Antepartum assessment and laboratory evaluation: The first visit
Mary Lee Barron, PhD, APRN, FNP-BC

Pages 2 and 3 of this PDF contain important updates to the text for this module.

Page 4 begins the original complete module text.
Please review this update carefully. It summarizes new clinical guidelines regarding best practices in the use of immunization and weight gain during pregnancy.

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**Update to immunizations**
Revised Appendix B in *Antepartum assessment and laboratory evaluation: The first visit:*

**Appendix B: Immune globulin and vaccine use during pregnancy**

<table>
<thead>
<tr>
<th>Recommended vaccines during pregnancy</th>
<th>Influenza: Recommended for all pregnant women (in any trimester) during flu season (October to March). Live attenuated inactivated vaccine (LAIV) preparations may NOT be used.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pertussis: Tdap immunization is recommended for every woman in every pregnancy. Optimal timing is between 27 and 36 weeks of pregnancy. If not immunized during pregnancy, women should be immunized immediately postpartum.</td>
</tr>
</tbody>
</table>

| Contraindicated/Not recommended vaccines during pregnancy | • Anthrax  
• BCG  
• Human papilloma virus (HPV)  
• Japanese encephalitis  
• Measles  
• Mumps  
• Plague*  
• Polio*  
• Rubella  
• Typhoid*  
• Varicella**  
• Yellow fever*  
• Zoster (Shingles) |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------|
|                                                         | *Risk vs. benefit: not routinely recommended except in persons at increased risk of exposure.  
**Contraindicated but no adverse outcomes reported if given in pregnancy.** |

| Indications for vaccine that are not altered by pregnancy | • Cholera  
• Hepatitis A  
• Hepatitis B  
• Meningococcus  
• Pneumococcus  
• Rabies  
• Tetanus-diphtheria |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|

| Indicated for immune globulins as post-exposure prophylaxis | • Hepatitis A  
• Hepatitis B  
• Measles  
• Rabies  
• Tetanus  
• Varicella |

CDC, 2013a; 2013b
**Update to weight gain**

The Institute of Medicine (IOM) (2009) updated its weight gain recommendations based on the revised body mass index (BMI) categories from the World Health Organization (WHO).

Revised text for Table 8:

<table>
<thead>
<tr>
<th>Status</th>
<th>BMI before pregnancy</th>
<th>Total weight gain range (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>18.5</td>
<td>28 to 40</td>
</tr>
<tr>
<td>Average weight</td>
<td>18.5 – 24.9</td>
<td>25 to 35</td>
</tr>
<tr>
<td>Overweight</td>
<td>25.0 – 29.9</td>
<td>15 to 25</td>
</tr>
<tr>
<td>Obese</td>
<td>≥30.0</td>
<td>11 to 20</td>
</tr>
</tbody>
</table>

IOM, 2009

**References**


**Update to references for genetic counseling**

The references for the most common indications for genetic counseling and prenatal diagnosis on page 9 are *Genetic issues for perinatal nurses* by Judith A. Lewis (2010), published by the March of Dimes, and *Genetic counseling* at http://www.marchofdimes.com/pregnancy/genetic-counseling.aspx
Cognitive Objectives

Upon completion of the module, the learner will be able to:

1. Identify deviations from normal pregnancy adaptation.
2. Identify risk factors that can affect perinatal outcome.
3. Identify recommended routine laboratory tests performed on pregnant women during the first prenatal visit.
4. Identify additional tests and their timing that may be indicated for a pregnant woman due to her health history, physical status, race, or cultural group.
5. Identify the following health problems by prenatal tests:
   a. Anemia
   b. Blood type and Rh factor incompatibilities
   c. Bacteriuria
   d. Diabetes
   e. Proteinuria
   f. Sexually transmitted infection
   g. Nonimmunity to rubella
   h. Hepatitis
   i. Cervical cancer
   j. Tuberculosis
   k. Some genetic disorders
6. Identify the key elements of psychological assessment in initial prenatal care.

Expected Practice Outcomes

The learner who meets the objectives and understands the key concepts of the module can be expected to:

1. Educate clients regarding normal pregnancy adaptations.
2. Identify deviations from normal pregnancy adaptation.
3. Perform an initial prenatal risk assessment.
4. Identify patients at risk for poor perinatal outcome.
5. Identify a woman at nutritional risk and refer appropriately. Increase nurse counseling role.
6. Explain to the pregnant woman and her partner/family the purpose of recommended laboratory tests and the procedures for testing.
7. Inform and explain laboratory results to the pregnant woman.
8. Recognize deviations from normal laboratory values for pregnancy.
Key Concepts

The material in this module will help the learner understand the following concepts:

1. The major purpose of maternal assessment during pregnancy is to identify deviations from normal adaptations and begin appropriate care promptly.
2. Possible problems, such as urinary tract infections and excessive nausea and vomiting, may occur due to particular adaptations during pregnancy.
3. Some preexisting maternal diseases affect adaptation to pregnancy, and pregnancy may affect disease process.
4. Cultural beliefs may strongly influence the attitudes of the pregnant woman and her family and their cooperation with care during pregnancy.
5. The initial history forms the basis of prenatal care and is reevaluated and updated as necessary throughout the pregnancy.
6. The initial prenatal assessment is thorough, taking into account cultural, nutritional, psychosocial, and physical findings to identify risk factors.
7. Substance use and abuse are major problems in our society and can have serious perinatal consequences.
8. All pregnant women should be assessed for the use of tobacco, alcohol, and other substances that may be harmful.
9. To promote maternal and fetal well-being, nurses should counsel women about exercise during pregnancy.
10. Nurses need to be able to identify factors that place the pregnant woman at nutritional risk and to refer appropriately to a registered dietitian for counseling.
11. Clinicians evaluate maternal lab values in terms of adaptation due to pregnancy.
Introduction

Early, adequate prenatal care has long been associated with improved pregnancy outcomes. Adequate prenatal care is a comprehensive process in which problems associated with pregnancy are identified and treated. Three basic components of adequate prenatal care have been identified: early and continuing risk assessment, health promotion, and medical and psychosocial intervention with follow-up (Expert Panel on the Content of Prenatal Care, 1989). Most societies place high priority on the identification of at-risk pregnancies and their surveillance (Malcus, 2004).

Adverse pregnancy outcomes include preterm birth and low birthweight—problems that respond to risk-appropriate care. Despite advances in perinatal care and technology, the underlying causes of preterm labor and low birthweight, for example, are not completely understood. However, a large body of knowledge regarding risk factors associated with prematurity and low birthweight exists. These factors include demographic, medical, obstetric, sociocultural, lifestyle, and environmental risks.
Guidelines Related to This Topic

The following guidelines provide additional information and instruction.


**Diagnosis and management of preeclampsia and eclampsia.** American College of Obstetricians and Gynecologists. 2002 Jan. NGC:003120 www.guideline.gov

**DoDNA clinical practice guideline for management of uncomplicated pregnancy.** Department of Defense, Department of Veterans Affairs and Veterans Health Administration. 2002 Oct. NGC:003062 www.guideline.gov


**Guidelines for diagnostic imaging during pregnancy.** American College of Obstetricians and Gynecologists, Committee on Obstetric Practice. (Obstet Gynecol 2004:104:647-51)

**The initial reproductive health visit.** American College of Obstetricians and Gynecologists, Committee on Adolescent Health. (Obstet Gynecol 2006:107:1215-19)


**Screening for fragile X syndrome.** American College of Obstetricians and Gynecologists, Committee on Genetics. (Obstet Gynecol 2006:107:483-5)


The Goals of Prenatal Care

Table 1 presents the goals of prenatal care; working to achieve these goals begins with the initial visit. Most women seek prenatal care after the first or second missed menstrual period.

A major goal of prenatal risk assessment is to identify women and fetuses at risk for poor perinatal outcome. Table 2 describes risk assessment during the initial prenatal visit.

Table 1. The Goals of Prenatal Care
1. Establish rapport with the woman.
2. Promote optimal health of the woman and her fetus.
3. Establish an accurate gestational age.
4. Screen and monitor the woman and her fetus for the presence and development of conditions that warrant further evaluation (risk assessment) or referral.
5. Educate the woman (and her partner) about the concerns and issues involved in pregnancy, birth and parenting.
6. Provide psychosocial assessment and referral as needed.
### Table 2. The Initial Prenatal Visit: Risk Assessment

<table>
<thead>
<tr>
<th>The Woman’s History</th>
<th>Routine Exams and Laboratory Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>- General medical history, including psychological history</td>
<td></td>
</tr>
<tr>
<td>- Medication use, including prescription, illicit and over-the-counter drugs</td>
<td></td>
</tr>
<tr>
<td>- Reproductive health history</td>
<td></td>
</tr>
<tr>
<td>- Family medical history with genetic screening, including information about the baby’s father</td>
<td></td>
</tr>
<tr>
<td>- Social/Lifestyle history</td>
<td></td>
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<tr>
<td>- Nutritional history</td>
<td></td>
</tr>
<tr>
<td>- Current pregnancy history</td>
<td></td>
</tr>
<tr>
<td>- Risk factors for intrauterine growth restriction, low birthweight, and preterm birth</td>
<td></td>
</tr>
<tr>
<td>- Environmental exposures, such as pesticides, cigarette smoke, benzene and lead</td>
<td></td>
</tr>
<tr>
<td>- Comprehensive physical exam including blood pressure, height and weight</td>
<td></td>
</tr>
<tr>
<td>- Serum testing:</td>
<td></td>
</tr>
<tr>
<td>- Complete blood count</td>
<td></td>
</tr>
<tr>
<td>- ABO and Rh typing, antibody screen</td>
<td></td>
</tr>
<tr>
<td>- Serology</td>
<td></td>
</tr>
<tr>
<td>- Rubella screen</td>
<td></td>
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<tr>
<td>- Hepatitis screen</td>
<td></td>
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<tr>
<td>- Hemoglobin electrophoresis</td>
<td></td>
</tr>
<tr>
<td>- HIV</td>
<td></td>
</tr>
<tr>
<td>- Pap smear</td>
<td></td>
</tr>
<tr>
<td>- Urine testing for asymptomatic bacteriuria</td>
<td></td>
</tr>
<tr>
<td>- Screening for sexually transmitted infections</td>
<td></td>
</tr>
</tbody>
</table>
The Health History

The woman’s history provides most of the information about the woman and her family; it is supplemented by a physical examination and laboratory evaluation. Expert history-taking skills are crucial to establishing a rapport and a good database (see Interviewing by the Perinatal Nurse by Givens and Moore, 2005, published by the March of Dimes).

To assess factors that may influence pregnancy outcome, the nurse analyzes the woman’s medical history, including health-maintenance information such as immunization status, socioeconomic status, and reproductive health history (Appendix A). Factors that alter the physiological process of pregnancy may adversely affect the health of the mother and her infant. The physiologic stress of pregnancy affects chronic conditions (e.g., diabetes, asthma, hypertension, cardiac disease), and these chronic conditions, in turn, affect the progress of pregnancy.

Previous pregnancy history is significant and may indicate risks for the current pregnancy. The nurse carefully evaluates information about preterm labor or birth, length of previous labors, gestational age, operative birth, grandmultiparity, elective or spontaneous abortion, stillbirth, and uterine and cervical anomalies. Additionally, information about major illnesses, such as pneumonia, depression, hepatitis, and rheumatic fever, is obtained. Childhood diseases and immunization status are noted.

During history taking, the nurse assesses the woman’s lifestyle, including factors such as substance abuse, smoking, caffeine intake, exercise, dental care, and nutritional patterns (how well does she take care of herself?). The woman is asked about sexually transmitted infections (STIs), including HIV/AIDS. Inquiring about use of emergency-room services and hospitalizations can lead naturally to questions about physical trauma and other safety issues, such as seat belt use. Adolescents, in particular, are likely to engage in risk-taking behaviors.

