PREGNANCY, LABOR AND DELIVERY, THE FETUS, AND THE NEWBORN

CHAPTER 12

PREGNANCY COMPLICATIONS

1. True or false: A high-normal blood urea nitrogen (BUN) or creatinine level during pregnancy often indicates renal disease.

True. BUN and creatinine decrease significantly in pregnancy after the first trimester in women with normal renal function.

2. What is a hydatidiform mole? What are the clues to its presence?

A hydatidiform mole is one form of gestational trophoblastic neoplasia in which the products of conception basically become a tumor. Look for the following clues:

- Preeclampsia before the third trimester
- A human chorionic gonadotropin (hCG) level that does not return to zero after delivery (or abortion/miscarriage) or that rapidly rises during pregnancy
- First- or second-trimester bleeding with possible expulsion of "grapes" from the vagina (the gross appearance of the tumor resembles a bunch of grapes) and excessive nausea/hyperemesis
- Uterine size/date discrepancy
- A so-called snow-storm pattern on ultrasound

3. Distinguish between complete and partial hydatidiform moles. How are hydatidiform moles treated?

Complete moles have a karyotype of 46,XX (with all chromosomes from the father) and no fetal tissue. **Incomplete moles** usually have a karyotype of 69,XXY with fetal tissue in the tumor.

Treat hydatidiform moles with uterine dilation and curettage. Then follow with serial measurement of hCG levels until they fall to zero. If the hCG level does not fall to zero or if it rises, the patient has either an invasive mole or a choriocarcinoma (increasingly aggressive forms of gestational trophoblastic neoplasia) and needs chemotherapy (usually methotrexate or dactinomycin, both of which are extremely effective).

4. How is intrauterine growth retardation (IUGR) defined? What causes it?

IUGR is defined as fetal size below the tenth percentile for age. Causes are best understood in broad terms as maternal (e.g., smoking, alcohol or drugs, lupus erythematosus), fetal (e.g., TORCH infections [**t**oxoplasmosis, **o**ther agents, **r**ubella, **c**ytomegalovirus, **h**erpes simplex], or placental (e.g., hypertension, preeclampsia). TORCH infections are discussed in more detail at the end of this chapter.

5. List the teratogenic effects of maternal diabetes mellitus. What is the best way to reduce these complications?

- Cardiovascular malformations
- Cleft lip and/or palate
- Caudal regression (lower half of the body is incompletely formed)
- Neural tube defects
- Left-sided colon hypoplasia/immaturity
- Macrosomia (most common and classic)
- Microsomia (can occur if the mother has longstanding diabetes)

Tight control of glucose during pregnancy dramatically reduces these complications.

6. What other problems does maternal diabetes cause in pregnancy?

In the mother, diabetes can result in polyhydramnios and preeclampsia (as well as the complications of diabetes). Problems in infants born to a diabetic mother (other than birth defects) include an increased risk of respiratory distress syndrome and postdelivery hypoglycemia (from fetal islet cell hypertrophy caused by maternal and thus fetal hyperglycemia).

After birth, the infant is cut off from the mother's glucose supply, and the hyperglycemia resolves, but the infant's islet cells still overproduce insulin and cause hypoglycemia. Treat with intravenous glucose.

7. True or false: Oral hypoglycemic agents should not be used during pregnancy.
True. Use insulin to treat diabetes if diet and exercise cannot control glucose levels. Oral hypoglycemic agents, unlike insulin, may cross the placenta and cause fetal hypoglycemia.

8. True or false: In terms of surgery, the usual rule of thumb is to treat disease in a pregnant woman the same as you would treat it in a nonpregnant woman.
The answer to this question depends on the circumstances. It is definitely true in the case of an acute surgical emergency. Pregnant women can develop appendicitis, for which the presenting symptom may be right upper quadrant pain because of displacement of the appendix by the pregnant uterus. Just as in nonpregnant patients, laparotomy or laparoscopy is perfectly appropriate when the diagnosis is uncertain and the patient has signs of peritoneal involvement.

For semiurgent conditions (e.g., ovarian neoplasm), it is best to wait until the second trimester to perform surgery (when the pregnancy is most stable). Purely elective cases are avoided during pregnancy.

9. What is the preferred method of anesthesia in obstetric patients? Why?
Epidural anesthesia is the preferred method in obstetric patients. General anesthesia involves a higher risk of aspiration and resultant pneumonia because the gastroesophageal sphincter is relaxed in pregnancy and patients usually have not refrained from eating before going into labor. There also is concern about the effect of general anesthetic agents on the fetus. Spinal anesthesia can interfere with the mother's ability to push and is associated with a higher incidence of hypotension than with epidural anesthesia.

10. True or false: Preeclampsia and eclampsia are risk factors for the development of hypertension in the future.
False.

11. What are the risk factors for developing an ectopic pregnancy?
The major risk factor for ectopic pregnancy is a previous history of pelvic inflammatory disease (PID) (tenfold increase in ectopic pregnancy rate). Other risk factors include a previous ectopic pregnancy, history of tubal sterilization or tuboplasty, pregnancy that occurs when an intrauterine device is in place, and a history of diethylstilbestrol (DES) exposure, which can cause tubal abnormalities in women who were exposed in utero.

12. What are the classic symptoms and signs of a ruptured ectopic pregnancy?
A recent history of amenorrhea with current vaginal bleeding and abdominal pain. Patients also have a positive hCG pregnancy test. If you palpate an adnexal mass, it may be an ectopic pregnancy or a corpus luteum cyst.

13. What should you do if you suspect an ectopic pregnancy?
Order an ultrasound to look for a gestational sac or fetus. When the diagnosis is in doubt and the patient is doing poorly (e.g., hypovolemia, shock, severe abdominal pain, rebound tenderness), perform laparoscopy for a definitive diagnosis and treatment, if necessary. Culdocentesis is rarely performed in a stable patient to check for blood in the pouch of Douglas (with a ruptured ectopic pregnancy) because it has a high false-negative rate.

14. How is symptomatic ectopic pregnancy managed?
With surgery. A tubal pregnancy, if stable and of less than 3 cm in diameter, can be treated with salpingostomy and removal of the products of conception. The tube is left open to heal on its own; this strategy retains normal tubal function and fertility. If the patient is unstable or the ectopic pregnancy has ruptured or is greater than 3 cm in diameter, salpingectomy is required. In rhesus (Rh)-negative patients, give RhoGAM after treatment. Methotrexate (causes fetal demise) is an alternative treatment for small (<3 cm) unruptured tubal pregnancies.

15. What are the diagnostic signs and symptoms of preeclampsia? When does it occur?
Preeclampsia causes **hypertension,** defined as a greater than 30-point increase in systolic or a greater than 15-point increase in diastolic blood pressure over baseline. Other signs and symptoms include **proteinuria** (protein score of 2+ or more on urinalysis), oliguria, edema of

the hands or face, headache, visual disturbances, or the HELLP syndrome (**h**emolysis, **e**levated **l**iver enzymes, **l**ow **p**latelets, and right upper quadrant or epigastric pain). Preeclampsia usually occurs in the third trimester.

