screening instruments	Increased likelihood of abuse during pregnancy in women in abusive environment	126

It is important to individualize patient care and to be thorough. The initial visit will include a detailed history and physical and laboratory examinations. The initial history requires that the patient be seen in an office setting. Ideally, she should not be first seen undressed sitting on an examining table.

PRECONCEPTIONAL EDUCATION

We have reached a level of awareness about prenatal care at which the optimal time to assess, manage, and treat

many pregnancy conditions and complications is before pregnancy occurs.^{36,37} Recognizing that half of pregnancies are unplanned, all reproductive-age women should be asked about their plans for pregnancy at routine gynecologic visits or health maintenance examinations. At that time, much of the risk assessment described later in this chapter can be performed, as well as the basic physical and laboratory evaluations. If there are questions about the history, such as family history of fetal anomaly, or previous cesarean delivery, further details can be obtained from family members or the appropriate medical facility. This is

the time to draw a rubella titer and immunize the susceptible patient. Hepatitis B immunization can be given to appropriate patients and human immunodeficiency virus (HIV) testing offered. Varicella titers or immunization is recommended in women with no history of chickenpox. Patients need to use contraception for up to 3 months following immunizations (see Chapter 50). Toxoplasmosis screening based on risk factors may be indicated at this time because approximately one fourth of the U.S. population is infected.³⁷ Patients who have negative screens are at risk for congenital toxoplasmosis and should be counseled to avoid risks such as contact with wild felines and ingestion of raw or undercooked meat. Immunocompetent patients who screen positive can be reassured of lack of risk with regard to fetal loss or stillbirth, although rare reports of congenital infection after previous infection have been described. A prospective analysis of the population risks and benefits to substantiate routine screening for and/or education about toxoplasmosis has not been done in the United States. However, proponents argue a theoretical benefit based on treatment availability, extrapolated epidemiologic data from European countries where screening is widespread, and the prevalence of congenital infection that is comparable to other congenital diseases that we currently screen for by mandate (e.g., phenylketonuria, congenital hypothyroidism).

Before pregnancy is the time to screen appropriate populations for genetic disease carrier states such as Tay-Sachs disease, Canavan's disease, cystic fibrosis, or hemoglobinopathies. Resolution of these issues is much easier and less hurried without the time limits placed by an advancing pregnancy. Medical conditions such as anemia, hypothyroidism, hypertension, and diabetes can be fully evaluated and medical treatment can be optimized before pregnancy. If the patient is obese, weight reduction should be attempted before pregnancy. The value of pre-pregnancy counseling needs to be emphasized to all those who treat women at significant risk for pregnancy problems. Women who are followed by other physicians (family physicians, pediatricians, general internists) for such problems as diabetes, hypertension, or systemic lupus erythematosus should be seen, evaluated, and counseled before pregnancy. Patients in whom risks are very serious are potentially at risk for progressive disease, end-organ damage, or death and should be so counseled, and every attempt should be made to let them make a fully informed decision about pregnancy. Often, significant risk factors can be treated or managed so as to reduce risk during pregnancy.

There is evidence that for some conditions, such as diabetes mellitus and phenylketonuria, medical disease management before conception can positively influence pregnancy outcome. Medical management to normalize the biochemical environment should be discussed with the patient and appropriate management plans outlined before conception. This is also the time to review drug usage and other practices such as alcohol ingestion and smoking (see Chapter 8). Advice can be given about avoiding specific medications in the first trimester (e.g., isotretinoin), and general advice can be given concerning diet, exercise, and occupational exposures.

Periconceptional supplements with folic acid can reduce the incidence of neural tube defects (NTDs) and the use

of therapeutic doses to decrease the risk of recurrence has been repeatedly demonstrated. This has resulted in national regulatory mandates for food supplements and national media campaigns to increase public awareness about the importance of this practice. **The CDC recommends that all women of childbearing age who are capable of becoming pregnant should consume 0.4 mg of folic acid daily, which is most easily achieved by taking a supplement. For women with a previously affected child, the recommendation is that the patient take 4 mg daily from 4 weeks before conception through the first 3 months of pregnancy.** The benefits of folic acid supplementation are being investigated with regard to the prevention of other complications of pregnancy, as well as chronic maternal disease states (e.g., preterm birth, cardiac disease), further emphasizing the appropriateness of prenatal care as both a model for primary care and a model for the provision of care in the context of a life span approach. Care provided at each visit affects not only pregnancy outcome, but ultimately long-term health outcomes for the woman and her family.

The importance of seeking care early for confirmation of pregnancy and gestational age dating can be discussed with the patient. Great precision can be achieved with an accurate menstrual calendar predating pregnancy and provide an opportunity for access to first trimester screening for aneuploidy and to prevent ambiguity about postdatism.

THE INITIAL PRECONCEPTIONAL OR PRENATAL VISIT

Social and Demographic Risks

Extremes of age are obstetrical risk factors. The pregnant teenager has particular nutritional and emotional needs. She is at special risk for sexually transmitted diseases; it has been shown that she benefits particularly from education in areas of childbearing and contraception. The pregnant woman over age 35 is at increased risk for a chromosomally abnormal child. Patients should be asked about family histories of Down syndrome, NTDs, hemophilia, hemoglobinopathies, and other birth defects, as well as mental retardation (see Chapter 10). Consultation for genetic counseling and genetic testing, if desired, may be appropriate. Women over 35 are at increased risk for almost all pregnancy-related morbidities, maternal mortality, and neonatal complications, including miscarriage, stillbirth, preterm birth, and neonatal mortality. The age of the father is also important, as there may be genetic risks to the fetus when the father is older than 55 years. Certain diseases may be related to race/ethnicity or geographic origin. Patients of African, Asian, or Mediterranean descent should be screened for the various heritable hemoglobinopathies (sickle cell disease, alpha and beta thalassemia). Patients of Jewish and French Canadian heritage should be screened for Tay-Sachs disease, Canavan's disease, and cystic fibrosis. More recently, it has been suggested that cystic fibrosis screening be offered to all couples planning a pregnancy or seeking prenatal testing.

Low socioeconomic status should be identified and attempts to improve nutritional and hygienic measures undertaken. Appropriate referral to federal programs, such as that for women, infants, and children (WIC), and to

public health nurses can have real benefits. If a patient has a history of previous neonatal death, stillbirth, or preterm birth, records should be carefully reviewed so that the correct diagnosis is made and recurrence risk appropriately assessed. A history of drug abuse or recent blood transfusion should be elicited. The history of medical illnesses should be detailed and records obtained if possible. A rapid procedure for diagnosing mental disorders in primary care may be useful in pregnancy.³⁸ If appropriate, patients should be screened and treated for depression.

Occupational hazards should be identified. If a patient works in a laboratory with chemicals, for example, she should be advised to identify potential reproductive toxins and limit her exposure. This is an active area of research and there are several online resources for information about potential environmental and occupational teratogens.³⁹ Patients whose occupations require heavy physical exercise or excess stress should be informed that they may need to decrease such activity later in pregnancy as both have been associated with increased risk of preterm birth and reduced fetal growth in observational studies.⁴⁰

Tobacco, alcohol, and recreational drug use can all adversely affect pregnancy and questions regarding information about their use are a critical part of the history. Specific questions concerning smoking, alcohol, and drugs (prescriptive, over-the-counter, and illicit) should be asked. Regular screening for alcohol and substance use should be carried out using such tools as the T-ACE questionnaire (see Chapter 8) or other simple screening tools, and appropriate directed therapy should be made available to those women who screen positive. Women should be urged to stop smoking before pregnancy and to drink not at all or minimally once they are pregnant. Studies show that smoking cessation counseling by the health care provider works. Pregnancy is an ideal time to initiate this intervention.⁴¹ Drug addiction confers a particularly high risk, and addicted mothers require specialized care throughout pregnancy (see Chapter 8). Discussions about caffeine use should also be addressed, as caffeine is addictive, associated with withdrawal symptoms, and relatively ubiquitous. It is present in coffee, tea, cocoa, cola drinks and other carbonated sodas, chocolate, “energy drinks,” and many over-the-counter headache, cold, and flu treatments, as well as diet pills and prescription medications. The average cup of instant or brewed coffee contains 90 to 130 mg of caffeine. High-end coffee from select coffee houses can approach 250 mg.⁴² A recent study sponsored by the ACOG suggests that there is considerable variation in assessment and advice related to caffeine consumption in pregnant or reproductive-age women. In a self-reported survey, Anderson and colleagues⁴² found that most clinicians did not know the caffeine content of common beverages and were not familiar with scientific data suggesting adverse reproductive consequence. Due to hormonal influences, caffeine metabolism slows during second and third trimester of pregnancy. It crosses the placenta and is distributed to all fetal tissues. Due to immature liver systems, caffeine metabolism is slow in fetuses and neonates, with an extremely long reported half-life ranging from 80 to 100 hours.⁴³ ACOG⁴⁴ concluded that moderate caffeine consumption (less than 200 mg/day) does not appear to be a major contributing factor in miscarriage or preterm birth although a conclusion cannot be made regarding a

correlation between higher caffeine intake and miscarriage. The relationship of caffeine to growth restriction is undetermined. **Hence, practice guidelines suggest that pregnant women should be advised to limit their caffeine consumption to 200 mg/day** (2 cups of coffee or cola drinks per day)⁴³⁻⁴⁶ (see Chapter 8).

Violence against women is increasingly recognized as a problem that should be addressed, with reports suggesting that abuse occurs during 3% to 8% of pregnancies. Questions addressing personal safety and violence should be included during the prenatal period, and such tools as the Abuse Assessment Score are recommended.⁴⁷ It consists of five questions that assess the pregnant woman’s history of abuse (emotional, physical, and sexual). It asks if a woman has ever experienced abuse in her lifetime by a partner or someone close to her and then focuses on questions regarding abuse during the current pregnancy. For example, in cases in which women did experience abuse during their pregnancy, they are asked to “score” each incident according to a scale provided, ranging from mild threats to the dangerous use of a weapon or wound from a weapon.