When asking the woman about safety, the nurse may also introduce the topic of domestic abuse. There is no single profile of the woman that suffers abuse, and abuse is likely to continue or escalate during pregnancy (AAP & ACOG, 2002). Prevalence studies indicate that the rate ranges between 4 percent and 8 percent. Table 3 summarizes some of the presenting patterns for domestic abuse.

<table>
<thead>
<tr>
<th>Table 3. Presenting Patterns for Domestic Abuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Unwanted pregnancy</td>
</tr>
<tr>
<td>● Late entry into prenatal care</td>
</tr>
<tr>
<td>● Missed prenatal appointments</td>
</tr>
<tr>
<td>● Substance use or abuse</td>
</tr>
<tr>
<td>● Poor weight gain and nutrition</td>
</tr>
<tr>
<td>● Multiple, repeated somatic complaints</td>
</tr>
</tbody>
</table>

(AAP & ACOG, 2002)
The nurse should select an abuse assessment tool to use with women. The Nursing Network against Violence against Women International has such a tool on its Web site. The March of Dimes nursing module *Abuse During Pregnancy* by McFarlane, Parker and Moran, 2007, includes a screening tool and a danger assessment.

### Maternal, Paternal, and Reproductive History

Maternal, paternal, and reproductive history (e.g., preeclampsia, hypertension, thyroid disease, preterm birth, fetal death, genetic disorders) may be particularly significant. Family history is the most important source of genetic information. Mutations on one or both chromosomes of a pair cause genetic mutations in fixed proportions among generations. A mutation on an individual gene can cause a genetic condition, whether it is present in a single or a double copy. Table 4 describes the three main patterns of Mendelian inheritance.

Conditions such as sickle cell disease or trait, thalassemia, and cystic fibrosis in the family of either partner may require a referral for genetic counseling and additional testing, if the woman or her partner desires. The ideal time for genetic screening is before attempting pregnancy. Counseling and testing of all pregnant women are not advisable. If the initial prenatal assessment reveals possible risk factors for the baby, the nurse should refer the woman and her partner for genetic counseling (Table 5). The most common indications for genetic counseling and prenatal diagnosis are usually maternal age and abnormal maternal serum screening. (See *Genetic Issues for Perinatal Nurses* by Williams and Lea, 2003, published by the March of Dimes, and “What Is Genetic Counseling?” on the March of Dimes Web site.)

Genetic counseling is becoming increasingly complex and has evolved into a well-recognized specialty. Our understanding of genetics and genomics in health care has changed in recent years. The term “genomics” refers to the study of all genes in the human genome, including their interactions with each other and the environment (Feetham, Thomson & Hinshaw, 2005). Evidence now indicates that not only can genes cause diseases, but they also can affect disease susceptibility and resistance, prognosis and progression, and responses to illness and their treatments. Recent findings about cystic fibrosis (CF) illustrate these concepts.

The American College of Obstetricians and Gynecologists (ACOG) recommends that the CF carrier screening test be offered to every woman as part of preconception and prenatal care (ACOG, 2005d). In 1989, scientists first reported the gene associated with CF on chromosome number 7. At the time, a single mutation, a three base-pair deletion, was found to account for about half of the people in the United States with CF. Scientists believed that a few more muta-
The term “genomics” refers to the study of all genes, including their interaction with each other and the environment. However, researchers have since described over a thousand mutations in the CF gene, accounting for 90 percent of “classical CF.”

As a more diverse population has been tested, some findings have been surprising. First, not all people with “classical CF” have mutations in the cystic fibrosis transmembrane conductance regulator (CFTR). Second, people with the same CFTR mutations can have quite different courses of disease even when they are from the same family. Third, not all people who have two mutations in the CFTR gene have “classical CF.” Fourth, the frequency of CF mutations varies from one population group to another (e.g., Ashkenazi-Jewish, 1 in 24; European-Caucasian, 1 in 25; Hispanic-American, 1 in 46; African-American, 1 in 65; Asian-American, 1 in 94) (ACOG, 2005d). Consequently, the sensitivity, specificity and predictive value of the genetic test for CF vary (Feetham, Thomson & Hinshaw, 2005). “The ability to identify carriers differs based on ethnic origin, ranging from less than 50% in Asian-Americans to up to 94% in the Ashkenazi Jewish population. Therefore, a negative carrier-screening test will reduce but not eliminate the risk of being a CF carrier” (ACOG, 2005d, p. 3).

Intensive education, planning and support are crucial in genetic counseling. As knowledge of the mechanisms of disease increases, individuals and families will need to incorporate the influence of genes, the environment and behavior into their understanding of and experiences with diagnosis, treatment and prevention (Feetham, Thomson & Hinshaw, 2005). Genetic counseling and fetal-surveillance techniques encourage a woman (and her partner) to confront difficult questions: How much and what kind of information do they want? What action, if any, will they take? What do their choices suggest about their parenting skills, self-image, and personal values? (Raines, 1996). While nurses can be knowledgeable, nonthreatening confidantes as the woman (and her partner) sort through the information and decision-making, they need to recognize the benefits, limitations and socioeconomic implications of the technology.
Cultural Assessment

Cultural assessment is an important part of prenatal care. To plan culture-specific care, the nurse should assess the woman’s beliefs, values and behaviors that relate to pregnancy and childbearing. This includes information about ethnic background, religious preferences, language, communication style, common etiquette practices, and expectations of the health care system (Olds et al., 2004).

Over the years, immigrants have come from a variety of cultures to the United States, and this trend is continuing today. According to the U.S. Census Bureau (2004), the U.S. population is becoming more diverse. Often, there are numerous cultural differences between health care providers and the patients they serve.

Cultural competence is a dynamic, multilayered process. It includes knowledge and skills that are both generic, applying across different groups, and specific to particular cultures (Callister, 2005). As they work to understand the reactions and behaviors of others, nurses and other clinicians need to be aware of their own cultural characteristics (Table 7).

When a woman is pregnant, her culture’s nutritional practices, beliefs about medication, and attitudes toward pregnancy are particularly important. For instance, a woman’s culture may view pregnancy as a natural occurrence; thus, she may not consider prenatal care to be important. Other women with different cultural backgrounds may believe that pregnancy should be carefully monitored for the best outcome. Because of her cultural background, a woman may refuse a pelvic exam or insist on a female health care provider.

Sometimes nurses must work with an interpreter to communicate with a woman. Meeting with the interpreter ahead of time to review goals and purposes can enhance the interaction. If the interpreter is male, a relative, or the child of the patient, it may not be possible to ask all questions or to be sure that they are interpreted appropriately. (See Cultural Competence in the Care of Childbearing Families by Moore and Moos, 2003, published by the March of Dimes.)
Table 7. Providing Culturally Competent Nursing Care

- Examine your personal cultural attitudes and knowledge.
- Use culturally sensitive interviewing tools, including asking the question, “Is there anything I need to know about your culture that will help me in providing care to you?”
- Foster an open, sensitive approach to health care beliefs.
- Demonstrate comfort with cultural differences.
- Develop cultural communication techniques.
- Demonstrate willingness to relinquish control and respect cultural practices, integrating them into the plan of care.
- Demonstrate RESPECT:

<table>
<thead>
<tr>
<th>R</th>
<th>E</th>
<th>S</th>
<th>P</th>
<th>E</th>
<th>C</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapport</td>
<td>should be developed</td>
<td>by understanding the patient’s point of view (avoid assumptions).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empathy</td>
<td>is important.</td>
<td>Remember that patients are seeking advice.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td>patients</td>
<td>by understanding their social context and involving their family.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partner</td>
<td>with patients</td>
<td>regarding their treatment plan and negotiate if necessary.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explain</td>
<td>or teach</td>
<td>them and verify their understanding.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultural competence</td>
<td>should be achieved</td>
<td>and the patient’s beliefs respected.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trust</td>
<td>is essential</td>
<td>and can be achieved by demonstrating patience and taking time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Callister, 2005. Reprinted with permission from Lippincott Williams & Wilkins)
Maternal Age
Maternal age is linked to pregnancy outcome. Knowledge of the risks serves as a guide for counseling women for whom age is a risk factor. Poverty is a related factor (Cunningham et al., 2005; Markovitz et al., 2005). With poor socioeconomic status, the risk of perinatal morbidity increases after age 35; with adequate income and health care, women over age 35 have only a slight increase in gestational diabetes, pregnancy-induced hypertension (PIH), placenta previa or abruption, and cesarean delivery (Cunningham et al., 2005). The incidence of Down syndrome increases with advanced maternal age.

Complications common in pregnant adolescents include low birthweight, preeclampsia, PIH, intrauterine growth restriction (IUGR), and preterm labor. Socioeconomic factors largely explain the increased risk of neonatal mortality in younger mothers (Markovitz et al., 2005).

Lifestyle Factors
Psychosocial and economic factors influence perinatal outcome. They are related to nutritional status, gestational age at entry into prenatal care, and availability of support systems.

Common-law unions illustrate the role of lifestyle in pregnancy. In many Western societies, births to women who live in an intimate relationship with a partner, but without legal marriage, have become increasingly common and widely accepted. However, pregnancy outcomes are worse among women in common-law unions than in traditional marital relationships. Also, the highest incidence of perinatal morbidity and loss occurs in families where the father is not present (Luo, Wilkins & Kramer, 2004).

Adolescence
When an adolescent (age < 20 years) becomes pregnant, she is thrust into a role for which she is often unprepared. She is at increased psychological and obstetric risk. She may delay entry into prenatal care because she is concerned about how others will react to her pregnancy, is unable to cope with the knowledge of pregnancy, or lacks a support system.

A woman’s relationship with the baby’s father is a factor in entry into prenatal care. One study has found that young women who continue to have a relationship with their baby’s father tend to enter prenatal care earlier than do teens who live with their mother and do not have a relationship with the father (Luo, Wilkins & Kramer, 2004).
Nutrition

Through nutrition education, nurses working in women’s health care are in an excellent position to improve a woman’s preconception health, prenatal health and perinatal outcome. Nutritional practices influence every pregnancy as well as a woman’s risk for diabetes mellitus, cardiovascular disease, osteoporosis, and several types of cancer. Some complications of pregnancy, such as preeclampsia, preterm birth, intrauterine growth restriction, and low birthweight, may correlate with a woman’s nutritional status. For those women with nutritional difficulties (e.g., inappropriate weight gain, gestational diabetes), the nurse should identify a registered dietitian for referral.

In 1990, the Institute of Medicine (IOM) issued recommendations for weight gain during pregnancy based on prepregnancy body-mass index (BMI) (Table 8). Many professional organizations in the United States have endorsed the recommendations, and several studies have validated them, demonstrating that weight gain in accordance with IOM guidance is associated with optimal birthweight and obstetric outcomes (Hickey et al., 1996; Parker & Abrams, 1992; Siega-Riz, Adair & Hobel, 1994).

<table>
<thead>
<tr>
<th>Status</th>
<th>BMI Before Pregnancy</th>
<th>Pounds/Kilograms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt;19.8</td>
<td>28-40 lb (12.7-18.2 kg) + 25 lbs</td>
</tr>
<tr>
<td>Average weight</td>
<td>19.8-26</td>
<td>25-35 lb (11.4-15.9 kg)</td>
</tr>
<tr>
<td>Overweight</td>
<td>25-29</td>
<td>15-25 lb (6.8-11.4 kg)</td>
</tr>
<tr>
<td>Obese</td>
<td>&gt;29</td>
<td>15 lb (6.8 kg)</td>
</tr>
<tr>
<td>Twin gestation</td>
<td>35-45 lb (15.9-20.4 kg)</td>
<td></td>
</tr>
</tbody>
</table>

*(IOM, 1990)*
Stotland et al. (2005) found that prepregnancy BMI was the strongest predictor of maternal weight gain outside the IOM recommendations. Women with low BMI before pregnancy had the highest risk for inadequate weight gain. Conversely, women with high BMI before pregnancy had the highest risk for excessive weight gain. Before recommending any intervention, however, the nurse should interview the woman about factors that may contribute to inadequate or excessive weight gain (e.g., stress, infection, other medical problems, lack of money to buy food).