16. What are the main risk factors for preeclampsia? How is it treated?
The risk factors (in decreasing order of importance) include chronic renal disease, chronic hypertension, family history of preeclampsia, multiple gestations, nulliparity, extremes of reproductive age (the classic patient is a young woman with her first child), diabetes, and black race. The definitive treatment is delivery. This is the treatment of choice if the patient is at term. In a preterm patient with mild disease, hypertension can be treated with hydralazine, labetalol, or methyldopa. Advise bed rest and observe. If the patient has severe disease (defined as oliguria, mental status changes, headache, blurred vision, pulmonary edema, cyanosis, HELLP syndrome, blood pressure >160/110 mm Hg, or progression to eclampsia [seizures]), deliver the infant once the mother is stabilized. Otherwise, both mother and infant may die.

17. True or false: The combination of hypertension and proteinuria during pregnancy means preeclampsia until proven otherwise.
True.

18. When is edema normal during pregnancy? When is it not?
Mild ankle edema is normal in pregnancy, but moderate to severe edema of the ankles or edema of the hands is likely to be preeclampsia.

19. What should you consider if preeclampsia develops before the third trimester?
The possibility of gestational trophoblastic disease (i.e., hydatidiform mole or choriocarcinoma).

20. Distinguish between preeclampsia and eclampsia. How can eclampsia be prevented?
Preeclampsia plus seizures equals eclampsia. Eclampsia can be prevented by regular prenatal care so that you catch the disease in the preeclamptic stage and treat appropriately.

21. What should you use to treat seizures in eclampsia? What are the toxic effects?
Magnesium sulfate is the treatment of choice for preeclamptic seizure prophylaxis and for eclamptic seizures; it also lowers blood pressure. Toxic effects include hyporeflexia (first sign of toxicity), respiratory depression, central nervous system depression, coma, and death. If toxicity occurs, the first step is to stop the magnesium infusion.

22. True or false: When eclampsia occurs, you must deliver the infant immediately, regardless of maternal status.
False. Do *not* try to deliver the infant until the mother is stable (e.g., do not perform a cesarean section while the mother is having seizures).

23. Why are preeclampsia and eclampsia so important?
Preeclampsia and eclampsia cause uteroplacental insufficiency, IUGR, fetal demise, and increased maternal morbidity and mortality rates.

24. What are the problems with preexisting maternal hypertension in pregnancy?
Preexisting hypertension (present before conception) increases the risk of IUGR and preeclampsia.

25. True or false: The initial workup for third-trimester bleeding, like most conditions, requires a history and thorough physical examination, including a good pelvic examination.
False. You should record a history and perform a partial physical examination, but an ultrasound scan should *always* be obtained before a pelvic examination is performed.

26. Describe the initial management of third-trimester bleeding.
For all cases of third-trimester bleeding, start intravenous fluids, give blood if needed, start the patient on oxygen, and start fetal and maternal monitoring. Then order a complete blood count (CBC), coagulation profiles, ultrasound, and a drug screen (if drug use is suspected, because cocaine causes placental abruption). Give RhoGAM if the mother is Rh negative.

A Kleihauer-Betke test can quantify fetal blood in the maternal circulation and can be used to calculate the dose of RhoGAM.

27. Define hyperemesis gravidarum. How do you recognize and treat it?

Hyperemesis gravidarum is intractable nausea and vomiting leading to dehydration and possible electrolyte disturbances. It occurs in the first trimester, usually in younger patients in their first pregnancy who have underlying social stressors or psychiatric problems. Treat with supportive care, as well as small, frequent meals and antiemetic medications such as pyridoxine-doxylamine, diphenhydramine, meclizine, dimenhydrinate, prochlorperazine, metoclopramide, and ondansetron. Patients may need intravenous fluids and correction of electrolyte abnormalities.

28. Define cholestasis of pregnancy. How is it treated?

Cholestasis of pregnancy involves itching (often severe) and/or abnormal liver function tests, usually in the second and third trimester. In rare cases, jaundice may coexist. The only known definitive treatment is delivery, but ursodeoxycholic acid or cholestyramine may help with symptoms.

29. What is acute fatty liver of pregnancy? How is it treated?

Acute fatty liver of pregnancy is a more serious disorder than cholestasis. It occurs in the third trimester or after delivery and usually progresses to hepatic coma. Treat with intravenous fluids, glucose, and fresh frozen plasma to correct coagulopathies. Vitamin K does not work, because the liver is in temporary failure. If the patient survives with supportive care, liver dysfunction usually resolves on its own with time.

30. What are the maternal and fetal complications of multiple gestations (e.g., twin pregnancy)?

Maternal complications include anemia, hypertension, premature labor, postpartum uterine atony, postpartum hemorrhage, and preeclampsia.

Fetal complications include polyhydramnios, malpresentation, placenta previa, abruptio placentae, velamentous cord insertion/vasa previa, premature rupture of the membranes, prematurity, umbilical cord prolapse, IUGR, congenital anomalies, and increased perinatal morbidity and mortality.

The higher the number of fetuses, the higher is the risk of most of the conditions mentioned for both mother and offspring.

31. How are multiple gestations delivered?

For vertex-vertex twin presentations (both infants are head first), you can try vaginal delivery for both infants; but for any other twin presentation combination or for more than two infants, perform a cesarean section.

32. List the top three causes of maternal mortality in the United States.

- Pulmonary embolus
- Hypertension/pregnancy-induced hypertension (preeclampsia/eclampsia)
- Hemorrhage

The maternal mortality rate increases with age and is higher among black women.

UNCOMPLICATED PREGNANCY

1. When does a standard home pregnancy test become positive?

Roughly 2 weeks after conception (about the time the woman realizes that her period is late).

2. List the symptoms and signs of pregnancy.

- Amenorrhea
- Morning sickness
- Weight gain
- Hegar sign (softening and compressibility of the lower uterine segment)
- Chadwick sign (dark discoloration of the vulva and vaginal walls)
- Linea nigra
- Melasma (also known as chloasma or the mask of pregnancy)
- Auscultation of fetal heart tones

- Gestational sac or fetus seen on ultrasound
- Uterine contractions
- Palpation/ballottement of fetus

3. What are the normal changes and complaints in pregnancy?

Normal changes in pregnancy include nausea or vomiting (morning sickness), amenorrhea, a heavy (possibly even painful) feeling in the breasts, increased pigmentation of the nipples and areolae, Montgomery tubercles (sebaceous glands in the areola), backache, linea nigra, melasma (chloasma), striae gravidarum, and mild ankle edema. Heartburn and increased frequency of urination are also common problems.

4. What commonly used drugs are generally considered safe in pregnancy?

A short list of drugs that are generally safe in pregnancy includes acetaminophen, penicillins, cephalosporins, erythromycin, nitrofurantoin, histamine-2 receptor blockers, antacids, heparin, hydralazine, methyldopa, labetalol, insulin, and docusate.

5. True or false: Levels of hCG roughly double every 2 days in the first trimester.

True. An hCG level that stays the same or increases only slowly on serial testing indicates a fetus in trouble (e.g., threatened abortion, ectopic pregnancy) or fetal demise. A rapidly increasing hCG level or one that does not decrease after delivery may indicate a hydatidiform mole or choriocarcinoma.