Medical Risk

Family history of diabetes, hypertension, tuberculosis, seizures, hematologic disorders, multiple pregnancies, congenital abnormalities, and reproductive wastage should be elicited. Often, a family history of mental retardation, birth defect, or genetic trait is difficult to elicit without formal genetic counseling or questionnaires; nonetheless, these areas should be emphasized at the initial history. A better history may be obtained if patients are asked to fill out a preinterview questionnaire or history form. Any significant maternal cardiovascular, renal, or metabolic disease should be defined. Infectious diseases such as urinary tract disease, syphilis, tuberculosis, or herpes genitalis should be identified. Surgical history with special attention to any abdominal or pelvic operations should be noted. A history of previous cesarean birth should include indication, type of uterine incision, and any complications. A copy of the surgical report may be informative. Allergies, particularly drug allergies, should be prominent on the problem list.

Hyperthyroidism

Neonatal hyperthyroidism is rare, with an incidence of 1:4000 to 1:40,000 live births. Fetal thyrotoxic goiter is usually secondary to maternal autoimmune disease, most commonly Graves disease or Hashimoto’s thyroiditis (see Chapter 40). As many as 12% of infants of mothers with a known history of Graves disease are affected with neonatal thyrotoxicosis. This can occur even if the mother is euthyroid. The underlying mechanism is transplacental passage of maternal IgG antibodies. These antibodies, known as thyroid-stimulating antibody or thyroid-stimulating immunoglobulin, are predominantly directed against the thyroid-stimulating hormone (TSH) receptor. Often fetal goiter is diagnosed on ultrasound in pregnancies in which the mother has elevated thyroid-stimulating antibodies. In some cases, fetal goiters are incidentally detected on routine ultrasonography. In still others, detection follows scan for polyhydramnios. Untreated fetal hyperthyroidism may be associated with a mortality rate of 12% to 25% owing to high-output cardiac failure.

Hypothyroidism

Congenital hypothyroidism is relatively rare, affecting about 1:3000 to 1:4000 infants. About 85% of the cases are the result of thyroid dysgenesis, a heterogeneous group of developmental defects characterized by inadequate thyroid tissue. Congenital hypothyroidism is only rarely associated with errors of thyroid hormone synthesis, TSH insensitivity, or absence of the pituitary gland. Congenital hypothyroidism presenting with a goiter is observed in only about 10% to 15% of cases.

Fetal goiterous hypothyroidism also follows maternal exposure to thyrostatic agents such as propylthiouracil and radioactive iodine-131 used to treat maternal hyperthyroidism. Maternal ingestion of amiodarone or lithium may also cause hypothyroidism in the fetus. Fetal hypothyroidism may also follow transplacental passage of maternal blocking antibodies (known as TBIAb or TBII). Rarely, defects in fetal thyroid hormone biosynthesis may exist.

An enlarged fetal goiter may cause esophageal obstruction and polyhydramnios, leading to preterm delivery or premature rupture of membranes. A goiter may even lead to high-output fetal heart failure. A large fetal goiter can also cause extension of the fetal neck, leading to dystocia. Fetal hypothyroidism itself may be devastating, and without treatment, postnatal growth delay and severe mental retardation ensue. Even with immediate diagnosis and treatment at birth, children with congenital hypothyroidism demonstrate lower scores on long-term perceptual-motor, visuospatial, and language tests.

Obstetrical Risk

Previous obstetrical and reproductive history is essential to optimizing care in subsequent pregnancies. The gravidity and parity should be noted and the outcome for each prior pregnancy recorded in detail. Previous miscarriages (and documentation about the gestational age at the time of the loss) not only confer risk and anxiety for another pregnancy loss but can be associated with an increased risk for genetic disease, as well as preterm delivery.

Previous preterm delivery is strongly associated with recurrence; it is important to delineate the events surrounding the preterm birth. Did the membranes rupture before labor? Were there painful uterine contractions? Was there bleeding? Were there fetal abnormalities? What was the neonatal outcome? All these questions are vital in determining the etiology and prognosis of the condition, although specific recommendations will vary and the efficacy of routine prevention programs is not clear. In patients with a previous premature delivery, after preterm labor or premature rupture of membranes, progesterone administration reduces the recurrence risk.^{48,49} Diethylstilbestrol (DES) exposure, incompetent cervix, and uterine anomalies are all conditions that may be known from a previous pregnancy. Previous fetal macrosomia makes glucose screening essential.

After all the specific questions, it is recommended to ask the patient a few simple questions: What important items haven't I asked? What else about you and your pregnancy do I need to know? What problems and questions do you have? Leaving time for open-ended questions is the best way to complete the initial visit.

Physical and Laboratory Evaluation

Physical examination should include a general physical examination, as well as a pelvic examination. Baseline height and weight and prepregnancy weight are recorded. Special attention should be given to the initial vital signs and cardiac examination, because many healthy young women have not had a physical examination immediately before becoming pregnant. Any physical finding that might have an impact on pregnancy or that might be affected by pregnancy should be defined. It is particularly important to perform and record a complete physical examination at this initial visit, because less emphasis will be placed on nonobstetrical portions of the examination as pregnancy progresses in the absence of specific problems or complaints.

The pelvic examination should focus on the uterine size. Before 12 to 14 weeks, size can give a fairly accurate estimate of gestational age in a thin patient. Papanicolaou smear and culture for gonorrhea and chlamydia are done. Bacterial vaginosis should be recognized. The cervix should be carefully palpated, and any deviation from normal should be noted. Clinical pelvimetry should be performed and the clinical impression of adequacy noted. The pelvic examination is limited by examiner and patient variation, as well as by obesity. If there is difficulty in examining the uterus, an ultrasound study is indicated.

Basic laboratory studies are routinely performed (see Table 6-2). Some studies need not be repeated if recent normal values have been obtained, such as at a preconceptional visit or a recent gynecologic or infertility examination. Blood studies should include Rh type and screening for irregular antibodies, hemoglobin level, or hematocrit and serologic tests for syphilis and rubella. A urine sample should be obtained and tested for abnormal protein and glucose levels. Screening for asymptomatic bacteriuria has been traditionally done by urine culture, but screening may be simplified by testing for nitrites and leukocyte esterase.⁵⁰ Tuberculosis screening should also be performed in areas of disease prevalence.

First trimester screening, a multiple marker screen, uses sonographic evaluation of nuchal translucency and biochemical markers (PAPP-A and free β hCG) to allow earlier screening for chromosomal aberrations. It is offered between 11 and 14 weeks.⁵¹ The QUAD test (α -fetoprotein, human chorionic gonadotropin [hCG], estriol, and inhibin A) or maternal serum α -fetoprotein screening is offered from 15 to 20 weeks' gestation to screen for NTDs and aneuploidy⁵² (see Chapter 10). Patients who undergo first trimester screening require a maternal serum α -fetoprotein level after 15 weeks for NTDs screening. The integrated screen combines first and second trimester screening and gives the result only after the second trimester evaluation is completed.

The laboratory evaluations outlined above are the minimum standard tests. Specific conditions will require further evaluation. A history of thyroid disease will lead to thyroid function testing. Anticonvulsant therapy requires blood level studies to determine adequacy of medication. The importance of compliance with dosing and serial evaluation of serum blood levels should be emphasized as both thyroid medications and anticonvulsant levels are sensitive to the physiologic changes in blood volume that occur

during pregnancy. Adequacy of replacement and/or blood levels will need to be monitored throughout pregnancy. Identification of problems on screening (e.g., anemia, abnormal glucose screen) will mandate further testing. Screening for varicella has been suggested for women with no known history of chickenpox. The ACOG has recommended routine screening of all pregnant women for hepatitis B.⁵³ HIV screening should also be offered, because maternal therapy with antiretroviral agents can reduce vertical transmission (see Chapter 50).⁵³ Hepatitis C and CMV screening should be considered for at-risk populations. Recommendations for the content of prenatal care are summarized in Table 6-3. Note that these recommendations are drawn from various sources, most are based on expert opinion, and although similar are not entirely in agreement with regard to all recommendations.⁵⁴⁻⁵⁸

ASSESSMENT OF GESTATIONAL AGE

During the course of the prenatal interview, assessment of gestational age begins with the question, “What was the first day of the last menstrual period?” From that point, the establishment of an estimated date of delivery and confirmation of that date by accumulation of supportive

information remains one of the most important tasks of good prenatal care.

Human pregnancy has a duration of 280 days, measured from the first day of the last menstrual period (LMP) until delivery. The standard deviation is 14 days. It is important to remember that clinicians are measuring menstrual weeks (not conceptional weeks) with an assumption of ovulation and conception based on day 14 of a 28-day cycle. This gives pregnancy the 40-week gestational period in common clinical use. Much confusion exists among patients who try to measure pregnancy in terms of 9 months, when in fact, it is 10 ($40/4 = 10$), or who try to measure in conceptional weeks. Another problem exists in women whose menstrual cycles do not follow a 28-day cycle and who therefore do not conceive on day 14 of the menstrual cycle. The commonly used term “4 months’ pregnant” has no meaning (one does not know whether this is 16 or 20 weeks) and has no place on a contemporary prenatal record. It is often helpful to explain to patients and their families that their pregnancy will be described in terms of weeks, rather than months, and that the pregnancy can be broken into three trimesters lasting 1 to 14 weeks, 14 to 28 weeks, and 28 weeks to delivery. Every effort should be made to be consistent in usage to prevent

TABLE 6-3 RECOMMENDATIONS FOR ALL WOMEN FOR PRENATAL CARE

PRECONCEPTION OR FIRST VISIT		WEEKS								
		6-8*	14-16	24-28	32	36	38	39	40	41
History										
Medical, including genetic	X									
Psychosocial	X									
Update medical and psychosocial		X	X	X	X	X	X	X	X	X
Physical examination										
General	X									
Blood pressure	X	X	X	X	X	X	X	X	X	X
Height	X									
Weight	X	X	X	X	X	X	X	X	X	X
Height and weight profile	X									
Pelvic examination and pelvimetry	X	X								
Breast examination	X	X								
Fundal height			X	X	X	X	X	X	X	X
Fetal position and heart rate			X	X	X	X	X	X	X	X
Cervical examination	X									
Laboratory tests										
Hemoglobin or hematocrit	X	X		X		X				
Rh factor, type blood	X									
Antibody screen	X			X						
Pap smear	X									
Diabetic screen				X						
MSAFP			X							
Urine										
• Dipstick	X									
• Protein	X									
• Sugar	X									
• Culture		X								
Infections										
Rubella titer	X									
Syphilis test	X									
Gonococcal culture	X	X				X				
Hepatitis B	X									
HIV (offered)	X	X								
Toxoplasmosis	X									
Illicit drug screen (offered)	X									
Genetic screen	X									

*If preconception care has preceded.