Stotland et al. (2005) also identified three other factors that increase the likelihood that women will gain less than the amounts recommended by the IOM: being of African-American or Latina background, reporting that a provider advised weight gain less than the IOM recommendation, and possessing a low educational level. Low weight gains among African-American and Latina women persisted even when controlling for educational status. Compared to people with good health literacy, people with poor health literacy have less health knowledge, poorer health status, and less use of health services.

Nutrition assessment includes diet information (1- to 3-day recall), weight-gain monitoring, and hematologic assessment. The woman's usual dietary routine provides a basis for understanding her nutritional health. Table 9 describes risk factors for nutritional problems.

<table>
<thead>
<tr>
<th>Table 9. Risk Factors for Poor Nutrition in Pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Adolescence</td>
</tr>
<tr>
<td>• Low income</td>
</tr>
<tr>
<td>• Cigarette smoking</td>
</tr>
<tr>
<td>• Substance use or abuse</td>
</tr>
<tr>
<td>• Frequent dieting</td>
</tr>
<tr>
<td>• Vegan diet</td>
</tr>
<tr>
<td>• Pica</td>
</tr>
<tr>
<td>• High parity</td>
</tr>
<tr>
<td>• Mental illness, including depression</td>
</tr>
<tr>
<td>• Use of certain medications, such as phenytoin</td>
</tr>
<tr>
<td>• Mental retardation</td>
</tr>
<tr>
<td>• Chronic diseases</td>
</tr>
<tr>
<td>• Eating disorders</td>
</tr>
</tbody>
</table>

(ACOG, 1996)
Many pregnant women experience pica or olfactory cravings during pregnancy. These conditions are not limited to any one group, educational level, race, ethnic group, income level or religious belief (Cooksey, 1995). The incidence varies from culture to culture. Pica has ranged from as low as 14.4 percent in rural women of Georgia to as high as 73 percent in Kenyan women (Corbett, Ryan & Weinrich, 2003).

While some women are embarrassed to tell the clinician about pica and olfactory cravings, these conditions may significantly interfere with dietary intake of proper nutrients during pregnancy. Corbett, Ryan and Weinrich (2003) recommend that patient interviewing regarding pica should be open, directive and culturally sensitive.

As with all sensitive issues, the nurse should establish a trusting relationship with patients and allow adequate time to verbalize their concerns and share information about pica and olfactory cravings. A nonjudgmental attitude is essential for the nurse and other health team members. The clinician should help the patient understand why pica and other types of cravings may be harmful in pregnancy. Several family members may engage in pica practices, lending credibility to them and influencing the woman's attitude about their safety.

**Cigarette Smoking**

During pregnancy, nicotine affects maternal circulation and may cause vasoconstriction of uterine and placental vessels. As smoking increases, the risk of miscarriage, stillbirth and neonatal death increases. Cigarette smoking during pregnancy has been linked to an increased incidence of low birthweight, prematurity, attention deficit hyperactivity disorder (ADHD), and other behavioral and learning problems in school-age children (ACOG, 2005c). Almost 25 percent of women aged 18 to 44 years smoke cigarettes (CDC, 2003). Of particular concern is the increase in smoking among adolescent girls.

Because many women feel guilty or embarrassed about smoking, they minimize the amount they actually smoke every day when they speak to health care providers. (This pattern of behavior also applies to drinking alcohol and using illicit drugs.)

Passive smoking has recently been reported to contribute to serious upper respiratory problems, particularly among infants and young children. While women may be aware that smoking during pregnancy affects the fetus, they may not know about the potentially detrimental effects of passive smoking. Smoking relapse rates are high 1 year after pregnancy (ACOG, 2005c), thus exposing infants to the risk of passive smoke.

As with other lifestyle issues, the nurse should approach smoking in a non-judgmental manner, and then educate the patient about risks of active and passive smoking.
(For a patient education tool to help patients quit smoking, see “Smoking” on the March of Dimes Web site. For more information for health care professionals, see the fact sheet “Smoking During Pregnancy” on the March of Dimes Web site. In addition, the following organizations provide resources to help women quit smoking during pregnancy: smokefree.gov, the National Partnership to Help Pregnant Smokers Quit, and the American Legacy Foundation.)

Substance Use and Abuse

Substance abuse and abuse may have disastrous effects in pregnancy. When substance abuse occurs during pregnancy, maternal risk of abruptio placentae, preterm labor, sudden cardiac death and stroke is increased. Substance abuse affects all body systems and can cause cardiac, pulmonary, gastrointestinal and psychiatric complications. Illicit drug use is highest among women during their peak childbearing years (Misra, 2001).

Pregnant women who report any alcohol use, binge drinking, and frequent drinking are more likely to be older than 30, employed and unmarried compared to other pregnant women (Sidhu & Floyd, 2002). According to the 2002 National Survey of Drug Use and Health, 9 percent of pregnant women reported alcohol use in the month preceding the survey, 3 percent reported binge drinking, and less than 1 percent reported heavy drinking (Substance Abuse and Mental Health Services Administration, 2003).

A study using data from the Pregnancy Risk Assessment Monitoring System (PRAMS) highlights the variations across states in the prevalence of alcohol use during pregnancy (Phares et al., 2004). Eight states were studied. During the first 3 months of pregnancy, prevalence of alcohol use ranged from 3.4 percent to 9.9 percent across the states. It was less than 6 percent in six of the eight states. In seven of eight states, prevalence was highest among pregnant women who were at least 35 years old, were non-Hispanic, had more than a high school education, or had higher incomes. In four of the states, prevalence was highest among white women; in three states, use was highest among American Indian women; in one state, among black women.

Using a diverse sample, Chasnoff and colleagues (2001) developed and evaluated a brief screening instrument called 4Ps Plus to detect substance use in pregnant women receiving prenatal care (Table 10). Based on their responses, women were classified as low risk, average or high risk. Compared to a self-report measure and a urine toxicology test, the 4Ps Plus instrument was more sensitive in identifying women with a substance-use issue.)
**Exercise During Pregnancy**

Overall, exercise benefits pregnant women physically and psychologically. Many women are committed to exercising regularly and wish to continue throughout pregnancy. Prenatal and postpartum exercise classes are readily available in urban and suburban communities, with a variety of health professionals certified to teach these programs.

The American College of Obstetricians and Gynecologists has found that, in the absence of obstetrical or medical complications, moderate activity maintains cardiopulmonary and muscular fitness during pregnancy (ACOG, 2003a). Table 11 describes important ACOG recommendations about exercise during pregnancy.
In its 2003 guidelines, ACOG did not define “moderate activity.” The author believes that “moderate” may vary from one individual to another and from one pregnancy to another in the same individual. Women need advice from doctors or advanced practice nurses about the meaning of “moderate activity.”

Other Lifestyle Factors

The nurse should assess the nature of the woman’s job, her hobbies, and her residential environment. Has she been exposed to or is she likely to be exposed to potential teratogens, including toxic chemicals? What about sources of stress? Does she sit or stand continuously? Lift heavy objects? Perceive problems with air ventilation?

Women work during pregnancy for many reasons. Some continue to work out of economic necessity, often making do from paycheck to paycheck. Many strive to minimize risk factors, such as hazards in the workplace or excessive hours on the job. Activities that cause excessive fatigue (such as heavy work, job-related stress, or daily commutes of 1.5 to 2 hours per day) may stimulate uterine contractions and increase the risk of perinatal complications.
Maternal Infections

Maternal infections have long been recognized as risk factors for adverse pregnancy outcomes. Intrauterine infection and bacterial vaginosis have both been identified as risks for preterm birth. The mechanism likely involves both maternal and fetal inflammatory responses. Both maternal and neonatal infections are more common after preterm than term birth. The earlier the delivery, the more risk there is of an associated infection (Boggess, 2005).

Epidemiological, microbiological and clinical evidence supports an association between infection and preterm birth (Boggess, 2005). According to epidemiological studies of spontaneous preterm birth, births at less than 34 weeks gestation are much more likely to be accompanied by clinical or subclinical infection than those at more than 34 weeks (Boggess, 2005). Maternal genitourinary and reproductive tract infections have been implicated as a main risk factor in 15 to 25 percent of preterm deliveries. Chlamydia and bacterial vaginosis are both associated with preterm birth. Bacterial vaginosis is a gram-negative, anaerobic dominance of the vaginal flora that can result in ascending infection. It occurs in up to 20 percent of all pregnancies (Boggess, 2005). (See the fact sheet “Sexually Transmitted Infections in Pregnancy” on the March of Dimes Web site.)

Dental care during pregnancy has received more attention lately since some studies have found an association between gingivitis and preterm birth, low birthweight, and preeclampsia (Boggess et al., 2003; Lopez, Smith & Gutierrez, 2002). Gingivitis occurs in 60 to 75 percent of pregnant women, surfacing most frequently in the second trimester (Barak et al., 2003; Khader & Ta’ani, 2005). Elevated levels of the hormones estrogen and progesterone cause the gums to react differently to bacteria found in plaque (Barak et al., 2003). Symptoms include swollen red gums and bleeding when brushing the teeth. Gums infected with periodontal disease are toxic reservoirs of bacteria resulting in increased prostaglandin production (Barak et al., 2003).

Lopez, Smith and Gutierrez (2002) found that periodontal diseases in the pregnant woman significantly increase the risk of subsequent preterm birth and low birthweight. While it is important to promote good oral hygiene during routine prenatal visits, there is no convincing evidence, on the basis of existing studies, that treatment of periodontal disease will reduce the risk of preterm birth (Khader & Ta’ani, 2005). (See “Periodontal Disease and Preterm Birth” on the March of Dimes Web site.)

Viral infections during pregnancy can lead to serious consequences for both the mother and the infant, including congenital anomalies, disabilities and mortality. Currently, prenatal patients are routinely screened for rubella, hepatitis B, syphilis, Group B streptococcus (GBS), and HIV. Table 12 presents the acronym TORCH, which describes significant maternal infections. Gestational age greatly influences the likelihood of fetal infection (Sweet & Gibbs, 2002). (See the fact sheets “Sexually Transmitted Infections in Pregnancy,” “Toxoplasmosis,” and “Group B Strep Infection” on the March of Dimes Web site.)
Nurses often encounter questions regarding viral exposure and the use of vaccinations, especially influenza vaccine. Appendix B describes vaccines recommended during pregnancy.

Listeriosis has a unique predilection for pregnant women, with an estimated 17-fold increase in incidence, as compared to women who are not pregnant (Mylonakis et al., 2002). Intrauterine infection can lead to severe complications such as amnionitis, preterm labor, spontaneous abortion, stillbirth, or infection of the neonate (Mylonakis et al., 2002). Listeriosis has a high fatality rate (20 to 30 percent) in neonates.

Listeria monocytogenes is transmitted to the fetus either by crossing the placenta via the maternal blood stream or by ascending from a colonized vaginal canal. In healthy pregnant women, vaginal colonization is rare. By contrast, L. monocytogenes is commonly isolated from the vaginas of women giving birth to infants with perinatal listeriosis (CDC, 2005d).

Maternal listeriosis may be a diagnostic challenge because the signs and symptoms are flu-like. Nurses often encounter questions regarding viral exposure and the use of vaccinations, especially influenza vaccine. Appendix B describes vaccines recommended during pregnancy.