6. When can ultrasound detect an intrauterine gestational sac? Why do you need to know this information?

At roughly 5 weeks after the last menstrual period (or when hCG is >2000 mIU), evidence of intrauterine pregnancy can be detected by transvaginal sonography. A definite fetus and fetal heartbeat can be detected by transvaginal ultrasound at 5 to 6 weeks of gestation. Use this information when trying to determine the possibility of an ectopic pregnancy. For example, if the patient's last menstrual period was 4 weeks ago, and a pregnancy test is positive, you cannot rule out an ectopic pregnancy with ultrasound. If, however, the patient's last menstrual period was 10 weeks ago with a positive pregnancy test and an ultrasound of the uterus does not show a gestational sac, be suspicious of an ectopic pregnancy.

7. Which vitamin should all pregnant women take? Why?

Give all pregnant patients folate to prevent neural tube defects. Ideally, all women of reproductive age should take folate because it is most effective in the first trimester, before most women know that they are pregnant. Iron supplements are frequently given to pregnant women to help prevent anemia.

8. What routine tests should be carried out for all pregnant patients?

- **Papanicolaou smear** if this test is due for the patient. Pregnancy does not change the frequency of screening.
- **Urinalysis** at the first visit and every visit thereafter (to screen for proteinuria, preeclampsia, and bacteriuria; not a good screen for diabetes).
- **Urine culture** obtained at 12 to 16 weeks to screen for asymptomatic bacteriuria.
- **Hemoglobin and hematocrit** at the first visit to see if the patient is anemic (because pregnancy may worsen anemia). This test should be repeated in the third trimester.
- **Blood type, Rh type, and antibody screen** at the first visit (for identification of possible isoimmunization).
- **Syphilis test** at the first visit (mandated in most states) and subsequent visits (for high-risk patients).
- **Rubella antibody screen.** If the patient is found to be nonimmune, counsel her on the benefit of postpartum immunization. Rubella vaccine should not be given during pregnancy.
- **Glucose screening for gestational diabetes** at the first visit for patients with risk factors for diabetes mellitus (obesity, positive family history, or age over 30 years); otherwise, screen at 24 to 28 weeks. Use fasting serum glucose and serum glucose levels 1 or 2 hours after an oral glucose load (oral glucose tolerance test).
- **Serum alpha-fetoprotein (AFP)** measured at 15 to 20 weeks, primarily to detect open spina bifida and anencephaly.

- **Hepatitis B antigen testing** to prevent perinatal transmission.
- **Varicella** testing in all pregnant women to determine immunity to varicella.
- **Thyroid function.** Maternal hypothyroidism may affect fetal neurologic development and can lead to fetal and maternal complications.
- **HIV test.** The American College of Obstetrics and Gynecology (ACOG) advocates an opt-out rather than an opt-in approach to increase screening.
- **Chlamydia screening.** The Centers for Disease Control (CDC) and ACOG advocate testing all pregnant women at the first prenatal visit.
- **Down syndrome screening** should be offered to all pregnant patients. There are multiple screening approaches, as described in Questions 21 to 27 in this section.
- **Beta-hemolytic group B *Streptococcus* (GBS)** screening should be performed at 35 to 37 weeks using a swab of the lower vagina and rectum.
- **Other tests.** A tuberculosis skin test should be performed for women at high risk. Testing for gonorrhea is warranted for women at high risk of this infection. Testing for toxoplasmosis is controversial. If asked, you should order *Chlamydia* and gonorrhea cultures for any pregnant teenager. Testing for sexually transmitted diseases should be repeated in the third trimester for women who continue to be at risk or for women who acquire a risk factor during pregnancy.

9. Explain Rh incompatibility. In what situations does it occur?

Rh blood-type incompatibility is of concern because it can lead to hemolytic disease of the newborn. Rh incompatibility occurs when the mother is Rh negative and her infant is Rh positive. The USMLE assumes an understanding of the inheritance of the Rh factor. If both the mother and the father are Rh negative, there is nothing to worry about because their infant will be Rh negative. If the father is Rh positive, the infant has a 50/50 chance of being Rh positive.

10. True or false: The first child is usually the most severely affected by Rh incompatibility.

False. Previous maternal sensitization is required for disease to occur. In other words, if a nulliparous Rh-negative mother has never received blood products, her first Rh-positive infant will not be affected by hemolytic disease—except in the rare case of sensitization during the first pregnancy from undetected fetomaternal bleeding, which commonly occurs later in the pregnancy and in most instances can be prevented by RhoGAM administration at 28 weeks gestation. The second Rh-positive infant, however, will be affected unless RhoGAM was administered at 28 weeks and within 72 hours after delivery for the first pregnancy. Any history of blood transfusion, abortion, ectopic pregnancy, stillbirth, or delivery can cause sensitization.

11. How much RhoGAM should you give if the maternal Rh antibody titer is extremely high?

In this setting, RhoGAM is worthless because sensitization has already occurred. RhoGAM administration is a good example of primary prevention. Close fetal monitoring for hemolytic disease is required.

12. How do you recognize, monitor, and treat hemolytic disease of the newborn?

Hemolytic disease of the newborn in its most severe form causes fetal hydrops (edema, ascites, pleural and/or pericardial effusions) and death. Amniotic fluid spectrophotometry and ultrasound can help in gauging the severity of fetal hemolysis. Treatment of hemolytic disease involves (1) delivery, if the fetus is mature (check lung maturity with a lecithin-to-sphingomyelin ratio); (2) intrauterine transfusion; and (3) phenobarbital, which helps the fetal liver to break down bilirubin by inducing enzyme expression.

13. True or false: ABO blood group incompatibility can cause hemolytic disease of the newborn.

True. ABO blood group incompatibility can cause hemolytic disease of the newborn when the mother is type O and the infant is type A, B, or AB. This condition does not require previous sensitization because immunoglobulin G (IgG) antibodies (which can cross the placenta) occur naturally in mothers with blood type O, but not in mothers with other blood types. The hemolytic disease is usually less severe than for Rh

incompatibility, but the treatment is the same. In rare instances, other minor blood antigens also may cause a reaction.

14. When should RhoGAM be given?

To reiterate, give RhoGAM only when the mother is Rh negative and the father is Rh positive or when his blood type is unknown. During routine prenatal care, check for Rh antibodies at the first visit. If the test is positive, do not give RhoGAM—you are too late. Otherwise, give RhoGAM routinely at 28 weeks gestation and immediately after delivery. Also give RhoGAM after an abortion, stillbirth, ectopic pregnancy, amniocentesis, chorionic villus sampling (CVS), and any other invasive procedure that may cause transplacental bleeding during pregnancy.

15. How do you detect and manage potential hemolytic disease of the newborn?

If indicated by maternal and potential fetal blood type, check maternal titers of Rh antibody every month, starting in the seventh month of gestation. Give RhoGAM automatically at 28 weeks and within 72 hours after delivery, as well as after any procedures that may cause transplacental hemorrhage.

16. How do you treat gonorrheal and chlamydial genital infections during pregnancy?

The treatment for gonorrhea remains unchanged because ceftriaxone is safe during pregnancy. For chlamydial infection, give azithromycin, amoxicillin, or erythromycin base instead of doxycycline or erythromycin estolate.