HIV, Human immunodeficiency virus; MSAFP, maternal serum α -fetoprotein.

confusion among patients and among clinicians who may assume care of the pregnancy.

Knowledge of gestational age is critical for obstetrical decision making. Generally, in a normal pregnancy, we can extrapolate from gestational age to estimate fetal weight. Throughout pregnancy, these are the two most important determinants of fetal viability and survival. Without accurate knowledge of gestational age, diagnosis of such conditions as postterm pregnancy and intrauterine growth restriction is often impossible. Multiple gestation is most often detected early when the size of the uterine fundus is greater than expected for gestation. Appropriate management of preterm labor or a medically complicated pregnancy depends on an accurate estimate of fetal age and weight. Within regional perinatal systems, records of gestational age are important for flow of information, and rapid access to consistent, clear data is vital. In such situations, and during prolonged hospitalization, it is sometimes helpful to define gestational age further by using the notation of fractional weeks ($27\frac{4}{7}$ weeks). It must be remembered, however, that we are describing a biologic system and that such precision is being used more for ease of communication and organization than for any ability to date the pregnancy with such a degree of accuracy.

Clinical Dating

Historically, the most reliable clinical estimator of gestational age is an accurate LMP. Using Naegele's rule, the estimated date of delivery is calculated by subtracting 3 months and adding 1 week from the first day of the LMP. A careful history must be taken from the patient verifying that the date given is the first day of the period, as well as whether the period was normal, heavy, or light. The date of the previous menstrual period will help ascertain the length of the cycle. History should also be taken about previous use of oral contraceptives, which might influence ovulation.

Other clinical tools can be used to confirm and support LMP data and, in cases in which the LMP is inaccurate or unknown, it has been shown that accumulated clinical information from early pregnancy can predict gestational age with an accuracy approaching that of menstrual dating.

The size of the uterus on early pelvic examination, or by direct measurement of the abdomen from the pubic symphysis to the top of the uterine fundus (over the curve), provides useful information. Experienced practitioners can assess the early pregnancy with reproducibility before 12 to 14 weeks. Fundal height measurement in centimeters using the over-the-curve technique approximates the gestational age from 16 to 38 weeks within 3 cm in non-obese patients.

The uterus also tends to reach the umbilicus at about 20 weeks, and this too can be assessed when uterine fundal measurements are made. The uterus may be elevated in early pregnancy in a patient with a previous cesarean delivery or with uterine myomas, making the fundal height appear abnormally high. Considerable variations in the level of the umbilicus and in the height of patients make this clinical marker variable. Quickening, the first perception of fetal movement by the mother, occurs at predictable times in gestation. In the first pregnancy, quickening is usually noted at about 19 weeks; in subsequent

pregnancies, probably because of the experience of the observer, it tends to occur about 2 weeks earlier. It is helpful to ask the woman to mark on a calendar the first time she feels the baby move and to report this date.

Audible fetal heart tones, in addition to being absolute evidence of pregnancy, are another marker of gestational age. Using an unamplified Hillis-DeLee fetoscope, they are generally audible at 19 to 20 weeks. Observer experience, acuity, and the time spent listening can all affect this number, so this guideline may need to be adapted individually.

Use of the electronic Doppler device is widespread and permits detection of the fetal heart by 11 to 12 weeks. Practitioners can set a standard individualized to their own equipment, which can be used as a gestational age marker. If fetal heart tones are not heard at the expected time, a sonogram is appropriate to look for date/examination discrepancy, fetal viability, twins, or polyhydramnios.

The conversion of a negative urinary pregnancy test to a positive one may be helpful in assessing gestational age, but the sensitivity of the test used must be known in order to interpret the data accurately. These tests may be negative if they are performed too early.

Comparison of the various clinical estimators shows a known LMP date to be the most precise predictor. The clinical estimators can be ranked according to decreasing order of accuracy as follows: (1) last menstrual period; (2) the uterus reaching umbilicus; and (3) fetal heart tone documentation, fundal height measurements, and quickening. Because of inherent biologic variability and differences in the examiner acuity, the estimated date of confinement can be predicted with 90% certainty only within ± 3 weeks by even the best single estimator.

Ultrasound

Ultrasound plays a major role in assessment of size and duration of pregnancy. The National Institutes of Health (NIH) consensus conference in 1984 concluded that in a low-risk pregnancy followed from the first trimester, routine ultrasound examination was not justified for determining gestational age. However, a long list of indications justify an ultrasound examination and studies on resource utilization indicate that at least 70% of women receive an ultrasound at some point in their pregnancy, and, importantly, women have come to expect an ultrasound as part of standard prenatal care. **With the advent of first trimester screening including nuchal translucency measurement, many women are receiving first trimester ultrasounds, and ultrasound is an accurate means of estimating gestational age in the first half of pregnancy.** The crown-rump length, biparietal diameter, and femur length in the first half of pregnancy correlate closely with age. As pregnancy progresses, fetal size varies considerably, and measurement of the fetus is a less reliable tool for estimation of gestational age, especially in the third trimester.

Recognizing that most women are receiving ultrasounds at some time in their pregnancy, the following question arises: What should be done if there is a discrepancy in the clinical dates (based on LMP) and the ultrasound dates? If ultrasound differs more than 7 days from LMP during the first trimester, or more than 10 days between 12 and 20 weeks' gestation, change the estimated due date to the

ultrasound date.⁵⁹ Issues arise when the patient is late to care and there is a size/date discrepancy. In general, one can assume an 8% margin of error in the ultrasound (measured in days).⁶⁰ Hunter⁶¹ advocates using the “rule of 8’s” in this special circumstance. Calculate the difference in dates using days based on LMP and ultrasound. Then multiply the LMP days by 0.08 (margin of error). If the difference is greater than 0.08, use the ultrasound date; if it is less than 0.08, use the LMP dates.⁶¹ It would be prudent to follow up with an interval growth scan to evaluate for growth abnormalities.

Although the benefits of routine ultrasound are widely debated, a randomized trial has shown that the risk of being called overdue was reduced from 8% to 2% for patients who received early ultrasound.⁶² Also, twins were detected more often and perinatal mortality was reduced in the ultrasound group. The Routine Antenatal Diagnostic Imaging with Ultrasound (RADIUS) study reported no improvement in perinatal outcome with use of routine ultrasound in normal, low-risk women.⁶³ However, 61% of women were excluded for many reasons such as an uncertain menstrual history, and only 35% of anomalies were detected in the ultrasound-screened group (only 17% before 24 weeks). The meta-analysis by Bucher and Schmidt indicated that routine scanning can detect many more anomalies. The authors’ practice is to perform ultrasound in the first trimester for women requesting integrated serum marker screening or if heart tones are not heard by Doppler by 11 weeks. We screen for fetal abnormality or multiple gestation at 18 to 20 weeks. If ultrasound is not done routinely, the caregiver must be vigilant in detecting problems that are indications for a scan.

REPEAT PRENATAL VISITS

A plan of visits is outlined to the patient. Traditionally, this has been every 4 weeks for the first 28 weeks of pregnancy, every 2 to 3 weeks until 36 weeks, and weekly thereafter, if the pregnancy progresses normally. The Public Health Service suggested that this number of visits can be decreased, especially in parous, healthy women, and studies suggest that this can be done safely⁶⁴ (see Table 6-1). If there are any complications, the intervals can be increased appropriately. For example, patients with hypertensive disease or at risk for preterm delivery may require weekly visits. Fetal heart tones can be documented before the 12th week by Doppler devices, and this information can be used for gestational dating purposes.

At regular visits, the patient is weighed, the blood pressure is recorded, and the presence of edema is evaluated (see Intercurrent Problems, following). Fundal height is regularly measured with a tape measure, fetal heart tones are recorded, and fetal position is noted. The goal of subsequent pregnancy visits is to assess fetal growth and maternal well-being. In addition, at each prenatal visit, time should be allowed for the following questions: Do you have any problems? Do you have any questions? Family members should be encouraged to come to prenatal visits, ask questions, and participate to the degree that the patient wishes.

A pelvic examination is usually only performed on the first visit. In patients at risk of prematurity or in those with

a history of DES exposure, however, frequent cervical checks or sonographic evaluation of cervical length may reveal premature dilation or effacement.

Further laboratory evaluations are routinely performed at 28 weeks, when the hemoglobin or hematocrit and Rh type and the screen for antibodies, as well as the serologic test for syphilis and possibly HIV testing, can be repeated. If the patient is Rh negative and unsensitized, she should receive Rhesus immune globulin (RhIG) prophylaxis at this time. A glucose screening test for diabetes is also appropriately performed at this time (see Chapter 39), and routine fetal movement counting can begin using an organized system. At 36 weeks, a repeat hematocrit, especially in those women with anemia or at risk for peripartum hemorrhage (multipara, repeat cesarean), may be performed. GBS screening should be done at 35 to 37 weeks and results made available for possible intrapartum prophylaxis. Also, appropriate cultures for sexually transmitted disease (gonorrhea, chlamydia) should be obtained as indicated in the third trimester based on geographic prevalence rates and demographic risk factors.

After 41 weeks from the last menstrual period, the patient should be entered into a screening program for fetal well-being, including electronic monitoring tests and ultrasound evaluation, or offered induction of labor if the dating is accurate (see Chapter 34).

INTERCURRENT PROBLEMS

It is the practice in prenatal care to evaluate the pregnant patient for the development of certain complications. Inherent in these checks is surveillance for intervening problems, an important one being preeclampsia. If a patient shows a blood pressure elevation at 28 weeks, for example, she should be seen again in a week, not a month. Blood pressure will change physiologically in response to pregnancy, but development of hypertension must be recognized and evaluation and hospitalization appropriately instituted.