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Maternal listeriosis may be a diagnostic challenge because the signs and symptoms are flu-like including fever, muscle aches, nausea and diarrhea. Infected newborns and infants are at risk for sepsis and meningitis. When maternal listeriosis is suspected, a blood test can be done to verify the causative organism. Ampicillin or penicillin is generally recommended as the treatment of choice (CDC, 2005d).
Current Pregnancy Status

Table 13 describes the key elements of an assessment of current pregnancy status. Current pregnancy history includes information to accurately date the pregnancy, such as last menstrual period, length of menstrual cycle, method and use of family planning (if any), date of the woman’s knowledge of pregnancy, and exposure to medications, toxic substances, and dangerous environmental conditions.

<table>
<thead>
<tr>
<th>Table 13. Assessment of Current Pregnancy Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Current pregnancy history, including psychological factors, nutritional status, and any available laboratory data</td>
</tr>
<tr>
<td>- Review of symptoms that may suggest medical or pregnancy complications</td>
</tr>
<tr>
<td>- Complete physical examination</td>
</tr>
<tr>
<td>- Support systems</td>
</tr>
<tr>
<td>- Barriers to prenatal care</td>
</tr>
</tbody>
</table>

The review of potential signs and symptoms includes information about nausea and vomiting, headaches, abdominal pain, visual changes, fever, viral illness, vaginal bleeding, dysuria, back pain, cramping, and other potential issues in pregnancy.

Because pregnancy affects the entire family, assessment must be family-centered. Psychological factors to assess include the woman’s and her partner’s acceptance of the pregnancy; support systems such as her family, the partner’s family, and friends; and psychological, financial, and/or social barriers to prenatal care.

Initial Physical Examination

The initial physical examination is complete and covers each body system. The review of systems can usually be performed as the physical examination is conducted. Because physical characteristics can influence the pregnancy course and birth, particular attention is given to the anthropometric assessment, including height, weight and pelvimetry data (Witter, Caulfield & Stoltzfus, 1995). The pelvic examination includes assessment of uterine size and cervical length, a Pap smear if there is no recent smear available, and assessment for vaginitis and cervicitis. At approximately 10 to 12 weeks or later, the fetal heart rate may be auscultated.

At about 10 to 12 weeks, the fetal heart rate may be auscultated.
Initial Laboratory Evaluation

Initial Laboratory Screening

*Table 14* is a valuable tool in establishing potential risk factors (e.g., sickle cell trait or iron deficiency anemia) and providing information about the woman’s overall health. Since pregnancy induces dramatic changes in maternal body systems, laboratory findings are evaluated according to pregnancy norms rather than non-pregnancy norms.

<table>
<thead>
<tr>
<th>Test</th>
<th>Significant Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete blood count</td>
<td></td>
</tr>
<tr>
<td>Hematocrit</td>
<td>&lt;32 percent</td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>&lt;11 g/dl</td>
</tr>
<tr>
<td>MCV</td>
<td>&lt;80 percent</td>
</tr>
<tr>
<td>MCHC</td>
<td>&lt;25 percent</td>
</tr>
<tr>
<td>Platelet count</td>
<td>&lt;150,000 or &gt;400,000/mm³</td>
</tr>
<tr>
<td>WBC</td>
<td>&gt;12,000/mm³</td>
</tr>
<tr>
<td>ABO and Rh Antibody screen</td>
<td>Mother Rh negative, father Rh positive</td>
</tr>
<tr>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>Serology (RPR, VDRL)*</td>
<td>Reactive</td>
</tr>
<tr>
<td>FTA or TP-MAHA</td>
<td>Positive</td>
</tr>
<tr>
<td>Rubella</td>
<td>Titers &lt;1:8, significant rise in titer</td>
</tr>
<tr>
<td>HBsAg*</td>
<td>Positive</td>
</tr>
<tr>
<td>Hemoglobin electrophoresis (selected women)</td>
<td>Sickle cell trait/anemia (Aß, ßß)</td>
</tr>
<tr>
<td></td>
<td>Hgb C trait/anemia (AC, SC)</td>
</tr>
<tr>
<td></td>
<td>Beta thalassemia major or minor</td>
</tr>
<tr>
<td>HIV*</td>
<td>Positive</td>
</tr>
<tr>
<td>Pap smear</td>
<td>Abnormal cytology (atypical cells)</td>
</tr>
<tr>
<td>Chlamydia, gonorrhea* DNA Probe or Culture</td>
<td>Positive</td>
</tr>
<tr>
<td>Urinalysis</td>
<td>Positive nitrites, 2+ proteinuria, glucoseuria of 2+</td>
</tr>
<tr>
<td></td>
<td>+ ketones</td>
</tr>
<tr>
<td>Urine culture and sensitivity</td>
<td>Positive</td>
</tr>
<tr>
<td>Urine drug screen (if indicated)</td>
<td>Positive</td>
</tr>
</tbody>
</table>

*Recommended screening tests for STIs by the Centers for Disease Control and Prevention (CDC, 2002)*
Blood Tests

Complete Blood Count
The complete blood count (CBC) includes laboratory evaluation of hemoglobin (Hgb), hematocrit (Hct), mean corpuscular volume (MCV), mean cell hemoglobin concentration (MCHC), platelet count, white blood cell count (WBC), and differential and stained blood smears. To screen for infection and anemias and to determine clotting potential, a CBC may be ordered on the first prenatal visit and repeated at 28 and 36 weeks. A hemoglobin and hematocrit may be all that is necessary in the CBC, but in some laboratories, the cost of ordering individual tests is higher than ordering a panel. Consequently, an entire CBC may be repeated to identify women who have developed anemia, an infection, or other related pathologies. Table 14 provides the significant values for the CBC.

Red Blood Cell Indices
Blood cell indices are a group of five different blood tests: mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), MCV, Hct, and Hgb. The indices are used to establish characteristics and hemoglobin content of the red blood cells. They assist in the diagnosis and differentiation of compensated and uncompensated anemias. Combined with staining, the indices help to determine the size and color of red blood cells and to diagnose any type of anemia that may exist.

Pregnancy induces marked cardiovascular alterations with hematologic effects. The maternal plasma volume increases, achieving a maximum level at approximately 32 weeks gestation. Shortly after the plasma volume begins to rise, erythropoiesis accelerates, producing an increase in the number of red blood cells. The increased plasma volume, along with the increase in red blood cell mass, ultimately expands the maternal blood volume by as much as 35 to 45 percent (Cunningham et al., 2005). Physiologic anemia “describes” the proportionately greater increase in plasma volume as compared to the rise in red blood cells. When hemoglobin levels are less than 11 g and/or hematocrit levels are less than 32 percent, pathologic anemia is diagnosed.

Both acquired and hereditary anemias can occur during pregnancy. Women with low iron reserves and/or poor dietary intake of iron are prone to iron deficiency anemia during pregnancy, the most frequent type of acquired anemia. This anemia can occur particularly during the second trimester as the blood volume rapidly expands, triggering an increase in erythropoiesis. Acquired anemia also appears in the third trimester when iron is stored in the fetus. The serum ferritin reflects iron reserves and gives valuable information to determine if the woman is actually taking and/or absorbing the iron. Some women do not tolerate iron therapy, and several products may need to be tried. A smear for red blood cell morphology is also useful. Anemia due to lack of iron causes hypochromic (pale), microcytic (small) red blood cells. Therefore, in iron deficiency anemia, MCH, MCHC and MCV are decreased. MCV is less than 80 percent in sickle cell anemia and alpha or beta thalassemia (Wallach, 2000).
Anemia during pregnancy may also be due to acute blood loss, infections, folic acid deficiency, B12 deficiency, autoimmune hemolytic diseases, and genetic factors, such as thalassemia and sickle cell trait and disease. Hemoglobin electrophoresis and knowledge of red blood cell morphology can help determine the etiology of the anemia.

**Stained Red Blood Cell Smear**

The stained red blood cell smear is a microscopic examination that screens for abnormalities in the size, shape, color or structure of red blood cells. This blood smear is also used to assess the adequacy of platelet cells.

**White Blood Cell Count**

A white blood cell count assesses the body's ability to defend itself. It helps to determine if the body is presently threatened by infections, inflammation, or hematopoietic and hemolytic disease. The normal non-pregnant WBC ranges from 5,000 to 10,000 mm$^3$. During pregnancy, the WBC increases, ranging from 5,000 to 12,000 mm$^3$ (Cunningham et al., 2005). However, during labor and the early puerperium, the WBC in healthy women can markedly rise to as high as 25,000 mm$^3$ (Cunningham et al., 2005).

A white blood cell count above 12,000 mm$^3$ should not be interpreted as a sign of infection or other pathology in an asymptomatic pregnant woman; however, further investigation is warranted. Follow-up assessment is needed whenever the WBC falls outside the normal range. Specific tests to be ordered are based upon the woman’s history, physical examination, and the results of other laboratory tests.

**Differential Smear**

The differential smear identifies the percentage of each type of white blood cell. The ratio of polymorphonuclear agranulocytes (lymphocytes and monocytes) to the total number of polymorphonuclear granulocytes (eosinophils, neutrophils, and basophils) in pregnant and non-pregnant women is similar. However, during pregnancy, the proportion of polymorphonuclear granulocytes may alter slightly, with a slight decrease in the number of eosinophils and basophils, while the neutrophils slightly increase in number (Kee, 2004). Usually when neutrophils increase in number, there are more immature than mature cells (Holland & Young, 2001).

The laboratory may report the findings of the differential smear as a “shift to the left.” Historically, laboratories recorded the results of the differential from left to right on a written page according to the following order: immature neutrophils, mature neutrophils, eosinophils, basophils, lymphocytes, and monocytes. A shift to the left denotes that the neutrophils, in particular the immature cells, have increased in number.

The differential WBC can be useful in diagnosing or monitoring the progression of pathology. Depending on the nature of the pathology, the levels of particular types of leukocytes increase or decrease in a specific way.
Platelet Count

The non-pregnant woman normally has a platelet count of 150,000 to 400,000/mm$^3$ (Kee, 2004). During normal pregnancy, the count progressively drops. However, it rarely drops below the range for the non-pregnant woman. The decreased platelet count is due to an increased utilization of platelets during pregnancy. A low platelet count is associated with pregnancy-induced hypertension, immunologic thrombocytopenia purpura, disseminated intravascular coagulation (DIC), acquired hemolytic anemia, septicemia, and lupus erythematosus (Cunningham et al., 2005).

ABO and Rh Typing, Antibody Screen

When blood incompatibilities between the woman and her fetus exist, hemolytic disease of the fetus and newborn can occur (Table 15). Most cases of hemolytic disease are caused by Rh and ABO incompatibilities, with Rh-induced disease causing the most severe cases. Rh hemolytic disease is not likely to occur during the first pregnancy as the primary Rh immune response is characteristically slow to develop. Early identification of blood incompatibilities and appropriate medical and nursing management can reduce the incidence and severity of hemolytic disease of the fetus and newborn.

<table>
<thead>
<tr>
<th>Table 15. Potential Blood Incompatibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>- The mother has type O blood; the fetus has type A, B or AB.</td>
</tr>
<tr>
<td>- The mother is Rh negative; the fetus is Rh positive.</td>
</tr>
<tr>
<td>- The mother is negative for some other RBC antigen, like Kell, for which the fetus is positive.</td>
</tr>
</tbody>
</table>

Laboratory assessment at the first prenatal visit includes an antibody screen, blood type, and Rh. Most often an indirect Coombs test is used for the initial antibody screen, since this test is sensitive to anti-Rh antibodies. Women who test positive are then tested for the specific antibody and titer. Management in pregnancy depends on the degree to which the specific antibody is known to cause hemolytic disease in the fetus or newborn.