17. What do you need to know about vaginal GBS colonization and pregnancy?

Pregnant women should be tested for vaginal GBS. Women who are carriers should be treated during labor with penicillin G or ampicillin. Earlier treatment (e.g., second trimester) is ineffective because GBS frequently returns and is usually only dangerous during labor and delivery. The reason for treating asymptomatic carriers is to prevent neonatal sepsis and endometritis, both of which are commonly caused by GBS.

18. What test is used to screen for neural tube defects? At what time during pregnancy is it measured? Explain the significance of a low or high AFP level in maternal serum.

Maternal AFP is most accurate when measured between 15 and 20 weeks of gestation. A low AFP level may represent **Down syndrome,** fetal demise, or inaccurate dates. A high AFP level may represent **neural tube defects** (e.g., anencephaly, spina bifida), **ventral wall defects** (e.g., omphalocele, gastroschisis), multiple gestation, or inaccurate dates.

19. What should be done if the AFP is elevated?

Repeat the test. As many as 30% of maternal serum AFP test results may be elevated but are normal on repeat testing. The initial elevation is not associated with an increased risk of neural tube defects.

20. What further testing should a patient undergo if AFP remains elevated?

If AFP remains elevated, the patient is first advised to undergo ultrasound to determine whether a neural tube defect or other anomaly is present. The ultrasound is also used to confirm gestational age, number of fetuses, and fetal viability. Further evaluation with amniocentesis may be required if the ultrasound findings are uncertain or there is a concern for nonvisualized neural tube defects (according to elevated AFP in amniotic fluid or detection of acetylcholinesterase in amniotic fluid). There is a small risk of miscarriage after amniocentesis.

21. What prenatal tests are available to screen for Down syndrome?

The first-trimester combined test, integrated tests, sequential testing, contingent testing, the quadruple test, and maternal plasma-based tests. The American College of Obstetricians and Gynecologists (ACOG) recommends that all women be offered screening before 20 weeks of gestation.

22. What is the first-trimester combined test for Down syndrome? When is it performed?

The first-trimester combined test is performed at 11 to 13 weeks of gestation. The test involves determination of nuchal translucency (NT) by ultrasound, combined with serum pregnancy-associated plasma protein-A (PAPP-A) and serum hCG. CVS is used for women who test positive in this first-trimester screening.

23. Describe the integrated test for Down syndrome.

The full integrated test includes ultrasound measurement of NT at 10 to 13 weeks of gestation; PAPP-A at 10 to 13 weeks of gestation; and AFP, unconjugated estradiol (uE3), hCG, and inhibin A at 15 to 18 weeks of gestation. Results for the full integrated test are not available until the second trimester.

The serum integrated test is the same as the full integrated test but without the ultrasound evaluation of NT. This test is used in areas where expertise in ultrasound measurement of NT is not available. Results for the serum integrated test are not available until the second trimester.

24. Describe sequential testing for Down syndrome.

Stepwise sequential testing has been developed to provide a risk estimate during the first trimester. The first-trimester portion of the integrated screen is performed. If the tests indicate a very high risk of having an affected fetus, CVS is offered. Women whose results do not place them at very high risk of having an affected fetus go on to have the second-trimester portion of the screen.

25. Describe contingent testing for Down syndrome.

Contingent testing has not yet been proven efficacious in a prospective clinical trial and probably will not be tested on the USMLE; it is mentioned here in case it is or in case you are studying for an obstetrics shelf exam. Contingent screening involves three risk cutoffs: (1) women at very high risk of having a fetus with Down syndrome after first-trimester testing are offered immediate invasive prenatal diagnosis; (2) women at very low risk are provided with their risk estimate and require no additional testing; and (3) women at intermediate risk receive second-trimester marker testing.

26. What is the quadruple test for Down syndrome? For whom is it typically used? When is it performed?

The quadruple test includes the serum markers AFP, uE3, hCG, and inhibin A. The quadruple test is the best available test for women who attend for prenatal care in the second trimester, but it can be used for women who receive earlier prenatal care. It is performed at 15 to 18 weeks of gestation.

27. What is the maternal plasma-based test for Down syndrome?

This is the newest option that is just becoming widely available and may make many of the other tests obsolete in the future. This test, also called cell-free fetal DNA testing, detects fetal DNA in the circulation and has a detection rate of greater than 98% and a false-positive rate of less than 0.5% for Down syndrome and Edward syndrome (trisomy 18). It is used after 10 weeks of gestation. Cell-free fetal DNA testing is not yet validated for low-risk women but can be used in women with a higher risk of having fetal trisomy (i.e., women who will be older than 35 years at the time of delivery, presence of sonographic findings associated with fetal aneuploidy, history of previous pregnancy with fetal trisomy, positive screening results for tests such as the first-trimester combined test, the integrated test, and the quadruple test).

28. What is the next step if a woman has a positive screening test for Down syndrome?

Offer fetal karyotype determination. This is performed on a sample obtained via CVS in the first trimester and amniocentesis in the second trimester.

29. Why is CVS performed instead of amniocentesis in some cases?

CVS can be performed at 9 to 12 weeks of gestation (earlier than amniocentesis) and is generally reserved for women with previously affected offspring or known genetic disease. It offers the advantage of a first-trimester abortion if the fetus is affected. CVS is associated with a slightly higher miscarriage rate than that for amniocentesis.

30. True or false: CVS can detect neural tube defects but not genetic disorders.

False. CVS can detect genetic or chromosomal disorders but not neural tube defects.

31. How is tuberculosis treated in pregnancy?

In a similar way as in a nonpregnant patient. Use isoniazid, rifampin, and ethambutol if the risk of a drug-resistant organism is low. Pyrazinamide should be used with caution because of a lack of data on the risk of teratogenicity. However, pyrazinamide should

be added if a drug-resistant organism is suspected. Streptomycin, which is a rarely used second-line agent, should be avoided. Give vitamin B_6 to pregnant patients treated with isoniazid to avoid a deficiency.

32. On every prenatal visit, listen to fetal heart tones and evaluate uterine size. When can these factors first be observed? What constitutes a size/date discrepancy?

Fetal heart tones can be heard with Doppler ultrasound at 10 to 12 weeks and with a normal stethoscope at 16 to 20 weeks. At 12 weeks of gestation, the uterus enters the abdomen and is palpable at the symphysis pubis; at roughly 20 weeks, it reaches the umbilicus. **Uterine size** is evaluated by measuring the distance from the symphysis pubis to the top of the fundus in centimeters. At roughly 20 to 35 weeks, the measurement in centimeters should equal the number of weeks of gestation. A discrepancy greater than 2 to 3 cm is called a **size/date discrepancy.** Ultrasound should be performed for further evaluation (e.g., IUGR, multiple gestations).