Weight gain and obesity in pregnancy have been shown to be important predictors of pregnancy outcome. Weight gain is an important correlate of fetal weight gain and is therefore closely monitored. Too little weight gain should lead to an evaluation of nutritional factors and an assessment of associated fetal growth. Excess weight gain is one of the first signs of fluid retention, but it may also reflect increased dietary intake or decreased activity. Sixty-five percent of Americans are overweight (body mass index [BMI] ≥ 25 kg/m²) or obese (BMI ≥ 30 kg/m²).⁶⁵ Compared to women with normal weight, pregnant obese women are at increased risk of miscarriage, gestational diabetes, preeclampsia, venous thromboembolism, induced labor, cesarean delivery, anesthetic complication, and wound infections. Obese women are less likely to initiate or maintain breastfeeding. Babies of obese mothers are at increased risk of stillbirth, congenital anomalies, prematurity, macrosomia, and neonatal death.⁶⁶ Furthermore, weight gain, and weight retention after pregnancy, is a risk factor for subsequent obesity.^{6,67} Thus, postpartum weight loss should be encouraged. A study by Rooney and Schaubberger⁶⁸ demonstrated that women who resumed their pre-pregnancy weight by 6 months postpartum gained only

2.4 kg over the next 10 years as compared 8.3 kg for women who retained weight after delivery. Whereas clinicians have been inundated with teaching women that appropriate weight gain is important for pregnancy, the concomitant importance of postpartum weight loss has not been given equal attention.^{6,12,69} Likewise, interventions and public education based on this knowledge have been poorly addressed. In fact, studies suggest that prenatal care providers are not addressing diet, weight gain, or physical activity, or are giving incorrect advice.⁷⁰ Factors that contribute to excessive weight gain during pregnancy include high fat, low fiber intake, high carbohydrate or sugar intake, and decreased physical activity during pregnancy.⁷¹ Several small studies suggest that monitoring weight gain, quantity of food intake, and physical activity, combined with behavioral counseling, can limit weight gain during pregnancy and promote postpartum weight loss. However, larger randomized trials are needed to demonstrate long-term effectiveness.^{66,67}

Dependent edema is physiologic in pregnancy, but generalized or facial edema can be a first sign of disease. It is critical here, as in all areas, for the practitioner to understand the normal changes associated with pregnancy not only to accept and explain the normal changes, but also to manage aggressively any abnormal changes.

Proteinuria reflects urinary tract disease, generally either infection or glomerular dysfunction, possibly the result of preeclampsia. Urinary tract infection should be looked for, and the degree of protein quantitated in a 24-hour urine collection.

Glycosuria is common because of increased glucose filtered through the kidney in pregnancy, but warrants evaluation for diabetes with a measurement of capillary glucose when clinical suspicion exists.

Fetal abnormalities are often first detected by deviation from the clinical expectation. In some conditions, risk of fetal anomaly will be so high as to prompt some kind of baseline screening or testing (e.g., amniocentesis, sonography, fetal echocardiography). At other times, risk only becomes evident during the course of prenatal care. Growth restriction and macrosomia can often be suspected clinically, usually on the basis of an abnormality in fundal growth. For the patient who has a history of these conditions or other predisposing factors, such as hypertension, renal disease, or diabetes, particular vigilance is in order. Excess amniotic fluid is another condition that can be clinically detected, and an etiology for the hydramnios should be sought. In addition to maternal conditions, hydramnios may be caused by fetal disease that can also be defined using sonography and that may alter management of the pregnancy.

THE PRENATAL RECORD

The prenatal care record describes in a consistent fashion the comprehensive care that is provided and allows for documentation of coordinated services. Prenatal care should be documented by a prenatal record of good quality designed to systematically capture important clinical and psychosocial information over time. One such example is the antepartum record designed by ACOG. Many of the advances in risk assessment and in regionalization result

directly from an improvement in this record and electronic medical records (EMRs) are being developed.⁷² Technology allows sophisticated recording, display, and retrieval (often computer-based) of prenatal care records, but quality relies on accurate, consistent compiling and concurrent recording of the information. The record must be complete, yet simple; directive, but flexible; and transmittable, legible, and able to display necessary data rapidly. European nations often have one record for uniform care; many states and regions have adopted records to permit internal consistency.

The commonly used records accurately reflect the following:

1. Demographic data, obstetrical history
2. Medical and family history, including genetic screening
3. Baseline physical examination, with emphasis on gynecologic examination
4. Menstrual history, especially last normal menstrual period with documentation of established due date and reference criteria for dating if other than LMP
5. Record of individual visits
6. Routine laboratory data (e.g., Rh, GBS, rapid plasma reagin (RPR), rubella, hepatitis, and HIV)
7. Problem list
8. Space for special notations and plans (e.g., planned VBAC or repeat cesarean, tubal ligation)

These records must be made available to consultants, and they should be available at the facility where delivery is planned. If transfer is expected, a copy of the prenatal record should accompany the patient.

PRENATAL EDUCATION

Patient education leads to better self-care. As maternal and neonatal outcomes improve, efforts become more sophisticated to improve understanding, involvement, and satisfaction with pregnancy and the perinatal period. In this area, more than any other, the options for paramedical support have expanded. Practitioners and patients have access to a vast array of support persons and groups to assist and advise in the pregnancy and subsequent parenthood. Group prenatal care has recently been proposed and evaluated. The wise practitioner stays abreast of these advances and integrates them into practice. Patients should be educated about care options and participate in decision making. Although not exhaustive, the following section includes common issues or concerns that practitioners should address at some point during successive prenatal visits as part of their health education, promotion, and prevention goals with each patient.

Informed Consent and VBAC

During the educational components of prenatal care there is significant opportunity to accomplish most if not all the informed consent required for the delivery process. There are also advantages to securing documentation of appropriate informed consent for management of labor and associated obstetrical procedures, possible interventions, and risks and benefits when they can be thoroughly reviewed and discussed rather than in the throes of labor. It is our practice to obtain consent, whenever possible, in the third

trimester for “delivery and related procedures including IV fluids, fetal monitoring, labor augmentation, episiotomy, operative vaginal delivery including forceps and vacuum, and cesarean delivery,” and this is documented on institutional consent forms and signed by the patient. Consent for anesthesia can also be obtained before admission. Risks such as third- and fourth-degree lacerations with episiotomy and operative delivery are appropriate to discuss, as well as the benefits of birth spacing and contraceptive options. Maternal, newborn, and familial benefits have been associated with optimal birth spacing—estimated to be approximately 2 to 5 years. Short pregnancy intervals are associated with increased low birth weight, preterm birth, and other adverse pregnancy outcomes attributed to decreased maternal reserves, whereas prolonged birth spacing has been associated with increased risk of breast cancer, preeclampsia, and stillbirths. The benefits of intermediate birth spacing needs to be emphasized by health care practitioners and more widely disseminated. It is associated with improved maternal health (decreased risk of uterine rupture, endometritis, antepartum bleeding, anemia, depression), improved child health (decreased childhood illnesses, injuries, death, improved education), and improved family health, functioning, and socioeconomic status.^{73,74} Although contraceptive options are numerous, tubal ligation is the most common method in the United States. If tubal ligation is offered, the risks, benefits, and alternatives of postpartum versus interval ligation should be discussed.

The special benefits and risks of vaginal birth after cesarean section are particularly important to discuss before labor, and it is common to document both the components of the informed consent process and the patient's choice with respect to route of delivery.

Smoking Cessation

Smoking has a demonstrated dose-response relationship to impaired fetal growth. Smoking cessation or reduction can reverse this growth disturbance. The likelihood of interventions to stop or reduce smoking are increased during pregnancy. Every effort should be made to identify prepregnancy and pregnant smokers and provide both pharmacologic and psychosocial interventions and programs to maximize likelihood of smoking cessation (see Chapter 8).

Drugs and Teratogens

At the preconceptional or first prenatal visit, recommendations for nonpharmacologic remedies for common ailments can be given. This can often be integrated into a discussion of the common side effects of pregnancy. Because of widespread use of over-the-counter drugs, the patient should be warned to take only those drugs specifically approved or prescribed by her practitioner (see Chapter 8). Likewise, the patient should be advised to inform her practitioner about all natural or herbal supplements that are being used. Practitioners should be aware of current studies estimating that roughly 40% to 87% of women have used complementary and alternative medicines (including herbal therapy).⁷⁵

Radiologic Studies

Elective radiologic studies can safely be delayed until completion of the pregnancy; however, dental and

radiologic diagnostic procedures should be performed during pregnancy when they are indicated with proper shielding of the abdomen. Tests to evaluate life-threatening events such as thromboembolic phenomenon, or as needed for trauma evaluation, particularly should not be deferred as this could put the mother's health at undue risk. Judicious use of pulmonary perfusion scans, spiral computed tomography (CT), and magnetic resonance imaging (MRI) have been life-saving for pregnant women with minimal radiation exposure risks. Dental restorative work especially should be performed to allow optimal maternal nutrition (see Chapter 8).

Nutrition

One of the earliest purposes of prenatal care was to counsel and ensure that women received adequate nutrition for pregnancy. The health care provider may be influential in correcting inappropriate dietary habits. Strict vegetarians may need supplemental vitamin B₁₂. Occasionally, consultation with a registered dietitian may be necessary when there is poor compliance or a special medical need such as diabetes mellitus.

Dietary allowances for most substances increase during pregnancy. According to the 1989 recommended dietary allowances (RDAs), only the recommendations for iron, folic acid, and vitamin D double during gestation.⁷⁶ The RDA for calcium and phosphorus increase by half; the RDA for pyridoxine and thiamine increase by about one third. The RDA for protein, zinc, and riboflavin increase by about one fourth. The RDA for all other nutrients except vitamin A increase by less than 20% (Tables 6-4 and 6-5) and vitamin A not at all, as that is believed to be stored adequately. All of these nutrients, with the exception of iron, are supplied by a well-balanced diet.

The National Academy of Sciences currently recommends that 30 mg of ferrous iron supplements be given to pregnant women daily, because the iron content of the habitual American diet and the iron stores of many women are not sufficient to provide the increased iron required during pregnancy. For those at high nutritional risk, such as some adolescents, those with multiple gestation, heavy cigarette smokers, and drug and alcohol abusers, a vitamin/mineral supplement should be given. Increased iron is needed both for the fetal needs and for the increased maternal blood volume. Thus, iron-containing foods should also be encouraged. Iron is found in liver, red meats, eggs, dried beans, leafy green vegetables, whole-grain enriched bread and cereal, and dried fruits. The 30-mg iron supplement is contained in approximately 150 mg of ferrous sulfate, 300 mg of ferrous gluconate, or 100 mg of ferrous fumarate. Taking iron between meals on an empty stomach will facilitate its absorption.