The Rh antigens are grouped in three pairs: Dd, Cc, and Ee. The presence of D determines that the person is Rh positive. Because d, the reciprocal of D, has never been identified, the absence of D determines that a person is Rh negative. Rh isoimmunization (i.e., the formation of serum antibodies to antigen D) can occur only when Rh positive erythrocytes enter an Rh negative person’s bloodstream. Anti-D causes hemolytic disease in the Rh-positive fetus (Moise, 2004). Isoimmunization can result when a patient is transfused with improperly matched blood or when a woman is exposed to fetal blood through induced or spontaneous abortion, ectopic pregnancy, amniocentesis, antepartal bleeding, or placental separation.
Most often the process of Rh isoimmunization begins at the time of first delivery. As the placenta separates, fetal erythrocytes leak from the villi into open maternal venous sinuses. Unless preventive measures are taken, the mother will then produce antibodies to the Rh antigen that can cause hemolytic disease in an Rh-positive fetus or newborn in future pregnancies. Specifically, when the fetus in a future pregnancy is Rh positive, maternal antibodies cross the placenta, enter fetal blood, and destroy fetal erythrocytes. Table 16 provides guidance about follow-up of Rh cases.

<table>
<thead>
<tr>
<th>Follow-up required</th>
<th>Women who are:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood type O, positive antibody screen</td>
<td></td>
</tr>
<tr>
<td>Rh negative; father is Rh positive</td>
<td></td>
</tr>
<tr>
<td>Rh negative; father’s type unknown</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Follow-up not required</th>
<th>Women who are:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rh positive, blood group A, B or AB with negative antibody screen</td>
<td></td>
</tr>
<tr>
<td>Rh negative; father is Rh negative; both have negative antibody screen</td>
<td></td>
</tr>
<tr>
<td>Rh negative, Du positive</td>
<td></td>
</tr>
</tbody>
</table>

Fortunately, administering Rho(D) immune globulin (e.g., RhoGAM) prenatally (at 28 weeks) and postpartum can usually prevent Rh isoimmunization. Table 17 describes other times when RhoGAM may be administered.

<table>
<thead>
<tr>
<th>Table 17. When to Administer RhoGAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prenatal (at 28 weeks) and postpartum administration, to prevent Rh isoimmunization</td>
</tr>
<tr>
<td>During or after all pregnancies, including ectopic pregnancies</td>
</tr>
<tr>
<td>After early miscarriages (before 12 weeks gestation)</td>
</tr>
<tr>
<td>After chorionic villus sampling, amniocentesis or cordocentesis</td>
</tr>
<tr>
<td>After external cephalic version</td>
</tr>
<tr>
<td>After injury to the abdomen</td>
</tr>
</tbody>
</table>

The Rh blood group system is much more complex than what has just been described. Thirty-five other antibodies delineate Rh antigens. Du, replacing D, is not uncommon and is found more frequently among African-Americans than in other groups. On rare occasions, a Du-positive mother carrying a D-positive fetus can produce anti-D, which can, in turn, cause hydrops fetalis.
Serology

The Centers for Disease Control and Prevention recommends universal screening of pregnant women for syphilis at the first prenatal visit (CDC, 2002). Women at increased risk should undergo repeat serologic testing at 28 weeks gestation and delivery. Most states have laws requiring antenatal syphilis testing. Syphilis is caused by *Treponema pallidum* and is primarily a sexually transmitted infection resulting from contact with syphilitic lesions. An infected mother may transmit syphilis during pregnancy to the fetus. Early prenatal detection of maternal syphilis, followed by prompt antibiotic treatment, can prevent serious consequences for the woman and her infant.

Either of two tests is used to screen for syphilis: the VDRL (Venereal Disease Research Laboratories) or the RPR (rapid plasma reagin). These tests detect the presence of nonspecific reaginic antibodies elicited by the spirochete; they are relatively inexpensive, very sensitive, moderately nonspecific, and fast. The test does not become positive until 7 to 10 days after the appearance of the chancre. The false-positive rate for pregnant women is 1 to 2 percent (Wallach, 2000). A high titer (>1:16) usually indicates active disease. A low titer (<1:8) indicates a biologic false-positive test in 90 percent of cases; occasionally, this result may be due to late or late latent syphilis.

Quantitation is always performed before the onset of treatment. A fourfold drop in the titer indicates a response to therapy. Treatment of primary syphilis usually causes a progressive decline (i.e., low titers) to a negative VDRL titer within 2 years. In secondary, late, or latent syphilis, low titers persist in approximately 50 percent of cases 2 years after treatment, despite a fall in titer. This does not indicate treatment failure or reinfection. These patients are likely to remain positive even if retreated. Titer response is unpredictable in late or latent syphilis. Rising titer (4 times) indicates relapse, reinfection, or treatment failure (Wallach, 2000).

A reactive VDRL or RPR strongly indicates that the person has syphilis, but false positives can occur in individuals with acute and chronic illnesses, such as tuberculosis, infectious mononucleosis, rheumatoid arthritis, collagen vascular diseases, chlamydia infection, and hepatitis (Wallach, 2000). The presence of anticardiolipin antibodies can cause a reactive VDRL and RPR.

To confirm the presence of *Treponema pallidum*, either the fluorescent treponemal antibody-absorption test (FTA-ABS) or the microhemagglutination assay for *Treponema pallidum* antibodies (TP-MHA) may be used. These tests specifically determine if the individual has developed antibodies to the spirochete. A seropositive result indicates that the individual has been exposed to the spirochete and has developed antibodies. Since these tests frequently remain positive even after successful treatment, clinicians use the titers of the VDRL or RPR to monitor treatment. Table 18 describes the stages of syphilis.
Rubella Screen

Rubella, also called German measles, is a viral infection that produces a rash and fever in adults and children. In the fetus, rubella has devastating effects, including eye lesions, hearing defects, heart disease, intrauterine growth restriction, enlargement of the liver and spleen, and central nervous system disorders. The incidence of congenital rubella is higher when the woman contracts rubella in the first half of her pregnancy. Also, if the woman acquires the disease shortly before conception, the fetus is at risk for congenital rubella. Although the fetus is at theoretical risk for the disease if the mother is vaccinated a month before or shortly after conception, researchers have found no evidence of congenital rubella syndrome in babies of women inadvertently vaccinated (ACOG, 2003b). At this time, there is no treatment for rubella contracted in utero.
Women who are immune to rubella, either by previous infection or vaccination, are protected from contracting the disease during pregnancy; therefore, the fetus is also protected. All pregnant women should have blood drawn for rubella titers, regardless of whether they have a history of a previous infection or vaccination. Previous exposure to the virus does not necessarily mean that a sufficient antibody titer was produced to protect the mother and fetus. Additionally, many women who have previously had a subclinical, undiagnosed case of rubella develop immunity to the virus.

The most frequently used test to detect rubella antibodies in serum is the hemagglutination inhibition test (HAI or HI). Immunity is confirmed if the rubella antibody titer is 1:8 or more (Wallach, 2000). Persons who have an “equivocal” serologic test result should be considered susceptible to rubella unless there is evidence of adequate vaccination or a subsequent serologic test result indicating rubella immunity (CDC, 2001a).

When the initial rubella titer is less than 1:8, the woman and her fetus are at risk for contracting the disease. The woman should be informed about the problems that could arise should she acquire the disease. She should immediately report any rash to the nurse or physician so that an accurate diagnosis can be made.

Diagnosis of rubella is often difficult, since it resembles a number of other exanthemas. Additionally, the disease may be subclinical, thereby infecting the fetus but not exhibiting itself clinically in the mother. If a rash occurs, repeat titers are obtained 2 to 3 weeks after onset and then again 2 weeks later. A significant rise in the titer level from the first repeat test to the second indicates that the rash was due to rubella. At this time, there is no treatment. The woman should be counseled about the impact of rubella infection on the fetus. The nurse may advise patients that tepid showers and baths may make them more comfortable.

Women without rubella immunity should be vaccinated shortly after delivery. Breastfeeding is not a contraindication to postpartum immunization (AAP, 2003). The nurse should inform women that the vaccine may result in transient arthralgias and arthritis. Women should avoid becoming pregnant for at least 3 months after the vaccination. Repeat rubella titers are needed to ascertain immunity.
Hepatitis Screening

Viral hepatitis is an inflammation of the liver caused by several different infections identified as hepatitis A, B, C, D, E and G.

Hepatitis A

Hepatitis A is the most common form. It is highly contagious, transmitted through fecal-oral exposure, and usually produces a mild, self-limited disease without any chronic sequelae. Perinatal transmission of hepatitis A virus is very rare (Sweet & Gibbs, 2002). Pregnant women are not routinely screened for hepatitis A. If they present with symptoms and/or a known exposure to the infection, they should be screened.

Hepatitis B

Hepatitis B (HBV) infection, a worldwide public health problem, occurs almost exclusively through contact with body fluids containing the virus (e.g., blood, semen, vaginal secretions). The disease may have no overt symptoms. Signs and symptoms may include nausea, vomiting, pain in the right upper quadrant of the abdomen, enlarged and tender liver, fever, chills, general weakness, and headache. Nonhepatic symptoms (rash, fever, arthralgia, myalgia and arthritis) usually precede jaundice.

Since 1998, the hepatitis vaccine has been widely used in the United States. The number of infected persons has dropped dramatically, but rates vary by population (Sweet & Gibbs, 2002). From 2000 to 2004, hepatitis B incidence among adults decreased to 2.7 per 100,000 population (CDC, 2006b). Table 19 describes abbreviations related to Hepatitis B.

<table>
<thead>
<tr>
<th>Table 19. Hepatitis B: Abbreviations</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBeAg: Hepatitis B e antigen</td>
</tr>
<tr>
<td>HBeAb: Hepatitis B e antibody</td>
</tr>
<tr>
<td>HBsAg: Hepatitis B surface antigen</td>
</tr>
<tr>
<td>HBsAb: Hepatitis B surface antibody</td>
</tr>
<tr>
<td>IgM HbcAb: Hepatitis B core antibody (IgM class-recent infection)</td>
</tr>
<tr>
<td>IgG HbcAb: Hepatitis B core antibody (IgG class-past infection)</td>
</tr>
</tbody>
</table>

Of persons infected as adults, 6 to 10 percent become chronic HBV carriers (CDC, 2006b). These persons are capable of transmitting the disease to others and are at risk for developing fatal complications. The risk of perinatal HBV infection among infants born to HBV-infected mothers ranges from 10 to 90 percent, depending on the mother’s hepatitis B e antigen (HBeAg) status. That is, mothers with e antigen-positive blood are much more likely to transmit the hepatitis B surface antigen (HBsAg) to their children than those with HBsAg-positive, e antigen-negative blood (Sweet & Gibbs, 2002). Infected newborns usually become HBV carriers and are at high risk for developing chronic liver disease.
The HBsAg test is used to screen patients for hepatitis B (Table 20). The presence of serum HBsAg indicates that the patient either has a current acute infection or is a carrier. To differentiate between infection and carrier state, an HBeAg is drawn. The presence of HBeAg indicates acute infection. Immunoglobulin M (IgM) anti-HBc appears during acute or recent HBV infection and is present for about 6 months. IgG HBcAB becomes predominant late in normal recovery and, together with HBsAb, may persist in noncarriers for many years.