33. What normal changes in laboratory results during pregnancy may be encountered on the Step 3 exam?

- The erythrocyte sedimentation rate becomes markedly elevated; hence this test is essentially worthless in pregnancy.
- Total thyroxine (T_4) and thyroid-binding globulin increase, but free T_4 remains normal.
- Hemoglobin increases, but plasma volume increases even more; thus the net result is a decrease in hemoglobin and hematocrit.
- BUN and creatinine decrease because of an increase in the glomerular filtration rate. BUN and creatinine levels at the high end of the normal range indicate renal disease in pregnancy.
- Alkaline phosphatase increases markedly.
- Mild proteinuria and glycosuria are normal in pregnancy.
- Electrolytes and liver function tests remain normal.

34. What cardiovascular and pulmonary changes occur in a normal pregnancy?

Normal cardiovascular changes: blood pressure decreases slightly, the heart rate increases by 10 to 20 beats/min, the stroke volume increases, and cardiac output increases (by up to 50%).

Normal pulmonary changes: minute ventilation increases because of an increase in tidal volume, but the respiratory rate remains the same or increases only slightly; the residual volume and carbon dioxide decrease. Collectively these changes cause the physiologic hyperventilation/respiratory alkalosis of pregnancy.

35. What is the average weight gain during pregnancy? What commonly causes weight gain to be greater or less than the average?

The average weight gain in pregnancy is roughly 28 lb (12.5 kg). A greater weight gain may mean maternal diabetes. A smaller weight gain may indicate hyperemesis gravidarum or a psychiatric or major systemic disease.

36. When is ultrasound most accurate at estimating fetal age?

At 7 to 10 weeks the crown-rump length is the most accurate measure for estimating fetal age. At 16 to 20 weeks the biparietal diameter (measured on ultrasound) gives the most accurate estimate.

37. When should ultrasound be used to evaluate the fetus?

The indications for ultrasound are now quite liberal. Order ultrasound for all patients who have a size/date discrepancy greater than 2 to 3 cm or risk factors for pregnancy-related problems (e.g., hypertension, diabetes, renal disease, lupus erythematosus, smoking, alcohol or drug use, and a history of previous pregnancy-related problems). Ultrasound is also used when fetal death, distress, or abortion or miscarriage is suspected (e.g., a baby that stops kicking, vaginal bleeding, or a slow fetal heartbeat on auscultation).

38. How is fetal well-being evaluated?

A **nonstress** test is the easiest initial screen. It is performed with the mother at rest. A fetal heart rate tracing is obtained for 20 minutes. A normal trace has at least two accelerations of heart rate, each at least 15 beats/min above baseline and lasting for at least 15 seconds.

A **biophysical profile** is slightly more involved and includes a nonstress test and measurement of amniotic fluid (to determine whether oligohydramnios or polyhydramnios is present), fetal breathing movements, and general fetal movements.

If the fetus scores poorly on the biophysical profile, the next test is the **contraction stress test,** which looks for uteroplacental dysfunction. Oxytocin is given and a fetal heart trace is monitored. If late decelerations are seen on the fetal heart trace with each contraction, the test is positive. In most cases of a positive contraction stress test, a cesarean section is performed.

39. True or false: A biophysical profile is often used in high-risk pregnancies in the absence of obvious problems.

True. A biophysical profile may be measured once or twice a week from the start of the third trimester until delivery to monitor for potential problems.

40. True or false: Aspirin should be avoided during pregnancy.

True. Use acetaminophen instead. One important exception is in patients with antiphospholipid syndrome, in whom aspirin may improve pregnancy outcome (subcutaneous unfractionated heparin or low-molecular-weight heparin also can be used to treat antiphospholipid syndrome in pregnancy).

41. Define postterm pregnancy. Why is it a major concern? How is it treated?

Postterm pregnancy is a pregancy of more than 42 weeks of gestation. Both prematurity and postmaturity increase perinatal morbidity and mortality rates. For postmaturity, **dystocia** (or difficult delivery) becomes more common because of the increased size of the infant.

In general, if the gestational age is known to be accurate and the cervix is favorable, labor is induced (with oxytocin, for example). If the cervix is not favorable or the dates are uncertain, twice-weekly biophysical profiles are measured. At 41 weeks, most obstetricians advise induction of labor. A 2012 metaanalysis demonstrated that routine labor induction at greater than 41 weeks resulted in lower perinatal mortality and a lower rate of meconium aspiration syndrome when compared with expectant management.

42. What two rare disorders are associated with prolonged gestation?

Anencephaly and placental sulfatase deficiency.

43. True or false: Asymptomatic bacteriuria detected on routine urinalysis should be treated during pregnancy.

True. Up to 20% of patients develop cystitis or pyelonephritis if untreated. This rate is much higher than in nonpregnant patients, who should not be treated for asymptomatic bacteriuria. In pregnancy, the gravid uterus can compress the ureters and increased progesterone can decrease the tone of the ureters, increasing urinary stasis and the risk of urinary tract infection.

44. Define abortion.

Abortion is the termination (intentional or not) of a pregnancy at less than 20 weeks of gestation or when the fetus weighs less than 500 g. The term *miscarriage* describes a spontaneous abortion.

45. What are the different terms for an unintentional abortion?

Threatened abortion: uterine bleeding without cervical dilation and no expulsion of tissue. Treat with bed rest and pelvic rest (although neither of these actually decrease the incidence of continuing to a complete abortion).

Inevitable abortion: uterine bleeding with cervical dilation, crampy abdominal pain, and no tissue expulsion.

Incomplete abortion: passage of some products of conception through the cervix.

Complete abortion: expulsion of all products of conception from the uterus. Treat with serial testing of the hCG level to make sure that it goes down to zero.

Missed abortion: fetal death with no expulsion of tissue (in some cases not for several weeks). Treat with dilation and curettage for less than 14 weeks of gestation, or attempt delivery for more than 14 weeks of gestation.

All of the above terms imply a gestation of less than 20 weeks. Treat all abortions with intravenous fluids (and blood transfusions if necessary), and consider dilation and curettage (once the fetus is confirmed as dead or expelled). Give the mother RhoGAM if she has an Rh-negative blood type.

46. Define induced and recurrent abortions. What do recurrent abortions suggest?

Induced abortion is intentional termination of pregnancy at less than 20 weeks of gestation; it may be elective (requested by the patient) or therapeutic (performed to maintain the health of the mother).

Recurrent abortion is two or three successive, unplanned abortions. The patient's history and a physical examination may suggest the cause, which may include:

- Infection (*Listeria, Mycoplasma,* or *Toxoplasma* species; syphilis)
- Inherited thrombophilia (factor V Leiden, G20210A gene mutation, antithrombin deficiency, deficiency of protein C or protein S)
- Environmental factors (alcohol, tobacco, drugs)
- Diabetes
- Hypothyroidism
- Systemic lupus erythematosus (especially with positive antiphospholipid/lupus anticoagulant antibodies, sometimes an isolated syndrome without coexisting lupus)
- Cervical incompetence (watch for a history of exposure to DES in the patient's mother during pregnancy and/or a patient with recurrent, painless second-trimester abortions; treat future pregnancies with cervical cerclage)
- Congenital abnormalities of the female reproductive tract (if possible, correct to restore fertility)
- Fibroids (remove them)
- Chromosomal abnormalities (e.g., maternal or paternal translocations)

47. Explain the term *bloody show.* How is it diagnosed?

On cervical effacement, a blood-tinged plug of mucus may be released from the cervical canal and heralds the onset of labor. This normal occurrence is a diagnosis of exclusion in the evaluation of third-trimester bleeding.