Because women of higher socioeconomic status have better reproductive performance and fewer low-birth-weight babies than do women of lower socioeconomic status, and because they also consume more protein, it is probably prudent to continue to recommend a generous amount of dietary protein. However, protein supplementation does not improve pregnancy outcome. Acute caloric restriction in a well-nourished population such as occurred during the Dutch famine of 1944 to 1945 caused the average birth weight to drop about 250 g, yet no adverse effect on long-term outcome was observed. These mothers

Pregnancy Information

Both the obstetric patient and her physicians and nurses want the same things for every pregnancy. They are: a comfortable pregnancy free of complications, an easy labor and delivery, and a healthy mother and baby when all is over. In our practice, to a greater or lesser extent, most patients achieve such outcomes. Complications can occur, however, and bad things at times do happen to good people.

The rationale for prenatal care is to prevent complications if possible, to identify complications if they occur, and to manage identified complications so as to minimize their adverse effects. Much of this is our job, but it is your job to keep your appointments, to avoid exposures to chemicals and drugs of abuse including cigarettes, and to use your seatbelts.

Mother Although pregnancy is a stress on you, most women tolerate pregnancy well. Depending on your situation, we may recommend a modification of your activities. Death of the mother during pregnancy is very unusual, but can occur either in mothers with serious underlying illnesses or from rare, but extremely serious obstetric problems. Other risks to the mother include organ injuries (for example, rectum or bladder), infections and hemorrhage. You may require blood transfusions if you have heavy bleeding. Blood is very safe, and the donors are tested for AIDS and hepatitis, but the risk of acquiring infections from blood transfusions is not zero. This is why we are conservative in our use of blood products.

Baby Babies are healthiest if they are full term and appropriately grown. This is why we will instruct you about warning signs of premature labor (cramping, intermittent back pain, vaginal spotting or change in discharge, and pressure in the pelvis), and why we measure the uterus (to get an idea of the size of the baby) at the time of your prenatal visits.

In the latter part of pregnancy, if you are worried about a decrease or lack of the baby's movements, call it to our attention promptly. Do not wait for your next appointment.

All parents fear malformations or birth defects. Although often these can be identified by testing, this is not always so. For example, just because an ultrasound examination does not indicate a particular problem, this does not mean with certainty that it is not there. One in 25 babies is born with a malformation. Many of these are minor or can be successfully corrected.

Cesarean Birth Fifteen to twenty percent of patients in our hospital are delivered by this operation. This is a very safe operation, but is a major operation nonetheless. Cesareans are done for complications in the mother or baby, and are only done with your permission. Risks include injury to normal structures, hemorrhage, infection, and anesthetic complications. Most of these can be managed without lasting harm, but occasionally are associated with the need for additional surgery, including hysterectomy, or with continuing difficulties. Rarely, death or severe, permanent problems, including brain damage, may result.

VBAC Most women with previous cesarean births are candidates for attempted vaginal birth after cesarean, or VBAC. Most women successfully complete VBAC trials. If so, the discomforts and risks of cesarean birth are avoided. Approximately one-quarter to one-third of the time, the VBAC attempt will be unsuccessful, and repeat cesarean birth will be required. The most serious complication specifically attributable to VBAC is rupture of the uterus. This occurs less than 1% of the time, but is serious for both mother and baby and emergency surgery is required.

The purpose of the preceding paragraphs is not to frighten you, but to make certain you understand that complications can occur. We will be happy to answer your questions regarding this pregnancy information today or in the future.

I have read the above information and have had opportunity to have my questions answered. I realize that the practice of obstetrics is not an exact science and that no guarantees have been made.

PATIENT: _____

PHYSICIAN: _____

UNIVERSITY OF MICHIGAN HOSPITALS

Department of Obstetrics & Gynecology
 Consent Form for
 Trial of Labor/Repeat Cesarean Section

Date: _____

You have had a previous cesarean section. Although “once a cesarean always a cesarean section” used to be the rule, some women may choose to attempt a vaginal delivery, called a “trial of labor.” The American College of Obstetricians and Gynecologists recommend that women with one previous cesarean delivery with a low transverse incision should be encouraged to attempt labor.

Your doctor or nurse-midwife will review the records of your cesarean section to determine whether or not you may safely attempt labor. A safe attempt to deliver vaginally is based on the type of uterine scar that you have. The previous incision in your uterus may have been transverse (back and forth) or vertical (up and down); this may be different from the incision in your skin.



Some vertical incisions are known to be weaker and at greater risk of opening or rupturing during labor. Therefore, women with vertical uterine scars should not be allowed to labor. If you have had more than one cesarean section, it will be necessary to examine the operative note from each of your deliveries.

Large studies have found a success rate of vaginal deliveries in 70%–80% for women who have a trial of labor. The alternative to a trial of labor is to have a repeat cesarean section, without labor. Most obstetricians recommend a repeat cesarean section if the baby is expected to be very large, if the baby is in a breech or transverse position, or for twins.

There are benefits and risks of a trial of labor. The benefits of vaginal delivery after cesarean section include a shorter hospital stay and recovery period for you. A vaginal delivery is considered safer than a cesarean section for the mother, with less blood loss and less risk of infection. The baby may benefit from vaginal birth by less remaining lung fluid after the first breath.

The risks of vaginal delivery after cesarean section should be understood as well. You may require a cesarean section during labor. If you do, you have a higher risk of infection. Cesarean section, however, does not guarantee a healthy/normal baby. Finally, there is a small (<1%-2%) risk of the uterus opening in the area of the old incision. If this happens, it could cause distress, permanent injury, or death to your baby, excessive bleeding, and rarely may require a hysterectomy (removal of the uterus).

If you qualify for a vaginal delivery after cesarean section, then you may choose to either plan a trial of labor or a repeat cesarean section. Your doctor or nurse-midwife will answer any questions that you may have.

_____. Please initial here that you have read and understand the risks and benefits of each procedure.

I have had the opportunity to have my questions answered and I elect:

- ☐ A trial of labor,
☐ A repeat cesarean section delivery.

signature

date

witness signature

date

PS2317 7/98 MEDICAL RECORDS

University of Michigan
 Medical Center

TRIAL OF LABOR/REPEAT CESAREAN

E-FIGURE 6-2. Consent form for trial of labor/repeat cesarean section.

TABLE 6-4 RECOMMENDED DIETARY ALLOWANCES

	NONPREGNANT WOMEN				LACTATION (MONTHS)	
	15-18	19-24	25-50	PREGNANCY	1-6	7-12
Calories (kcal)						
Protein (g)	1244	1246	250	1260	1265	1262
Vitamin A (mcg RE)	1800	1800	800	1800	1300	1200
Vitamin D (mcg)	1210	1205	1, 25	1210	1210	1210
Vitamin E (mg TE)	1208	1208	1, 28	1210	1212	1211
Vitamin C (mg)	1260	1260	1, 60	1270	1295	1290
Thiamin (mg)	1201.1	1201.1	1, 21.1	1201.5	1201.6	1201.6
Riboflavin (mg)	1201.3	1201.3	1, 21.3	1201.6	1201.8	1201.7
Niacin (mg NE)	1215	1215	1, 15	1217	1220	1220
Vitamin B ₆ (mg)	1201.5	1201.6	1, 21.6	1212.2	1202.1	1202.1
Folate (mcg)	1180	1180	180	1400	1280	1260
Vitamin B ₁₂ (mcg)	1202.0	1202.0	1, 22.0	1202.2	1202.6	1202.6
Calcium (mg)	1200	1200	800	1200	1200	1200
Phosphorus (mg)	1200	1200	800	1200	1200	1200
Magnesium (mg)	1300	1280	280	1320	1355	1340
Iron (mg)	1215	1215	1, 15	1230	1215	1215
Zinc (mg)	1212	1212	1, 12	1215	1219	1216
Iodine (mcg)	1150	1150	150	1175	1200	1200
Selenium (mcg)	1250	1255	1, 55	1265	1275	1275

Data from Spitzer RL, Williams JBW, Kroenke K, et al: Utility of a new procedure for diagnosing mental disorders in primary care. JAMA 272:1749, 1994.

TABLE 6-5 SUMMARY OF RECOMMENDED DIETARY ALLOWANCES FOR WOMEN AGED ≥25-50 YEARS, CHANGES FROM NONPREGNANT TO PREGNANT, AND FOOD SOURCES

NUTRIENT	NONPREGNANT	PREGNANT	PERCENT INCREASE	DIETARY SOURCES
Energy (kcal)	2200.6	2500.6	+13.6	Proteins, carbohydrates, fats
Protein (g)	2250.6	2560.6	+20.6	Meats, fish, poultry, dairy
Calcium (mg)	2800.6	1200.6	+50.6	Dairy products
Phosphorus (mg)	2800.6	1200.6	+50.6	Meats
Magnesium (mg)	2280.6	1320.6	+14.3	Seafood, legumes, grains
Iron (mg)	2215.6	1230.6	+100.6	Meats, eggs, grains
Zinc (mg)	2212.6	2515.6	+25.6	Meats, seafood, eggs
Iodine (mcg)	1150.6	1175.6	+16.7	Iodized salt, seafood
Vitamin A (mcg RE)	1800.6	1800.6	+100.6	Dark green, yellow, or orange fruits and vegetables, liver
Vitamin D (IU)	1200.6	1400.6	+100.6	Fortified dairy products
Thiamin (mg)	1201.2	1201.5	+36.3	Enriched grains, pork
Riboflavin (mg)	1201.3	1201.6	+23.2	Meats, liver, enriched grains
Pyridoxine (mg)	1201.6	1202.2	+37.5	Meats, liver, enriched grains
Niacin (mg NE)	1215.2	1217.2	+13.3	Meats, nuts, legumes
Vitamin B ₁₂ (mcg)	2202.0	2202.2	+10.2	Meats
Folic acid (mcg)	2180.2	2400.2	+122.2	Leafy vegetables, liver
Vitamin C (mg)	2260.2	2270.2	+16.7	Citrus fruits, tomatoes
Selenium (mcg)	2255.2	2265.2	+18.2	

From National Academy of Sciences: Recommended Dietary Allowances, ed 10. Washington, DC, National Academy Press, 1989.

ate a calorie-restricted, balanced diet in their second and third trimesters.

Weight Gain

The total weight gain recommended in pregnancy is 25 to 35 lb for normal women.⁷⁷ Underweight women may gain up to 40 lb, and overweight women should limit weight gain to 15 lb, although they do not need to gain any weight if they are morbidly obese.⁷⁸ About 2 to 3 lb are from increased fluid volume, 3 to 4 lb from increased blood volume, 1 to 2 lb from breast enlargement, 2 lb from enlargement of the uterus, and 2 lb from amniotic fluid. At term, the infant weighs approximately 6 to 8 lb and the placenta 1 to 2 lb. A 4- to 6-lb increase in maternal stores of fat and protein is important for lactation. Usually, 3 to 6 lb are gained in

the first trimester and ½ to 1 lb per week in the last two trimesters of pregnancy.