### Table 20. Hepatitis B Testing and Result Interpretation

<table>
<thead>
<tr>
<th>Tests</th>
<th>Results</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBsAg Anti-HBc Anti-HBs</td>
<td>Negative Negative</td>
<td>Susceptible</td>
</tr>
<tr>
<td>HBsAg Anti-HBc Anti-HBs</td>
<td>Negative Positive</td>
<td>Immune due to natural infection</td>
</tr>
<tr>
<td>HBsAg Anti-HBc Anti-HBs</td>
<td>Negative Positive</td>
<td>Immune due to hepatitis B vaccination</td>
</tr>
<tr>
<td>HBsAg Anti-HBc IgM anti-HBc Anti-HBs</td>
<td>Positive Positive Positive Negative</td>
<td>Acutely infected</td>
</tr>
<tr>
<td>HBsAg Anti-HBc IgM anti-HBc Anti-HBs</td>
<td>Positive Positive Negative Negative</td>
<td>Chronically infected</td>
</tr>
<tr>
<td>HBsAg Anti-HBc Anti-HBs</td>
<td>Negative Positive</td>
<td>Four interpretations possible*</td>
</tr>
</tbody>
</table>

* Four Interpretations

1. May be recovering from acute HBV infection
2. May be distantly immune, and test is not sensitive enough to detect very low level of anti-HBs in serum
3. May be susceptible with a false-positive anti-HBc
4. May be undetectable level of HBsAg present in the serum and the person is actually a carrier

(CDC, 2005b)

The Centers for Disease Control and Prevention (2002) and the American College of Obstetricians and Gynecologists (1998) recommend routine prenatal screening for hepatitis B for all women, pregnant or not. Additionally, pregnancy is not a contraindication to administration of HBV or hepatitis B immune globulin (HBIG) vaccine. Women who test negative should be consid-
ered for vaccination if they have not been previously immunized. HBV vaccination is particularly recommended for persons known to be at high risk for acquiring HBV (e.g., persons with multiple sex partners, sex partners of HBV carriers, injection-drug users, persons living in endemic areas, health care workers). Additional high-risk groups include men and women recently diagnosed with another sexually transmitted infection, women whose partner is bisexual, or persons who have had more than one sex partner in the preceding 6 months (Sweet & Gibbs, 2002).

Hepatitis C

Hepatitis C (HCV) is the major cause of post-transfusion hepatitis; it was formerly known as hepatitis non-A, non-B. Since blood products are now screened for HCV in the United States, transmission of the virus is greater than 4 percent. Hepatitis C was not identified until 1989, although infectious-disease professionals recognized the existence of an agent responsible for transfusion-related hepatitis. The prevalence rate is now at 1.8 percent of the general population. Intravenous drug use accounts for 60 percent of HCV transmission. Tattoos and body piercing are another mode of transmission. Heterosexual transmission accounts for up to 16 percent of HCV infections, much less than that for hepatitis B. However, sexual transmission of HCV is more likely if HIV is co-transmitted (Sweet & Gibbs, 2002).

In pregnant women, risk factors for HCV include abusing intravenous drugs, having a history of multiple sexually transmitted infections, being infected with HBV, being a prison inmate, being 22.5 years of age or older, having a sexual partner who abuses intravenous drugs, and having three or more lifetime sexual partners (Sweet & Gibbs, 2002). Pregnancy does not alter the course of HCV infection. However, any chronic active hepatitis may lead to perinatal complications such as preterm labor.

Maternal transmission of HCV has occurred, but only at a rate of about 1 percent. Co-infection with HIV may increase the chance of maternal HCV transmission to as high as 19 percent (CDC, 2005c; Sweet & Gibbs, 2002).

Most people infected with HCV are unaware that they have the virus. HCV is usually discovered when a routine blood test shows elevated liver enzymes or when a blood donation is positive for HCV antibody. The acute phase of hepatitis C is usually asymptomatic and without jaundice. When symptoms are present, they may include anorexia, nausea, pain in the upper right quadrant of the abdomen, malaise, weakness, fatigue, arthralgias, arthritis, urticaria and myalgia.

Of those infected with HCV, 55 to 85 percent become chronic carriers. This fact accounts for the high number of chronically infected individuals who may have serious and often asymptomatic chronic liver disease (CDC, 2005c). Because vertical transmission is low, routine screening of prenatal women is not warranted (CDC, 2005c). If the health care provider suspects that the woman may have hepatitis C, then a blood test for antibodies is ordered. A third-generation enzyme-linked immunosorbent assay (ELISA) has been developed to detect HCV antibodies. However, because of the low specificity of even this third-generation test, a confirmatory test is always necessary.
Once patients are infected, their anti-HCV tests appear to remain positive indefinitely (Sweet & Gibbs, 2002). A patient with a positive test is considered infectious and capable of transmitting the disease.

Liver enzymes, specifically ALT (SGPT), continue to play an important role in the evaluation and treatment of patients with hepatitis C. ALT appears to wax and wane throughout the course of the disease, without correlation to viral activity.

**Hemoglobin Electrophoresis**

Sickle cell anemia, thalassemia major, and hemoglobin C are common autosomal-recessive hemoglobinopathies. Like other autosomal recessive disorders, a fetus is at risk for sickle cell anemia and thalassemia major if both parents are carriers of the trait. However, a milder form of anemia may exist if the individual has one normal gene and one gene for the trait. There may be a combination of traits as well. If one parent carries the sickle cell trait and the other parent carries the trait for either thalassemia or hemoglobin C, an individual has a 25 percent chance of inheriting sickle-thalassemia or hemoglobin SC disease. Sickle-thalassemia can be as severe as sickle cell anemia. Because there is less marked destruction of red blood cells and anemia in hemoglobin SC, the disorder is less severe clinically (Wallach, 2000).

A quick screening test is available to detect sickle cell trait, but it does not differentiate between those who have the disease or the trait. A hemoglobin electrophoresis (Table 21) provides more detailed information that includes the thalassemias as well as other hemoglobinopathies. These recessive inherited conditions occur in the United States primarily in families of Asian, Middle Eastern, African and Mediterranean descent. Because the prevalence rate for sickle trait is 8 to 12 percent in the United States, men of African descent are routinely screened for these disorders (Wallach, 2000).
The rate of perinatal transmission of HIV has been estimated at 50 percent in the days before delivery.

### Table 21. Hemoglobin Electrophoresis Results

<table>
<thead>
<tr>
<th>Result</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Normal adult hemoglobin</td>
</tr>
<tr>
<td>AS</td>
<td>Sickle cell trait carrier, 8 to 12 percent African-Americans</td>
</tr>
<tr>
<td>SS</td>
<td>Sickle cell disease, 1:625 African-Americans</td>
</tr>
<tr>
<td>AC</td>
<td>Hemoglobin C trait</td>
</tr>
<tr>
<td>SC</td>
<td>Sickle-C disease, 1:833 African-Americans</td>
</tr>
<tr>
<td>ASF</td>
<td>Sickle-thalassemia, 1:1,667 African-Americans Hgb S is 20 to 80 percent, Hgb F (fetal hemoglobin) is 2 to 20 percent, Hgb A is 0 to 50 percent</td>
</tr>
<tr>
<td>A2F</td>
<td>Thalassemia major; Hgb A may be detected or completely absent Beta thalassemia minor, many different forms</td>
</tr>
</tbody>
</table>

*(Wallach, 2000)*

### HIV Infection

The human immunodeficiency virus (HIV) has been identified as the infectious agent responsible for acquired immunodeficiency syndrome (AIDS). Not only is HIV infection one of the leading causes of morbidity and mortality among women, but women also account for the most rapid increases in the number of cases. About half of all cases of AIDS among women are secondary to injected-drug use, and one-third of the cases are attributed to heterosexual contact (CDC, 2002).

The exact incubation period from infection to clinical disease is unknown; however, it is usually 2 to 3 months (Wallach, 2000). HIV appears in plasma and circulating mononuclear cells 1 to several weeks after infection; HIV antibodies usually appear in 1 to 3 months. Anti-HIV antibodies develop in all patients infected with the virus and are considered evidence of infection. Antibodies may appear by 60 days, but seroconversion may not occur for more than 12 months after infection. Antibody-positive individuals can transmit the virus (Wallach, 2000).

The rate of perinatal transmission of HIV has been estimated according to time of gestation: 20 percent before 36 weeks, 50 percent in the days before delivery, and 30 percent intrapartum (Kourtis, Bulterys, & Nesheim, 2001). When HIV infection is identified early in pregnant women, treatment can reduce the risk of vertical transmission to the fetus (ACOG, 2004).

Laboratory screening for HIV is highly specific. It usually consists of an ELISA test, followed by a confirmatory test (commonly the Western blot). A false-positive result from the combination of the two tests is rare. More likely to occur is
a positive ELISA and an indeterminate or negative Western blot. The Western blot can then be repeated at a later time (1 month) to determine the woman’s status. Table 22 describes possible reasons for false-positive ELISA results.

The Western blot is a more complex test than the ELISA; it is less sensitive but more specific for HIV. The false-positive rate is 1 to 2 percent. An indeterminate Western blot may be due to (1) recent HIV infection (usually positive within 6 weeks to 6 months) or (2) loss of antibodies in an AIDS patient with advanced immunodeficiency.

An alternative confirmatory test to the Western blot is immunofluorescent antibody (IFA) staining. This test detects HIV antibodies, but it is less expensive and easier to perform than the Western blot. HIV antibodies are detectable in at least 95 percent of patients within 3 months after infection.

Since 1995, the Centers for Disease Control and Prevention has advised health care providers to encourage all pregnant women to be tested for HIV infection (CDC, 1995). In 2001, CDC modified the recommendations for pregnant women to emphasize HIV screening as a routine part of prenatal care, simplification of the testing process so pretest counseling would not pose a barrier, and flexibility of the consent process to allow multiple types of informed consent (CDC, 2001b). In addition, the 2001 recommendations for HIV testing in health care settings were extended to include multiple, additional clinical venues in both the private and public health care sectors, encouraging providers to make HIV counseling and testing more accessible and acknowledging the need for flexibility. The CDC recommended that HIV testing be offered routinely to all patients in high HIV-prevalence health care settings. In low prevalence settings, in which the majority of clients are at minimal risk, targeted HIV testing on the basis of risk screening was considered more feasible for identifying limited numbers of HIV-infected women.

Recently, the CDC has issued new guidelines advocating a more aggressive approach to identify pregnant women who are HIV positive (CDC, 2006c). The objectives of these recommendations are to increase HIV screening of patients, including pregnant women, in health care settings; foster earlier detection of HIV infection; identify and counsel persons with unrecognized HIV infection and link them to clinical and prevention services; and further reduce perinatal transmission of HIV in the United States.
Waiting for results can be quite stressful. The woman must understand that a positive result does not necessarily mean a diagnosis of AIDS, but that a large percentage of seropositive individuals develop the disease within 8 to 10 years. Women with a positive result should be referred for high-risk care. Conversely, the woman should understand that a negative result does not rule out exposure to the virus. In addition, she should consider the potential effect a seropositive result would have on her fetus, her other children, and her sex partner(s). Women at risk for HIV infection who test negative should receive counseling and education.

The CDC (2001c) has standards for HIV counseling:

HIV prevention counseling should focus on the client’s own unique circumstances and risk and should help the client set and reach an explicit behavior-change goal to reduce the chance of acquiring or transmitting HIV. HIV prevention counseling is usually, but not always, conducted in the context of HIV testing. The client-centered HIV prevention counseling model involves two brief sessions, whereas other effective models are longer or involve more sessions. Regardless of the model used, in HIV prevention counseling, the counselor or provider focuses on assessing the client’s personal risk or circumstances and helping the client set and reach a specific, realistic, risk-reduction goal. These guidelines avoid using the terms “pretest” and “posttest” counseling to underscore that prevention counseling is a risk-reduction process that might involve only one or >1 session.

Several models for HIV prevention counseling in conjunction with HIV testing have been developed, evaluated in controlled studies, and documented to be efficacious in changing behavior or reducing sexually transmitted infections, including individual face-to-face counseling, large- and small-group counseling with a facilitator, and video-based counseling.