48. Define quickening. When does it occur?

Quickening is the term used to describe when the mother first detects fetal movements, usually at 18 to 20 weeks of gestation in a primigravida woman and 16 to 18 weeks of gestation in a multigravida woman.

LABOR, DELIVERY, AND THE POSTPARTUM PERIOD (INCLUDING PLACENTAL ABNORMALITIES)

1. What causes third-trimester bleeding?

- Placenta previa
- Abruptio placentae
- Uterine rupture
- Fetal bleeding
- Cervical or vaginal infections (e.g., herpes simplex virus, gonorrhea, chlamydial or candidal infection)
- Cervical or vaginal trauma (usually from sexual intercourse)
- Bleeding disorders (rare before delivery; more common after delivery)
- Cervical cancer (which may occur in pregnant patients)
- Cervical effacement (bloody show)

2. Why should ultrasound be performed before a pelvic examination for third-trimester bleeding?

In case placenta previa is present. Disturbing the placenta may make the bleeding worse and turn a worrisome case into an emergency.

3. Define placenta previa. What are the presenting symptoms? How is it diagnosed and treated?

True placenta previa occurs when the placenta implants in an area where it covers the cervical opening (os). Predisposing factors include multiparity, increasing maternal age, multiple gestation, and a history of prior placenta previa. Because of this condition, you should *always* perform ultrasound before a pelvic examination for third-trimester bleeding. The bleeding is painless and may be profuse. Ultrasound is 95% to 100% accurate in diagnosing placenta

previa. A cesarean section is mandatory for delivery, but patients may be admitted to the hospital for bed and pelvic rest and tocolysis if they are preterm and stable and if the bleeding has stopped.

4. Define abruptio placentae. What are the presenting symptoms? How is it treated?

Abruptio placentae is premature detachment of a normally situated placenta. Predisposing factors include hypertension (with or without preeclampsia); trauma; polyhydramnios with rapid decompression after membrane rupture; cocaine or tobacco use; and preterm premature rupture of the membranes (PROM). Patients can have this condition without visible vaginal bleeding; the blood may be contained behind the placenta. Usual symptoms include pain, uterine tenderness, increased uterine tone with a hyperactive contraction pattern, and fetal distress. Abruptio placentae may also cause disseminated intravascular coagulation if fetal products enter the maternal circulation. Ultrasound detects only a small percentage of cases. Treat with intravenous fluids (and blood if needed) and rapid delivery (vaginal route preferred).

5. What causes fetal bleeding that presents as third-trimester vaginal bleeding?

Visible fetal bleeding is usually due to vasa previa or velamentous insertion of the cord, which occurs when umbilical vessels present in advance of the fetal head, usually traversing the membranes and crossing the cervical os. The biggest predisposing risk factor is multiple gestation (the higher the number of fetuses, the higher the risk). Bleeding is painless and the mother is completely stable, whereas the fetus shows worsening distress (tachycardia initially, then bradycardia as the fetus decompensates). An Apt test performed on vaginal blood is positive for fetal blood (this test differentiates fetal from maternal blood). Treat with immediate cesarean section.

6. How do you manage fetal malpresentation?

External cephalic version can be used to rotate the fetus from the breech to the cephalic position. If this fails, a decision must be made as to whether to attempt a vaginal delivery or perform a cesarean section. Although some frank and complete breech fetuses may be delivered vaginally under specific guidelines, it is acceptable to perform a cesarean section for any breech presentation. For a shoulder presentation or an incomplete/footling breech presentation, cesarean section is mandatory. For face and brow presentations, watchful waiting is best, because most cases convert to a vertex presentation; if they do not convert, perform a cesarean section.

7. Distinguish between true labor and false labor.

In true labor, normal contractions occur at least every 3 minutes, are fairly regular, and are associated with cervical changes (effacement and dilation). In false labor (Braxton-Hicks contractions), contractions are irregular and no cervical changes occur.

8. Define preterm labor. How is it treated?

Preterm labor is labor for a gestation of between 20 and 37 weeks. Put the mother in the lateral decubitus position, order pelvic rest, and give oral or intravenous fluids and oxygen. In some cases these maneuvers stop the contractions. If they fail, you can give a tocolytic agent ($beta_2$ agonist or magnesium sulfate) if no contraindications (heart disease, hypertension, diabetes, hemorrhage, ruptured membranes, cervix dilation of >4 cm) are present. The mother can be managed as an outpatient with an oral tocolytic agent once she is stable. Give steroids to promote fetal lung maturity (discussed in more detail in Questions 14 to 16) for preterm labor that occurs between 24 and 34 weeks of gestation.

9. What are tocolytic agents? When is it not appropriate to give them?

Tocolytic agents stop uterine contractions. Common examples are $beta_2$ agonists (terbutaline, ritodrine) and magnesium sulfate. Do not give a tocolytic agent to the mother in the presence of preeclampsia, severe hemorrhage, chorioamnionitis, IUGR, fetal demise, or fetal anomalies incompatible with survival.

10. Define PROM. How is it diagnosed?

PROM is rupture of the amniotic sac before the onset of labor. Diagnosis of rupture of membranes (whether premature or not) is based on the patient's history, a sterile speculum examination, and/or a positive nitrazine test. The sterile speculum examination shows

pooling of amniotic fluid and a ferning pattern when the fluid is placed on a microscopic slide and allowed to dry. Nitrazine paper turns blue in the presence of amniotic fluid. Ultrasound should be performed in cases of PROM to assess the amniotic fluid volume, gestational age, and any anomalies that may be present.

11. What usually follows membrane rupture? What should you do if it does not occur?

Spontaneous labor usually follows membrane rupture; for this reason, amniotomy may be performed in an attempt to induce labor if the membrane does not rupture spontaneously. If labor does not occur within 6 to 8 hours of membrane rupture, and the mother is at full term and the cervix is favorable, labor should be induced.

Labor is induced because the main risk of PROM is infection, which may occur in the mother (chorioamnionitis) and/or infant (neonatal sepsis, pneumonia, meningitis). The usual culprits are GBS, *Escherichia coli,* or *Listeria* species.

12. Define preterm PROM (PPROM). How is it managed?

PPROM is premature rupture of membranes before 36 to 37 weeks of gestation. The risk of infection increases with the length of time after membrane rupture. Order a culture and Gram stain of the amniotic fluid. If the results are negative, treatment simply involves pelvic and bed rest with frequent follow-up. If the culture is positive for GBS, treat the mother with penicillin G or ampicillin, even if she is asymptomatic.

13. What is fetal fibronectin? When is a test for this substance useful? Is the test more helpful when positive or negative?

Fetal fibronectin (an extracellular matrix protein that helps attach the amniotic membrane to the uterine lining) can be detected in the vaginal secretions of some women with signs and symptoms of preterm labor. The test is most helpful when negative between 22 and 34 weeks of gestation, because it indicates a very low likelihood of delivery in the 2 weeks that follow. In such cases a more conservative, observational approach can be used. When fetal fibronectin is positive in this setting, the woman is at higher risk of delivery in the next 2 weeks, and a more aggressive approach to tocolysis and hastening of fetal lung maturity is typically adopted.