If the patient does not show a 10-lb weight gain by midpregnancy, her nutritional status should be reviewed, unless she is obese. Inadequate weight gain is associated with an increased risk of a low-birth-weight infant (Figure 6-3). Inadequate weight gain seems to have its greatest effect in women who are low or normal weight before pregnancy. Underweight mothers must gain more weight during pregnancy to produce infants of normal weight. Patients should be cautioned against weight loss during pregnancy.

When excess weight gain is noted, patients should be counseled to avoid high fat, high carbohydrate, or sugar intake, and to increase their physical activity. Rapid weight

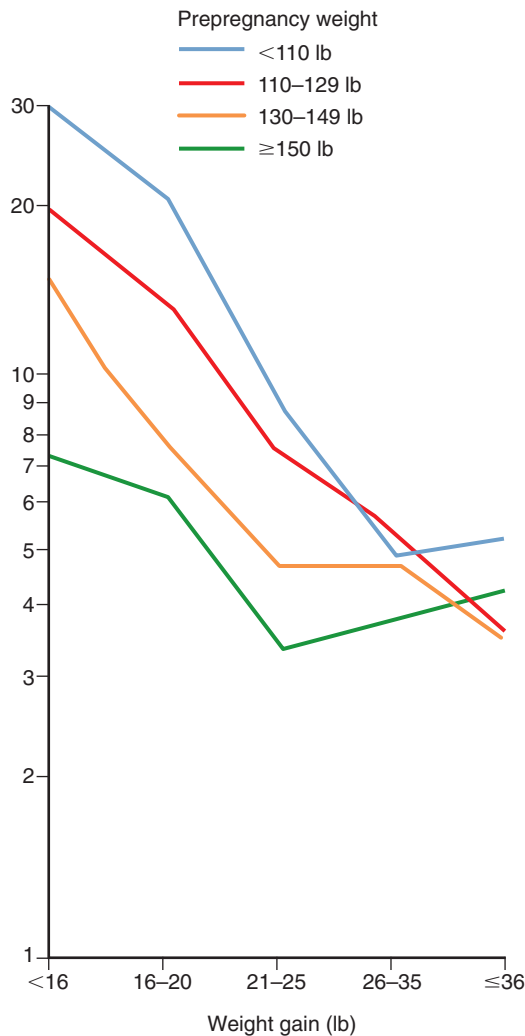


FIGURE 6-3. Percentage of live-born infants of low birth weight by maternal weight gain during pregnancy according to the mother's prepregnancy weight. *Low birth weight* is defined as birth weight of less than 2500 g or 5 lb, 8 oz. (From the National Natality Survey—United States. DHHS Pub No. [PHS] 86-1922, 1980.)

gain requires an assessment for fluid retention. In the assessment of edema, some dependent edema in the legs is normal as pregnancy advances because of venous compression by the weight of the uterus. Elevation of the feet and bedrest on the left side will help correct this problem. Turning the patient from her back to her left side increases venous return from the legs as the pressure on the vena cava is relieved. This maneuver increases the effective circulating blood volume, cardiac output, and thus the blood flow to the kidney. A diuresis will follow, as well as increased blood flow to the uterus.

Limitation of fluids will neither prevent nor correct fluid retention. Salt is not restricted, although patients with hypertension may be advised to decrease salt load.

Activity and Employment

Most patients are able to maintain their normal activity levels in pregnancy. Mothers tolerate pregnancy with considerable physical activity, such as looking after small

children, but heavy lifting and excessive physical activity should be avoided. Modification of activity level as the pregnancy progresses is seldom needed, except if the job involves physical danger. Recreational exercises should be encouraged, such as those available in prenatal exercise classes. Unfortunately, many women are routinely told to decrease their physical activity, but research on moderate aerobic activity shows no negative impact on pregnancy outcomes. In the absence of medical or obstetrical complications, current ACOG recommendations advocate for 30 minutes (or more) of moderate exercise daily.⁷⁹ A Cochrane review of aerobic exercise in pregnancy indicated improved maternal fitness, but insufficient evidence to determine if there are maternal or neonatal risks or benefits.⁴⁰

Previously sedentary women with no medical contraindications can start with 15 minutes of continuous exercise three times per week and work toward a goal of 30 minutes four times per week. With regard to exercise intensity, a good rule of thumb is the “talk test.” If a pregnant, exercising woman cannot maintain a conversation (perceived moderate intensity), she is probably overexercising. Studies suggest that women who engage in regular recreational activity have less gestational diabetes, less preeclampsia, and less low back pain/pelvic pain.⁷⁹ The patient should be counseled to discontinue activity whenever she experiences discomfort.

Healthy pregnant women may work until their delivery, if the job presents hazards no greater than those encountered in daily life. Strenuous physical exercise, standing for prolonged periods, and work on industrial machines, as well as other adverse environmental factors, may be associated with increased risk of poor pregnancy outcome, and these should be modified as necessary.⁷⁹

Travel

A pregnant woman should be advised against prolonged sitting during car or airplane travel because of the risk of venous stasis and possible thromboembolism. The usual recommendation is a maximum of 6 hours per day driving, stopping at least every 2 hours for 10 minutes to allow the patient to walk around and increase venous return from the legs. Hydration and support stockings are also recommended.

The patient should be instructed to wear her seat belt during car travel, but under the abdomen as pregnancy advances. It may also be helpful to take pillows along in a car to increase comfort. If the patient is traveling a significant distance, it might be helpful for her to carry a copy of her medical record with her in case an emergency arises in a strange environment. She should also become familiar with the medical facilities in the area or perhaps obtain the name of an obstetrician in the event of a problem.

Immunizations

Because of a theoretical risk to the fetus, pregnant women or women likely to become pregnant should not be given live, attenuated-virus vaccines. Influenza vaccination should be given during flu season.⁸⁰ Yellow fever and oral polio may be given to women exposed to these infections. Despite theoretical risks, no evidence of congenital rubella syndrome in infants born to mothers inadvertently given rubella vaccine has been reported. Measles, mumps, and

rubella viruses are not transmitted by those immunized and can be given to children of pregnant women. There is no evidence of fetal risk from inactivated virus vaccines, bacterial vaccines, toxoids, or tetanus immunoglobulin, which should be administered if appropriate. Postdelivery rubella and varicella vaccinations should be encouraged as this remains a substantial missed opportunity. Tdap is given postpartum if the patient has not received it previously, regardless of the interval since the last Td (see Chapter 22).

Nausea and Vomiting in Pregnancy

Nausea and vomiting is a common symptom of pregnancy affecting approximately 75% of pregnancies.^{81,82} Hyperemesis gravidarum is an extreme form characterized by unexplained vomiting, dehydration, and weight loss and frequently results in hospitalization.⁸¹ The exact etiology of hyperemesis gravidarum is unknown, but is believed to be related to a product of the placenta, and its occurrence is correlated with human chorionic gonadotropin (hCG) and estradiol concentration. Twin and sibling studies suggest there may be a genetic component.⁸¹ Epidemiologic risk factors include younger age, low prepregnancy body mass, female fetus, and a history of motion sickness or migraines.^{81,82} Smoking and obesity are associated with decreased risk of hyperemesis.^{81,83} If hyperemesis gravidarum occurs in a first pregnancy, the recurrence risk is approximately 15%, although this can be reduced by a change in paternity.^{81,82}

Women with hyperemesis gravidarum can have transient laboratory abnormalities including suppressed TSH or elevated free thyroxine. They can also have elevated liver enzymes, bilirubin, amylase, lipase, and altered electrolytes (loss of sodium, potassium, and chloride).⁸⁴ Women with severe hyperemesis can develop rare, severe complications such as Wernicke's encephalopathy, beriberi, central pontine myelinolysis, peripheral neuropathy, hepatic failure, or renal failure. Similarly, severe retching has been associated with Mallory-Weiss tears, esophageal rupture, pneumomediastinum, and retinal detachment.⁸¹

Fetal effects of hyperemesis gravidarum are unclear. In general, if the problem is corrected or resolves and the patient is able to gain weight, there are no consequences. However, if the woman has poor weight gain (fewer than 15 lb), the fetus is at increased risk for low birth weight and preterm birth.⁸⁵

Treatment of hyperemesis gravidarum is primarily symptomatic. There is no evidence to support an ideal diet in these cases, but women are frequently advised to eat small meals that favor protein over carbohydrates and liquids over solids.⁸⁶ **Women admitted to the hospital typically require IV hydration, and most recommend initial supplementation with thiamine (100 mg) for 3 days to prevent the possibility of Wernicke's encephalopathy.**^{81,82} Three randomized controlled trials suggest a benefit of vitamin B₆ in reducing nausea.⁸⁷ If symptoms persist, adding an antihistamine may be beneficial.⁸⁸ In addition to antihistamines, benzamides, phenothiazines, butyrophenones, type 3 serotonin receptor antagonists, and corticosteroids have all been used in the treatment of hyperemesis. Although anecdotally successful, the evidence of efficacy from randomized trials is inconclusive.^{81,82} This is important to consider given that some of the agents can cause

adverse reactions including but not limited to extrapyramidal symptoms, anxiety, and depression. Alternative therapies that have been described with variable success include acupuncture and acupressure.^{81,82} Ginger has been shown in two randomized placebo-controlled trials to be effective.^{89,90}

In rare instances, patients do not respond to treatment, are unable to tolerate oral intake, and are unable to maintain or continue to lose weight. These patients may benefit from enteral or parenteral nutrition although significant complications have been described with parenteral nutrition, including infection, thrombophlebitis, and death from infection or pericardial tamponade.⁸¹ A recent study by Holmgren and colleagues⁹¹ described maternal and neonatal outcomes from 94 patients admitted with hyperemesis gravidarum and treated with medication only as compared to nasogastric tube or peripherally inserted central catheter (PICC). They found no difference in neonatal gestational age, mean birth weight, or Apgar scores, but found an increased risk of NICU admission in the PICC line group (9.1% vs. 4.1% or 0%). Of patients managed with medication, 7% (3/42) had an adverse reaction from the medication that resolved after treatment, whereas 11% (2/19) of patients had the nasogastric tube dislodged, and 66% (21/33) of patients with a PICC line required treatment for infection, thromboembolism, or both. Based on their findings, and those of others, the authors suggested that PICC lines should be avoided.⁹¹

Finally, there are patients who fail treatment and opt to terminate pregnancy. The exact incidence is unknown. However, a Web-based survey of over 800 women who agreed to be part of a hyperemesis gravidarum registry noted that 15% had at least one termination and 6% had more than one termination as a direct or indirect result of severe hyperemesis gravidarum. These women felt they were too sick to care for their family or themselves or they were concerned about the potential adverse consequences of hyperemesis gravidarum on their baby. Further, these women indicated that health care providers were uncaring or did not appear to understand or acknowledge how sick they were, suggesting that further education within the medical community about the physical and psychological burden of hyperemesis gravidarum is needed.⁹²

Heartburn

Heartburn is a common complaint in pregnancy because of relaxation of the esophageal sphincter. Overeating contributes to this problem. The patient should be advised to save part of her meal for later if she is experiencing postprandial heartburn and also not to eat immediately before lying down. Pillows at bedtime may help. If necessary, antacids may be prescribed. Liquid antacids coat the esophageal lining more effectively than do tablets. In a subset of patients, H₂ blockers may be helpful (see Chapter 8).