(For more information regarding interventions, see Compendium of HIV Prevention Interventions with Evidence of Effectiveness on the CDC Web site.)
Perinatal transmission occurs either by transplacental infection or at birth. Vertical transmission is more common in preterm births, especially those associated with prolonged rupture of membranes. Concurrent syphilis infection is associated with vertical perinatal transmission (Koumans et al., 2000).

To reduce the risk of maternal-fetal transmission of HIV, health care providers can prophylactically administer antiretroviral agents during the antepartum and intrapartum periods to pregnant women who are HIV seropositive and to their infants. A number of regimens may be used. Treatment failures may be due to nonadherence, inadequate drug potency, suboptimal levels of antiretrovirals, or viral resistance (Cunningham et al., 2005).

Pap Smear
A Pap (Papanicolaou) smear is performed to identify women who have precursor lesions for cervical cancer [i.e., cervical intraepithelial neoplasia (CIN)] and who have cervical cancer. Precursor lesions are most commonly identified in women in their twenties (Noller, 2005).

Until recently, all national medical organizations that took a position on cytology screening agreed that Pap testing should begin at age 18 years or at the onset of sexual activity. These same groups have now changed that guideline and recommend starting either at age 21 or within 3 years of the onset of sexual activity (Noller, 2005). The reason behind the change is that most women (and men, of course) become infected with human papilloma virus (HPV) when they become sexually active (Noller, 2005). The newer liquid-based cervical cytology screening can identify a few more cases of high-grade squamous intraepithelial lesions (HSIL) than conventional testing (FDA, 2003).

A Pap smear is done routinely at the first prenatal visit. If the woman has douched, had intercourse, or used a vaginal suppository in the last 24 to 48 hours, the Pap smear is deferred until the next visit. Additionally, if there is evidence of a cervical infection, the clinician may defer the Pap smear until a subsequent visit.

Pregnancy produces changes in the cervix that need to be considered when interpreting Pap smear results. Pregnancy produces changes in the cervix that need to be considered when interpreting the results of a Pap smear. Typically, in a non-pregnant woman, squamous epithelial cells cover the external surface of the cervix, and columnar epithelium lines the endocervix. During pregnancy, the squamocolumnar junction (the area where the squamous and columnar cells meet) increases in size. As the pregnancy progresses, squamous epithelium may replace columnar epithelium by a process called squamous metaplasia. Pap smears may reflect cytologic changes in the squamocolumnar junction due to squamous metaplasia. Because of this migration of cells, colposcopy is easier to do in pregnancy than in the non-pregnant state (Cunningham et al., 2005).

While different systems have been used for reporting Pap smear results, the Bethesda system is the most recent and has undergone several revisions since its inception in 1988. The 2001 revisions addressed specimen adequacy and categorization (Solomon et al., 2002).
The Pap report addresses specimen adequacy, categorization, and interpretation/results. Non-neoplastic findings include identified organisms (such as *Trichomonas* or *Candida*) and/or inflammation (reactive cellular changes). The report categorizes epithelial cell abnormalities by type of cell (i.e., squamous, glandular, other) and grades them by severity.  

### Table 24. Reporting Categories for Pap Smear Results: Squamous and Glandular Cells

<table>
<thead>
<tr>
<th>Squamous Cell Abnormalities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Squamous cells cover most of the external part of the cervix.</td>
<td></td>
</tr>
<tr>
<td>• Atypical squamous cells: Unknown significance (ASC-US) or Cannot exclude HSIL or high-grade changes (ASC-H)</td>
<td></td>
</tr>
<tr>
<td>• Low-grade squamous intraepithelial lesion (LSIL)</td>
<td></td>
</tr>
<tr>
<td>• High-grade squamous intraepithelial lesion (HSIL); one subcategory: &quot;with features suspicious for malignancy&quot;</td>
<td></td>
</tr>
<tr>
<td>• Squamous cell carcinoma</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Glandular Cell Abnormalities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Glandular cells cover the endocervical canal.</td>
<td></td>
</tr>
<tr>
<td>• Atypical cells, not otherwise specified</td>
<td></td>
</tr>
<tr>
<td>• Atypical cells, favor neoplastic</td>
<td></td>
</tr>
<tr>
<td>• Adenocarcinoma in situ</td>
<td></td>
</tr>
<tr>
<td>• Adenocarcinoma (can be from endometrium, endocervical, extrauterine, or the site of the malignancy cannot be determined based on the Pap smear)</td>
<td></td>
</tr>
</tbody>
</table>

(Solomon et al., 2002)

In pregnancy, the only diagnosis that alters management of an abnormal Pap smear is invasive cancer (ACOG, 2005b). When abnormal results are not likely to be associated with cancer (atypical squamous cells or a low-grade squamous intraepithelial lesion), the woman may undergo a colposcopy examination either during pregnancy or at 6 to 12 weeks postpartum. Pregnant women with CIN 2 or CIN 3 may undergo follow-up colposcopy during each trimester and should be reevaluated with a Pap and colposcopy at 6 to 12 weeks postpartum or thereafter. Treatment of CIN lesions during pregnancy is not indicated (ACOG, 2005b).

Atypical glandular cells (AGC) in Pap smears can be associated with premalignant and malignant cervical and endometrial lesions. These lesions lead to adenocarcinoma. AGC is difficult to diagnose in pregnancy due to confusion.
with normal cellular changes that accompany pregnancy. While guidelines have been established for management of AGC cases in the nonpregnant patient, special considerations are required when AGC is discovered during pregnancy. In nonpregnant women with AGC, the lesion should be excised. In pregnant women, excision may be considered if the lesions look invasive (ACOG, 2005b).

Human papilloma virus is the most common sexually transmitted infection that produces genital warts (condyloma acuminata). Certain types of HPV are a marker for the risk of a diagnosis of CIN 2/3. Typing of HPV lesions is becoming more common, but varies according to the practice setting. Mild dysplasia or CIN 1 is virtually always a transient infection with HPV and not a cancer precursor (Noller, 2005). The clinician can inform women with this result that they have a common viral infection of the cervix. They should return in 6 months for a repeat Pap test. Women who have a history of HPV are encouraged to have regular Pap smears.

High-risk HPV is the primary causal factor in the development of cervical cancer (ACOG, 2005a). The Digene HPV Test, also known as the DNAwithPap Test, is the only FDA-approved HPV DNA test; it collectively detects the 13 clinically relevant, high-risk HPV types. The test is a signal-amplified, nucleic acid test that provides standardized, objective results to accurately assess patient risk for CIN and cancer. Combining HPV testing with the Pap test has a negative predictive value for CIN 2 and CIN 3 of 99 to 100 percent (ACOG, 2005a).

Women older than 30 years with a negative Pap test who have high-risk DNA positive test results should have Pap and HPV testing repeated in 6 to 12 months. Women with certain types of Pap results (low-grade squamous intraepithelial lesions, atypical squamous cells or atypical glandular cells) are not recommended to have HPV testing. If women have the result of ASC-US, performing the DNA test for HPV as a triage tool helps to identify those women for whom colposcopy is recommended (i.e., fewer women will be referred for colposcopy because the significance will be known) (ACOG, 2005a).

Recently, the U.S. Food and Drug Administration (2006) approved a new vaccine (Gardasil) to prevent HPV infection. The vaccine is recommended for preteen girls (i.e., never exposed to the HPV virus), but approved for females ages 9 to 26. Gardasil is administered intramuscularly as three separate 0.5-ml doses.

Screening for Vaginal and Cervical Infections

If a woman complains of vaginal discharge, if she is at risk for sexually transmitted infections, or if an abnormal discharge is noted during the initial pelvic exam, the clinician may do a saline and potassium hydroxide wet prep.

Bacterial Vaginosis

Bacterial vaginosis (BV) is not the result of one particular species of bacteria and is, therefore, not an infection in the traditional sense. Rather, BV is the clinical result of alterations in the vaginal flora due to a maldistribution of...
normal vaginal flora. The over-represented bacteria tend to be gram-negative and anaerobic. Bacterial vaginosis is associated with preterm birth and occurs in 20 percent of pregnancies (Boggess, 2005).

More than 50 percent of BV infections are asymptomatic. The symptoms most often reported are increase in vaginal discharge and a change to gray, frothy, malodorous (fishy) secretions. Diagnosis is made by presence of a homogenous discharge, a vaginal pH >4.5, a positive whiff test, or presence of clue cells on a wet prep. Unfortunately, treatment does not reduce preterm birth; routine screening is not recommended (ACOG, 2001).

*Trichomoniasis*

A sexually transmitted infection, trichomoniasis is caused by the flagellated protozoan *Trichomonas vaginalis*. Between 10 and 50 percent of infected women are asymptomatic. Symptoms, if present, include profuse frothy gray or greenish malodorous vaginal discharge, pruritus, and possibly dysuria. Diagnosis is made by wet-prep visualization of mobile trichomonads. Symptomatic and asymptomatic women and their partners should be treated. Metronidazole is the recommended treatment.

*Vulvovaginal Candidiasis*

Vulvovaginal candidiasis (yeast infection) is caused by *Candida albicans* as well as other *Candida* species. It is not considered a sexually transmitted infection. Predisposing factors include pregnancy, antibiotic use, menstruation, oral contraceptive use, diabetes, and immunosuppression. Symptoms include vaginal itching, burning, soreness, dysuria, and dyspareunia. Examination shows a thick, white, curd-like discharge. The vulva and vagina may be reddened and excoriated due to intense pruritus. Diagnosis is confirmed by potassium-hydroxide wet-prep examination. There are many effective treatment regimens, including a wide variety of antifungal agents, many of which are available over the counter.

*Screening for Chlamydia and Gonorrhea*

Chlamydia is one of the most common sexually transmitted infections. While it is often “silent” with few symptoms, it can cause serious complications. Chlamydia is most prevalent in women under the age of 25, although screening to the age of 30 has been suggested. A history of multiple sex partners is a risk factor. Pregnant women infected with chlamydia are at risk for antepartal bleeding, pelvic inflammatory disease, preterm labor, premature rupture of membranes, and late postpartum infection.

Gonococcal infection may have a deleterious effect in any trimester. Pregnant women infected with gonorrhea are at risk for spontaneous abortion, premature rupture of membranes, chorioamnionitis, premature delivery, intrauterine growth restriction, and postpartum infection.

During a vaginal delivery, the infant may contract chlamydia and gonorrhea in the birth canal. Newborns of infected mothers may develop chlamydial conjunctivitis, pneumonia, nasopharyngeal infections, and gonococcal neonatal ophthalmia.
Chlamydia and gonorrhea are both easily and inexpensively treated. Nonculture tests include enzyme immunoassay tests, direct fluorescent antibody tests, and the DNA probe. The probe assay, which is highly sensitive and specific, has the ability to simultaneously identify Neisseria gonorrhoeae and Chlamydia trachomatis. This is clinically advantageous because both infections are present in about 40 percent of cases of gonorrhea and chlamydia (Sweet & Gibbs, 2002), and only one urogenital sample is required. The Centers for Disease Control and Prevention (2002) recommends diagnostic testing for C. trachomatis, if possible, at the first prenatal visit for all pregnant women and again in the third trimester (36 weeks) for those at high risk. (For a discussion of current guidelines and treatment, see Recommendations and Rationale: Screening for Chlamydial Infection at the Web site of the Agency for Healthcare Research and Quality.)

Tuberculosis Skin Testing, Purified Protein Derivative (PPD)
Tuberculosis (TB) continues to be a public health problem. TB morbidity has substantially increased in areas with a high prevalence of HIV infection. More than 80 percent of childhood cases of tuberculosis occur in minority groups, most in children under 5 years of age. Congenital and neonatally acquired tuberculosis is frequently under-diagnosed, resulting in delayed treatment. Current recommendations are that pregnant patients who are at high risk for TB (Table 25) should be skin tested (CDC, 2000). In endemic urban areas, universal screening may be warranted, as essentially all patients meet risk criteria.