14. When should fetal lung maturity be evaluated?

Evaluation of fetal lung maturity is indicated before elective deliveries that are, or may be, at less than 39 weeks of gestation. Testing is not necessary for well-documented pregnancies of 39 or more weeks of gestation or pregnancies of less than 32 weeks of gestation (because fetal lung maturity is unlikely), or when a delay in delivery because of fetal lung immaturity will place the mother or fetus at significant risk.

15. What tests can be used to assess fetal lung maturity?

- Lamellar body count
- Lecithin/sphingomyelin ratio
- Phosphatidylglycerol
- Surfactant/albumin ratio
- Optical density at 650 nm
- Foam stability index

For the purposes of the USMLE, it is not necessary to know the details of these tests. No test performs better than any other. All of these tests are better at predicting the absence, rather than the presence, of respiratory distress.

16. What is the role of steroids in preterm labor?

Steroids are often given with tocolytic agents (at 24 to 34 weeks of gestation) to hasten fetal lung maturity and thus decrease the risk of respiratory distress syndrome in the neonatal period.

17. What problems may be encountered when oxytocin is used to augment labor?

On the Step 3 exam, watch for uterine hyperstimulation (painful, overly frequent, and poorly coordinated uterine contractions), uterine rupture, fetal heart-rate decelerations, and water intoxication/hyponatremia (caused by the antidiuretic hormone effect of oxytocin). Treat all of these complications first by discontinuing the oxytocin infusion, for which the half-life is less than 10 minutes.

18. What problems are associated with the use of intravaginal prostaglandin and amniotomy?

Prostaglandin E2 (dinoprostone) or misoprostol may be used locally to induce cervical effacement (a process sometimes called ripening) and is highly effective in combination with (or before) oxytocin administration. It also may cause uterine hyperstimulation. **Amniotomy** (creating a manual opening in the amniotic membrane) also hastens labor but exposes the fetus and uterine cavity to possible infection if labor does not occur promptly.

19. What are the contraindications to labor induction or augmentation?

The list is almost the same as the list of contraindications to vaginal delivery: placenta or vasa previa, umbilical cord prolapse, prior classic (vertical) cesarean section, transverse fetal position, active genital herpes, cephalopelvic disproportion, and cervical cancer.

20. What does a basic fetal heart trace show?

The fetal heart rate and the uterine contraction pattern over time.

21. In fetal heart monitoring, what is the difference between early decelerations, late decelerations, and variable decelerations?

For **early decelerations** (Fig. 12-1), the peaks match up (nadir of fetal heart deceleration and peak of uterine contraction). This pattern signifies **head compression** (probably a vagal response) and is normal.

Variable decelerations (Fig. 12-2) are so called because fetal heart rate deceleration varies in relation to uterine contractions. This is the type of deceleration pattern most commonly encountered and signifies **cord compression.** If it is observed, place the mother in the lateral decubitus position, administer oxygen via a face mask, and stop any oxytocin infusion. If the fetal bradycardia is severe (less than 80 to 90 beats/min) or fails to resolve, check the fetal oxygen saturation or scalp pH.

Late decelerations (Fig. 12-3) occur when a fetal heart rate deceleration occurs after a uterine contraction. This pattern signifies **uteroplacental insufficiency** and is the most worrisome. If it is observed, first place the mother in the lateral decubitus position, give oxygen via a face mask, and stop any oxytocin infusion. Next, give a tocolytic agent ($beta_2$ agonist such as ritodrine or magnesium sulfate) if the mother is not in active labor and intravenous fluids (if the mother is hypotensive). If these late decelerations persist, measure the fetal oxygen saturation or scalp pH. Consider preparing the patient for operative delivery.

22. What other patterns of fetal distress may be seen on a fetal heart tracing? What is a normal fetal heart rate?

Loss of short-term (beat-to-beat) variability, loss of long-term variability (or normal baseline changes in heart rate over 1 min), and prolonged fetal tachycardia (>160 beats/min). The normal fetal heart rate is 120 to 160 beats/min.

23. What if the question gives you a value for fetal oxygen saturation or scalp pH?

Any fetal scalp pH less than 7.2 or an abnormally decreased oxygen saturation is an indication for immediate cesarean delivery. If the pH is greater than 7.2 or oxygenation is normal, you can generally continue to observe the mother and fetus.

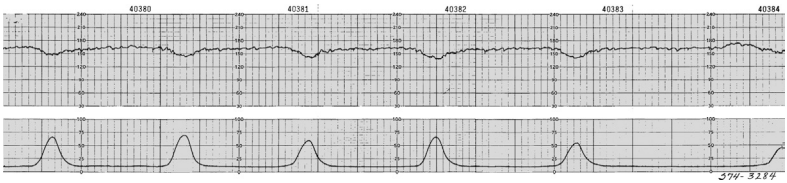

Figure 12-1. Early decelerations are caused by compression of the fetal head. They are shallow, symmetric, uniform decelerations that begin early in the contraction, have a nadir coincident with the peak of the contraction, and return to the baseline by the time the contraction is over. *(From Gabbe SG, Niebyl JR, Simpson JL. Obstetrics: normal and problem pregnancies, 5th ed. Philadelphia: Churchill Livingstone, 2007, Fig. 15-13.)*

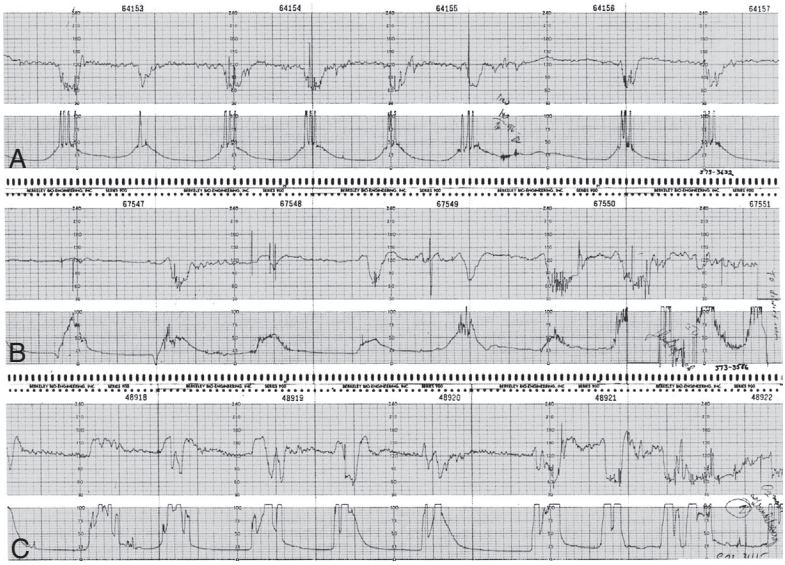

Figure 12-2. Examples of typical variable decelerations. Variable decelerations are often recognized by the accelerations that precede and follow the decelerations. *(From Gabbe SG, Niebyl JR, Simpson JL. Obstetrics: normal and problem pregnancies, 5th ed. Philadelphia: Churchill Livingstone, 2007, Fig. 15-18.)*