Restless Legs Syndrome

About 1 in 10 women will develop restless legs syndrome (RLS) during the second half of pregnancy. RLS usually occurs as women fall asleep and is characterized by tingling or other uncomfortable sensations in the lower legs, resulting in the overwhelming urge to move the legs. Unfortunately, movement, walking around, or other measures do

not relieve RLS. Iron deficiency anemia has been associated with an increased chance of RLS, and in anemic women, iron supplementation may reduce leg restlessness. Avoiding caffeine-containing drinks such as coffee, tea, or sodas in the last half of the day should also be recommended, as caffeine may increase symptoms.

Sciatica

Sciatica refers to nerve pain that shoots rapidly down from the buttocks and unilaterally down one leg, usually ending in the foot. True sciatica is rare in pregnancy, affecting only about 1% of pregnancies. True sciatica is caused either by a herniated disc or, less commonly, by uterine pressure on the sciatic nerve. In addition to pain, other signs of nerve compression include numbness in the affected leg. True sciatica should prompt referral to a neurologist or an orthopedic surgeon for further evaluation.

Carpal Tunnel Syndrome

The extra fluid retention of pregnancy can exacerbate carpal tunnel syndrome; higher weight gain during pregnancy is also a risk factor. The most common symptoms of carpal tunnel syndrome are pain and numbness in the thumb, index, and middle fingers and weakness in the muscle that moves the thumb. Between 25% and 50% of pregnant women will notice some symptoms of carpal tunnel syndrome. Treatment during pregnancy is usually limited to supportive measures such as nighttime splinting that may help reduce increased pressure on the nerve that occurs when the wrist is bent; about 80% of women will notice reduction in symptoms with splinting alone. Severe cases of carpal tunnel syndrome can be treated with steroid injections into the area around the carpal tunnel to reduce swelling and inflammation. After delivery, symptoms generally resolve within 4 weeks (see Chapter 46).

Hemorrhoids

Hemorrhoids are varicose veins of the rectum. Because straining during bowel movements contributes to their aggravation, avoidance of constipation is preventive, and prolonged sitting should also be avoided. Hemorrhoids will often regress after delivery but usually will not disappear completely.

Constipation

Constipation is physiologic during pregnancy with decreased bowel transit time, and the stool may be hardened. Dietary modification with increased bulk such as with fresh fruit and vegetables and plenty of water can usually help this problem. Constipation is aggravated by the addition of iron supplementation; if dietary measures are inadequate, patients may require stool softeners. Additional dietary fibers such as Metamucil (psyllium hydrophilic muciloid) or surface-active agents such as Colace (docusate) can be used, if indicated. Laxatives are rarely necessary.

Urinary Frequency and Incontinence

Often during the first 3 months of pregnancy, the growing uterus places increased pressure on the bladder. Urinary frequency usually will improve as the uterus rises out of the pelvis by the second trimester. However, as the head engages near the time of delivery, urinary frequency may

return as the head presses against the bladder. About 40% to 50% of women will experience urinary incontinence during their pregnancy. The risk of incontinence of urine is highest in the third trimester. The chances of experiencing incontinence are increased in multiparous women, especially those with a history of incontinence. Incontinence during pregnancy is a risk factor for persistent incontinence. If the patient experiences pain with urination or new-onset incontinence, it is appropriate to check for infection.

Round Ligament Pain

Frequently, patients will notice sharp groin pains caused by spasm of the round ligaments associated with movement. This is more frequently felt on the right side as a result of the usual dextrorotation of the uterus. The pain may be helped by application of local heat such as with hot soaks or a heating pad. Patients may awaken at night with this pain after having suddenly rolled over in their sleep without realizing it. During the daytime, however, modification of activity with gradual rising and sitting down, as well as avoidance of sudden movement, will decrease problems with this type of pain. An elastic four-way stretch can minimize movement of the uterus. Analgesics are rarely necessary.

Syncope

Compression of the veins in the legs from the advancing size of the uterus places patients at risk of venous pooling associated with prolonged standing. This may lead to syncope. Measures to avoid this possibility include wearing support stockings and exercising the calves to increase venous return. In later pregnancy, patients may have problems with supine hypotension, a distinct problem when undergoing a medical evaluation or an ultrasound examination. A left lateral tilt position with wedging below the right hip will help keep the weight of the uterus and fetus off the inferior vena cava.

Backache

Back pain is a common complaint in pregnancy affecting over 50% of women. Numerous physiologic changes of pregnancy likely contribute to the development of back pain, including ligament laxity related to relaxin and estrogen, weight gain, hyperlordosis, and anterior tilt of the pelvis. These altered biomechanics lead to mechanical strain on the lower back. Backache can be prevented to a large degree by avoidance of excessive weight gain, and a regular exercise program before pregnancy. Exercises to strengthen back muscles can also be helpful. Posture is important, and sensible shoes, not high heels, should be worn. Scheduled rest periods with elevation of the feet to flex the hips may be helpful. Other successful treatment modalities that have been described include nonelastic maternity support binders, acupuncture, aquatic exercises, and pharmacologic regimens incorporating acetaminophen, narcotics, prednisone, and rarely antiprostaglandins (if remote from term).

Sexual Activity

No restriction need generally be placed on sexual intercourse. However, the patient should be advised that pregnancy may cause changes in comfort and sexual desire.

Frequently, increased uterine activity is noted after sexual intercourse; it is unclear whether this is due to breast stimulation, female orgasm, or prostaglandins in male ejaculate. Fox and colleagues,⁹³ in a survey of 425 primiparous women, reported that over 60% of women reported sexual activity in the third trimester and up to one third engaged in sexual activity within 2 days of delivery. Studies suggest that sexual activity during pregnancy is rarely discussed, although most women feel the need to receive more information.⁹⁴ For women at risk for preterm labor or with a history of previous pregnancy loss and who note increased uterine activity after sex, use of a condom or avoidance of sexual activity may be recommended.

Circumcision

Newborn circumcision is a widely practiced elective procedure with significant variation by race/ethnicity, geographic region, education level, and religious belief. Although the medical benefits have been widely debated, recent studies suggest that circumcision offers protection against urinary tract infections, some sexually transmitted diseases, HIV transmission, cervical cancer, penile cancer, and phimosis. Despite these findings, the American Academy of Pediatrics (AAP) does not recommend routine neonatal circumcision.⁹⁵ Education in good personal foreskin hygiene offers many of the advantages of circumcision without the risks.

Circumcision in the newborn is an elective procedure and should be performed only if the infant is stable and healthy. If performed, the AAP recommends a multifaceted approach to pain management in order to reduce the observed physiologic response to the newborn's pain.⁹⁵

Breastfeeding

Breastfeeding as a public policy has been widely endorsed and supported by the Department of Health and Human Services. *Healthy People 2000 and 2010* called for 50% of mothers to breastfeed for at least 6 months. Hence, during prenatal visits, the patient should be encouraged to breastfeed her infant (see Chapter 23). Human milk is the most appropriate nutrient for human infants and also provides significant immunologic protection against infection. Infants who are breastfed have a lower incidence of infection and require fewer sick child office visits and hospitalizations than do infants who are fed formula exclusively. A myriad of other infant benefits have been reported, including but not limited to decreased incidence of sudden infant death syndrome, diabetes, otitis media, respiratory tract disease, tonsillitis, dental caries, and a host of immunologic-mediated conditions such as rheumatoid arthritis, Crohn's disease, multiple sclerosis, eczema, and allergic reactions. These benefits are greatest if the infant is exclusively breastfed for 6 months and the protection decreases in proportion to the amount of supplementation.

Maternal advantages of lactation include economy, convenience, more rapid involution of the uterus, and natural child spacing. Breastfeeding protects the mother from infections, cancer (breast, endometrial, and ovarian), osteoporosis, diabetes, and rheumatoid arthritis. The reasons a woman decides to bottle-feed should be explored, as they may be based on a misconception. For example, preterm

birth and medical problems are usually not contraindications for breastfeeding. Practitioner encouragement, liberal use of lactation consultants, and spouse and peer support will sometimes convince a hesitant mother who may then be able to nurse successfully. The American Dietetic Association recommends exclusive breastfeeding for the first 6 months and breastfeeding with complementary foods for at least 12 months as the ideal feeding pattern for infants. Studies on incidence and duration of breastfeeding indicate that U.S. women fall far short of that. Based on survey data, the United States cites initiation rates ranging from 27% to 70% and only 19% to 33% of women reporting duration of breastfeeding for at least 6 months. Initiation and duration of breastfeeding are widely influenced by age, race/ethnicity, cultural, and peer influences.

Working outside the home need not be a contraindication to breastfeeding. Many women who previously would not have considered nursing an option, such as those with careers, are now finding time to breastfeed their infants. Employer-based lactation support programs have demonstrated prolonged breastfeeding duration, as well as specific employer benefits—mothers of breastfed infants were more productive at work, missed fewer days, and used fewer health care benefits because of child care issues. Women should be aware that alternative ways of breastfeeding can be used to correspond with their work schedules. They can decrease the frequency of lactation to a few times a day in most cases and still continue to nurse. Other women may pump their breasts at work, leaving milk for the child's caretaker during the day and thus providing breast milk to the infant even more frequently. The milk may be collected in containers and, if refrigerated, is safe to use for 24 hours. For a longer duration, the milk should be frozen. Because freezing and thawing destroy the cellular content, fresh milk is preferred.