Symptoms of active disease include cough, fever, malaise, weight loss, night sweats, and hemoptysis. Pregnancy does not alter symptoms and disease progression. In most cases of tuberculosis diagnosed by screening in pregnancy, patients are asymptomatic with no evidence of active disease.

The recommended test for detecting tuberculosis is the Mantoux test, performed by intracutaneous injection of the skin of the forearm with 0.1 ml of tuberculin-purified protein derivative. The test is interpreted 48 to 72 hours later.
after injection, but may be read up to 1 week after administration if the patient fails to return in 72 hours. Sensitivity is indicated by induration, not by erythema. Induration is measured in millimeters along the vertical axis of the forearm. A positive reaction is 10 mm or greater in the general population or > 5 mm in HIV-positive patients. Women with a positive skin test are evaluated by physical exam and chest x-ray for active disease. The risk of progression to active disease is highest in the 2 years after conversion (CDC, 2000).

BCG (Bacille Calmette-Guerin) vaccination is not usually recommended in the United States because of the low risk of infection and the variable effectiveness of the BCG vaccine. Many countries use BCG as part of their control programs for tuberculosis, especially for infants. PPD sensitivity and immunity to tuberculosis infection after BCG vaccination are highly variable. In most situations, a history of vaccination with BCG does not alter the guidelines for interpretation of the tuberculin skin test (CDC, 2000).

Urinalysis, Urine Culture and Sensitivity

Urinalysis involves the physical, chemical and microscopic evaluation of the urine. This test is used to screen for renal disease, urinary tract infection and metabolic disorders. Certain physiologic adaptations directly affect the urine of pregnant women (see Table 14). Excess tissue fluid that accumulates during the day returns to the bloodstream and urine volume increases, thus producing nocturia and a low specific gravity in the morning. Glucosuria is common due to an increase in the glomerular filtration rate and sluggish tubular reabsorption of glucose (Cunningham et al., 2005). Trace proteinuria may occasionally appear, particularly after vigorous exercise and after the first void of the day (Cunningham et al., 2005).

During a healthy, low-risk pregnancy, a complete urinalysis is usually performed only once, at either the first or second prenatal visit. Pregnancy-related anatomic, physiologic, and hormonal changes predispose a pregnant woman to pyelonephritis, one of the most common medical problems of pregnancy (Sweet & Gibbs, 2002). Women with sickle cell trait or disease, high parity, and diabetes are more likely to develop bacteruria. However, asymptomatic bacteruria (ASB) is a major risk factor for the development of pyelonephritis (Cunningham et al., 2005; Sweet & Gibbs, 2002). Additionally, women experiencing urinary tract infections (UTIs) are more likely than women without UTIs to have preterm labor (Cunningham et al., 2005; Sweet & Gibbs, 2002). Consequently, prenatal screening for bacteruria is essential.

To screen for symptomatic or asymptomatic bacteruria, a freshly voided, clean-catch, midstream specimen is required. The diagnosis of ASB or symptomatic UTI is usually based on a colony count of 100,000/ml of a particular organism. However, lower counts may also be significant. The pathogen responsible for 80 to 90 percent of infection is E. coli, followed by Klebsiella, Proteus, and the enterococci. Group B streptococcus and S. saprophyticus are also important urinary pathogens (Sweet & Gibbs, 2002).
After the initial urinalysis and urine culture and sensitivity, urine dipstick for nitrites and leukocyte esterase is a less expensive way to screen for urinary tract infection. The urine dipstick alone is not sensitive enough to be used as a screening test for ASB. Nitrites, by-products of bacterial growth, are frequently present with urinary tract infection. Leukocyte esterase may not be as useful since vaginal contamination readily causes urine to be leukocyte-esterase positive. Patients at risk for urinary tract infection should have a urinalysis and a urine culture and sensitivity repeated at least once or each trimester.

In the absence of hypertension, routine urine screening for proteinuria beyond the first prenatal visit has not been found to be useful in identifying women at risk for gestational diabetes or preeclampsia (Murray et al., 2002; Waugh et al., 2004). A trace amount of protein may be found in a urine specimen during normal pregnancy. Additionally, healthy pregnant women may manifest glucosuria without abnormal plasma glucose levels.

**Table 26. Detection Times for Drugs in Urine**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Detection Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocaine</td>
<td>48 hours</td>
</tr>
<tr>
<td>Amphetamines</td>
<td>48 hours. Cold medicines containing ephedrine, pseudoephedrine or phenylpropanolamine may cause false-positive result. Ecstasy is technically an amphetamine, but it requires special testing to detect.</td>
</tr>
<tr>
<td>Marijuana</td>
<td>5 days after occasional use 21-32 days after last use in chronic users</td>
</tr>
<tr>
<td>Opiates</td>
<td>24-48 hrs 4-5 days in chronic users</td>
</tr>
<tr>
<td>PCP</td>
<td>1 week after single dose 2 weeks in chronic users</td>
</tr>
<tr>
<td>Barbiturates</td>
<td>9 days for phenobarbital 2-3 days for intermediate-acting barbiturates 1-2 days for short-acting barbiturates</td>
</tr>
</tbody>
</table>

_Wallach, 2000_

**Urine Drug Screen**

Substances with potential adverse effects on the pregnant woman and her baby include alcohol, drugs (both legally prescribed and illegal), or chemicals, particularly cocaine and its derivatives, heroin, phenylcyclohexine (PCP), amphetamines, marijuana, barbiturates, and narcotic analgesics. With one exception, urine drug screening is the preferred method to screen for an unknown drug. The exception is ethyl alcohol, which is most reliably detected in the blood (Holland & Young, 2001). Drug concentrations are higher in the
urine than in the blood, and drug metabolites are excreted for a longer period of time through urine than blood. Thus, a urine screen may detect drugs administered days or weeks before the test (Table 26).

Rules for obtaining informed consent for urine drug screening vary from state to state and from institution to institution. In addition, the local laboratory may tailor drug screens to the clinical setting. For example, a prenatal drug screen may consist of drugs of abuse (cocaine, heroin, marijuana, PCP) as well as prescribed medications that contain amphetamines or barbiturates. Drug screens may be ordered when a woman admits to use before or during the current pregnancy, when the clinician assesses the woman and suspects abuse, and when the clinician observes medical and/or obstetrical complications associated with substance abuse.

Urinary retention times vary by drug, patient's physical condition and hydration, and route and frequency of drug use. Additionally, the causes of false reactions must be taken into account (Wallach, 2000).
Summary

Even though pregnancy is a normal process, it is biologically, physiologically and psychologically stressful. Optimal prenatal care is based upon risk assessment, done at the first prenatal visit and updated throughout the pregnancy. Risk assessment is aided by the use of laboratory testing.

Conditions that may have deleterious effects on perinatal outcome are the result of many high-risk factors such as age, blood type, predisposing chronic illness, lifestyle, poor obstetrical history, socioeconomic status and psychological well-being.
Appendix A: Risk Assessment of the Pregnant Woman

**Psychosocial, Economic and Personal Factors**
- Low income
- Heavy lifting/Long periods of standing
- BMI <19.8 or >29
- Poor nutrition
- Smoking
- Unwed/Father of baby not involved
- Late entry into prenatal care
- Use of drugs (prescription, illicit, over-the-counter)
- Low educational level
- Long commute
- Excessive alcohol consumption
- Age <16 or >35
- Inadequate support systems
- Domestic violence

**Medical Disorders**
- Endocrine disease: Diabetes mellitus, thyroid disorder
- Metabolic disorder, such as celiac disease
- Anemia (hemoglobin <11g/dl or hematocrit <32 percent)
- Renal disease, repeat urinary tract infections, bacteriuria
- Malignancy
- Sexually transmitted infections
- Pulmonary disease
- Cardiac disease
- Hypertension
- Seizure disorder
- Hemoglobinopathies
- Psychiatric/Emotional disorder

**Obstetrical Factors**
- Previous preterm labor or birth
- Previous pregnancy loss (either spontaneous or elective)
- Previous cesarean birth
- Previous macrosomic infant or low birthweight infant
- Previous infant with neurological deficit, birth injury, or congenital anomaly
- Previous ectopic pregnancy
- Previous neonatal death
- Grandmultiparity
- Preeclampsia, severe preeclampsia, HELLP syndrome
- Multiple gestation
- Rh-negative status
- Abnormal placentation
- Cervical cerclage
- Maternal infection
- Inappropriate weight gain
- Uterine fibroids
- Oligo- or polyhydramnios

(Adapted from Barron, 2001, and Olds et al., 2004)
Appendix B: Use of Vaccines and Immune Globulin During Pregnancy

Influenza

*Recommended for:*
- All women in second and third trimester during flu season (October-March)
- Women at high risk for pulmonary complications regardless of trimester

Vaccines Contraindicated/Not Recommended During Pregnancy
- Anthrax
- Measles
- Mumps
- Polio*
- Rubella
- Yellow fever
- Plague*
- Typhoid*
- Varicella**

Indications for Vaccines That Are Not Altered by Pregnancy
- Rabies
- Hepatitis A
- Hepatitis B
- Cholera
- Meningococcus
- Pneumococcus
- Tetanus-Diptheria

Indications for Immune Globulins as Postexposure Prophylaxis
- Hepatitis A
- Hepatitis B
- Measles
- Rabies
- Tetanus
- Varicella

* Risk v. benefit: Not routinely recommended except in persons at increased risk of exposure
** Contraindicated, but no adverse outcomes reported if given in pregnancy

(CDC, 2005a; ACOG, 2003b)
Appendix C: Web Resources


**National Partnership to Help Pregnant Smokers Quit.** http://www.help-pregnantsmokersquit.org/


**Smokefree.gov.**
http://www.smokefree.gov


**Smoking: Tools for Quitting.** American Legacy Foundation.
http://www.americanlegacy.org


Clinical Application

The following activities will aid the learner in applying concepts presented in this module.

1. Record your nursing assessment, potential etiology, and appropriate nursing actions for the following case scenarios.
   a. During the first prenatal visit, a woman at 9 weeks gestation complains of nausea and vomiting.
   b. During the first prenatal visit, a woman at 10 weeks gestation reveals that her cousin had a baby who has been diagnosed with cystic fibrosis.
   c. A woman at 24 weeks gestation has noticeable bruising on the face, neck and abdomen. She says she fell down the stairs. This is the woman’s first prenatal visit.
   d. A woman who is Rh negative has been diagnosed as pregnant. She reports bleeding and spotting. The diagnosis is threatened abortion.

2. Review the charts of two healthy pregnant women:
   a. Identify the routine laboratory tests that were performed.
   b. Identify additional laboratory tests that were ordered based upon the findings from the routine tests.
   c. Identify additional tests that need to be ordered based on the history and physical examination.
Group Discussion Items

The following discussion items will aid the learner in applying concepts presented in this module.

1. Discuss the advantages and disadvantages of your assessment system. Who is responsible for recording data in the woman's record? Would you recommend changes in your assessment or recording system? How would you initiate change in your clinical setting?

2. Identify the biological data that would indicate the childbearing family should be screened for:
   a. Tay-Sachs disease
   b. Sickle cell disease/Thalassemia
   c. Trisomy

3. Tessa Johnson has a VDRL titer of 1:16 and a positive TP-MHA. Interpret this finding. Identify the actions that should be taken. When should the VDRL be repeated? Should the TP-MHA be repeated?

4. Jane Brown is a primagravida. Her blood type is A negative. The father of the baby is O positive. Discuss what additional pertinent information the nurse should obtain. Outline the counseling information that the couple should receive. Identify any additional tests that may be indicated. Discuss how Rh isoimmunization can be prevented.
References


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