There is no need for specific nipple preparation during pregnancy. In one study, women prepared one nipple and not the other with a variety of techniques, including massage and breast creams, and found no difference in the two. Soap and drying agents should not be used on the nipples, which should be washed only with water.

Preparation for Childbirth

The introduction of childbirth education and consumerism has had significant impact on the practice of obstetrics. Studies have shown that prepared childbirth education can have a beneficial effect on labor and delivery. Although the education can be transmitted by the obstetrician at the initial visit or over a series of shorter return visits, patients have come to expect more personal involvement than to be given a book or handout to read. The appropriate place for such education has evolved to be a series of planned, structured prenatal education classes taught by informed, qualified individuals. These classes can be given in the physician's office, at the hospital, or in free-standing classes. National organizations such as the Childbirth Education Association and the American Society for Psychoprophylaxis in Obstetrics have recognized the need for such instruction and teach prepared childbirth. There are also advantages to office- and hospital-based programs, if the patient volume permits it, since specifics of management and alternatives offered by that practice or

hospital can be discussed in these programs. On the other hand, free-standing classes offer the advantage of open-endedness and of presenting many options to the patient, who can then discuss them with her care provider. Group prenatal care also can apparently serve an important education function. However, attendance at traditional childbirth classes has been waning.^{11,12} This has been attributed to various factors such as a growing preference for medicated birth including scheduled inductions and epidurals, increased elective cesareans, and a perception that the content and philosophy of childbirth education classes are not consistent with the changing needs of childbearing women.^{11,96} Many advances in family-centered practice (e.g., allowing fathers in the delivery room and operating room) have come from consumer requests and demands. Additional research is needed to understand how clinicians and educators might help inform women and their partners in the current childbirth climate. The prenatal period should be one in which the patient is exposed to information about pregnancy, normal labor and delivery, anesthesia and analgesia, obstetrical complications, and obstetrical operations (e.g., episiotomy, cesarean delivery, and forceps or vacuum delivery). Although the physician, midwife, or childbirth educator is the ideal person to transmit this information, patients have ready access to Internet, media, and peers, all of which can propagate both information and misinformation. Of concern is that many younger women enter pregnancy believing that all technology and medical interventions increase the safety and outcome for both mother and baby.¹¹

The primary purpose of childbirth education is to provide the mother with information regarding the range of interventions that could be encountered during childbirth and to empower the patient to participate in shared decision making. Late third trimester is an ideal time to obtain informed consent from the patient for her intrapartum care and management, and to discuss her concerns and preferences about childbirth. A pregnant patient often makes a list of what she would like to discuss with her practitioner in the peripartum period. Thus, the care provider can understand her needs and desires, better address these needs and desires if labor and delivery do not proceed normally or as planned, and explain why certain requests are not possible or reasonable.

Signs of Labor

It is important to instruct the patient about certain warning signs that should trigger a call to her care provider or a visit to the hospital. All women should be informed of what to do if contractions become regular, if rupture of membranes is suspected, or if vaginal bleeding occurs. Patients should be given a number to call where assistance is available 24 hours a day.

Prepared Parenthood and Support Groups

Routine classes on newborn child care and parenting should be part of the prenatal care program. Many parents are completely unprepared for the myriad of changes in their lives, and some idea of what to expect is beneficial. As pregnancy progresses, special needs can arise. Support groups for families with genetic or medical conditions such

as Down syndrome, skeletal dysplasias, preterm infants, or maternal support groups for mothers of twins or triplets, and for women who have had cesarean delivery, have all shown that they can meet the special needs of these parents. Unsuccessful pregnancies lead to special problems and needs, for which social workers, clergy, and specialized support groups can be invaluable. Miscarriage, stillbirth, and infant death are particularly devastating events, best managed by a team approach, with special attention to the grieving process. Referral to such groups as Compassionate Friends of Miscarriage, Infant Death, and Stillbirth is recommended. Careful evaluation and follow-up for depression should be part of the routine pregnancy postpartum care.

Postpartum Visit

Most patients should be seen approximately 6 weeks postpartum, sooner for complicated deliveries and/or cesarean deliveries. **The goal of this visit is to evaluate the physical and psychosocial and mental well-being of the mother, provide support and referral for breastfeeding, initiate or encourage compliance with the preferred family planning option, and to initiate preconception care for the next pregnancy.** Current estimates suggest that 82% and 58.5% of commercial and Medicaid enrollees, respectively, obtain a postpartum visit. Data suggest that maternal health after pregnancy is associated with improved child health, and so increasing compliance with postpartum visits has been identified as both a national and an international public health priority.⁹⁷⁻⁹⁹ Specific attention should be directed toward counseling about weight loss and follow-up for medical complications including heart disease, hypertension, and diabetes (conditions that may have been exacerbated by pregnancy), as well as thyroid disease and epilepsy (conditions in which medication adjustments may be required).

SUMMARY

Prenatal care is effective, if incompletely understood and studied. It provides a model for primary care services for both obstetricians/gynecologists and other primary care providers. It satisfies the Institute of Medicine criteria for primary care, as it is comprehensive and continuous, and provides coordinated services. Preconceptional care has the potential to improve pregnancy outcome if key conditions are recognized and treatment is optimal. Risk assessment, with subsequent elimination or management of risks, health education, advocacy, and disease prevention, as well as appropriate medical management of complications, remain the core of the process. Changes in number of visits and improved understanding of the successful components of prenatal care will improve services and efficiency without altering the substance of what has been developed and achieved. Prenatal care should reinforce the importance of lifelong disease surveillance and prevention, as well as active participation in personal wellness behavior for women and their families. Care providers and patients should embrace pregnancy as a teachable moment and capitalize on the potential

to directly improve the health and well-being of the mother, and indirectly improve the health and well-being of the child and family.

KEY POINTS

- ◆ Preconception and prenatal care are not only part of the pregnancy continuum that culminates in delivery, the postpartum period, and parenthood, but they should also be considered in the context of women's health throughout the life span. Importantly, this introduces the concept of interconception care—almost all health care interactions with reproductive-age women are opportunities to assess risk, promote healthy lifestyle behaviors, and identify, treat, and optimize medical and psychosocial issues that could affect pregnancy.
- ◆ Maternal mortality is the demise of any woman from any pregnancy-related cause while pregnant or within 42 days of termination of a pregnancy. The United States has not met its *Healthy People 2010* goal of 3.3 per 100,000. The current maternal mortality rate is 12.1 per 100,000 and appears to be rising, with significant ethnic disparity.
- ◆ Preconception evaluation should include rubella, hepatitis B, and HIV testing. In selected situations, screening should be extended to varicella, toxoplasmosis, tuberculosis, and hepatitis C. Further tests may be indicated depending on historical genetic risk factors identified.
- ◆ Preconception supplementation with folic acid can reduce the incidence of NTDs and other defects. All women of childbearing age should consume 0.4 mg of folic acid daily. Women who have had a child previously affected by an NTD should take 4 mg daily from 4 weeks before conception through the first 3 months of pregnancy.
- ◆ Tobacco, alcohol, recreational drugs, and even caffeine have been associated with adverse pregnancy outcomes. Women should be urged to stop smoking, avoid alcohol, and limit caffeine to 2 cups of coffee or cola drinks per day (200 mg/day).
- ◆ Accurate dating of pregnancy is essential to optimize screening and to minimize unnecessary interventions for management of postdate pregnancies. Ultrasound evaluation between 16 and 20 weeks allows accurate assessment of gestational age and survey for fetal abnormality and multiple gestation.
- ◆ A number of multiple marker tests are available for screening for aneuploidy in the first trimester and/or second trimester. Practitioners should be familiar with the various options and offer them to their patients irrespective of maternal age.
- ◆ The total weight gain recommended for healthy women is 25 to 35 lb. Underweight women may gain up to 40 lb, and overweight women should limit weight gain to 15 lb. Women should be monitored on overall weight gain and actively encouraged to return to prepregnancy weight during the postpartum period to minimize long-term risk of subsequent obesity.
- ◆ Most patients are able to maintain their normal activity levels in pregnancy. Mothers tolerate pregnancy with considerable physical activity, but heavy lifting and excessive physical activity should be avoided.
- ◆ The pregnant woman should be advised against prolonged sitting during car or airplane travel because of the risk of venous stasis and possible thromboembolism.
- ◆ Women with hyperemesis gravidarum can have transient laboratory abnormalities including suppressed TSH, elevated liver enzymes, bilirubin, amylase, lipase, and altered electrolytes. Treatment of hyperemesis gravidarum is primarily symptomatic. Recent studies suggest increased risks associated with rare cases requiring parenteral treatment.
- ◆ Prenatal care should include information on labor, delivery, possible operative procedures, obstetrical analgesia, breastfeeding, postpartum recovery, and contraception.
- ◆ For infant nutrition, “breast is best.” The Department of Health and Human Services and *Healthy People 2000 and 2010* called for 50% of mothers to breastfeed for at least 6 months. Human milk is the most appropriate nutrient for human infants, providing significant immunologic protection. Infants who are breastfed have a lower incidence of infection and require fewer office visits and hospitalizations than do infants who are fed formula exclusively. Other reported infant benefits include decreased incidence of sudden infant death syndrome, diabetes, otitis media, respiratory tract disease, tonsillitis, dental caries, rheumatoid arthritis, Crohn's disease, multiple sclerosis, eczema, and allergic reactions. Maternal advantages include economy, convenience, more rapid involution of the uterus, and natural child spacing. Breastfeeding protects the mother from infections, cancer (breast, endometrial, and ovarian), osteoporosis, diabetes, and rheumatoid arthritis.
- ◆ Postpartum visits and interconception visits are valuable times for ongoing risk assessment, health promotion, and screening about factors likely to affect the health of women and their families (e.g., diet, exercise, breastfeeding, family planning, substance use, depression, violence and injury prevention). Practitioners should develop the infrastructure within their practices to provide opportunities for patient education about these issues and referral as appropriate.
- ◆ Pregnancy is a “teachable moment” (naturally occurring life transition) that motivates people to adopt risk-reducing behaviors. Health care providers should capitalize on this opportunity to educate and facilitate healthy lifestyle changes and primary prevention strategies that may benefit women and their families.

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