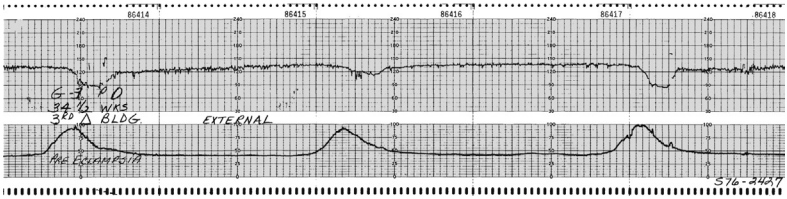

Figure 12-3. Late decelerations in a case complicated by third-trimester bleeding. Note the presence of persistent late decelerations with only three contractions in 20 minutes, as well as the apparent loss of variability of the fetal heart rate. The rise in baseline tone of the uterine activity channel cannot be evaluated with the external system. *(From Gabbe SG, Niebyl JR, Simpson JL. Obstetrics: normal and problem pregnancies, 5th ed. Philadelphia: Churchill Livingstone, 2007, Fig. 15-14.)*

24. Define the characteristics and duration of the normal stages of labor.

STAGE	CHARACTERISTICS	NULLIGRAVIDA	MULTIGRAVIDA
First stage	Onset of true labor to full cervical dilation	<20 h	<14 h
Latent phase	From 0 to 3-4 cm dilation (slow, irregular)	Highly variable	Highly variable
Active phase	From 3-4 cm to full dilation (rapid, regular)	>1 cm/h dilation	>1.2 cm/h dilation
Second stage	From full dilation to birth of baby	30 min-3 h	5-30 min
Third stage	Delivery of baby to delivery of placenta	0-30 min	0-30 min
Fourth stage	Placental delivery to maternal stabilization	Up to 48 h	Up to 48 h

25. Give the order of fetal positions during normal labor and delivery.

1. Descent
2. Flexion
3. Internal rotation
4. Extension
5. External rotation
6. Expulsion

26. In the fetal circulation, where are the highest and lowest oxygen concentrations?

The highest oxygen concentration in the fetal circulation is in the umbilical vein (blood coming from the mother), and the lowest is in the umbilical arteries. Remember also that the oxygen concentration is higher in blood going to the upper extremities than in blood going to the lower extremities.

27. What changes occur in the circulation as an infant goes from intrauterine to extrauterine life?

The first breaths inflate the lungs and cause decreased pulmonary vascular resistance, which increases blood flow to the pulmonary arteries. This and the clamping of the cord increase left-sided heart pressure, causing functional closure of the foramen ovale. The increased oxygen concentration shuts off prostaglandin production in the ductus arteriosus, causing gradual closure.

28. Distinguish between a protraction disorder and an arrest disorder. What should you do when either occurs?

A **protraction disorder** occurs once true labor has begun if the mother takes longer than the table in Question 24 indicates, but labor nonetheless is progressing slowly. An **arrest disorder** (failure to progress) occurs once true labor has begun if no change in dilation is seen over 2 hours or no change in descent is seen over 1 hour.

In either situation, first rule out an abnormal position and cephalopelvic disproportion. If neither is present, the mother can be treated with labor augmentation (e.g., oxytocin, prostaglandin). If these steps fail, manage expectantly and perform a cesarean section at the first sign of trouble.

29. What is the most common cause of protraction or arrest disorder?

Cephalopelvic disproportion, which is a disparity between the size of the infant's head and the size of the mother's pelvis. Labor augmentation is contraindicated in this setting.

30. What should you do if shoulder dystocia or impaction occurs during a vaginal delivery?

The first step is to try the McRoberts maneuver. Have the mother sharply flex her thighs against her abdomen, which may free the impacted shoulder. Other maneuvers include applying suprapubic pressure, a Woods screw maneuver (rotates the fetus so the anterior shoulder emerges from behind the maternal symphysis), delivery of the posterior arm, and fracture of the clavicle (risky). If these maneuvers fail, the options are limited. A cesarean section is usually the procedure of choice (after pushing the infant's head back into the birth canal).

31. What are the signs of placental separation during delivery?

The signs of placental separation include a fresh show of blood from the vagina, lengthening of the umbilical cord, and a rising fundus that becomes firm and globular.

32. What is an APGAR score? When is it measured?

The APGAR score is a general measure of well-being in newborns. It is commonly assessed at 1 and 5 minutes after birth if values are normal. If the score is less than 7, continue to assess every 5 minutes until the infant reaches a score of 7 or more (while resuscitating the child as needed). There are five APGAR score categories, with a maximum score of 2 points per category and a possible total of 10 points. Remember the APGAR mnemonic: **a**ppearance (skin color), **p**ulse (heart rate), **g**rimace (reflex irritability), **a**ctivity (muscle tone), and **r**espiration (breathing).

	NUMBER OF POINTS GIVEN		
Category	0	1	2
Color	Pale, blue	Body pink, extremities blue	Completely pink
Heart rate	Absent	<100 beats/min	>100 beats/min
Reflex irritability*	None	Grimace	Grimace and strong cry, cough, sneeze
Muscle tone	Limp	Some flexion of extremities	Active moan
Respiratory effort	None	Slow, weak cry	Good, strong cry

*Reflex irritability is usually measured as the infant's response to stimulation of the sole of the foot or catheter insertion into the nose.

33. True or false: The APGAR score is important because it is the first assessment of how a child is doing.

False. Do not wait until the 1-minute mark to evaluate the infant. You may have to suction or intubate the infant seconds after delivery.

34. Which vitamin is given to all newborns?

Vitamin K is given as prophylaxis against hemorrhagic disease of the newborn.

35. True or false: After cesarean section, a patient may have a vaginal delivery in the future.

The answer depends on the circumstances. After a classic (vertical) uterine incision, patients must have cesarean sections for all future deliveries because of the increased rate of uterine rupture during vaginal delivery. After a lower (horizontal) uterine incision (the incision of choice), a patient may deliver future pregnancies vaginally with only a slightly increased (i.e., acceptable) risk of uterine rupture.

36. Define lochia. When is it a problem?

For the first several days after delivery, some vaginal discharge (known as lochia) is normal. It is red for the first few days and gradually turns white or yellowish white by day 10. If the lochia smells foul, suspect endometritis.

37. What treatment may be given to a woman who does not want to breastfeed?

Because the breasts can be become engorged with milk and thus quite painful, you may prescribe a tight-fitting bra, ice packs, and analgesia to reduce symptoms. Medications for suppression of lactation (e.g., bromocriptine and estrogens or oral contraceptive pills) are generally no longer recommended because of the risk of thromboembolism and stroke.

38. List the common contraindications to breastfeeding.

- Use of alcohol or illicit drugs (with a few caveats that will not be tested on the USMLE)
- HIV infection (although the World Health Organization recommends breastfeeding in developing countries if replacement feeding is not possible)
- Some medications, including antineoplastic agents, antimetabolic agents (cyclophosphamide, mercaptopurine), some anticonvulsants (topiramate), and amiodarone

39. When does mastitis occur? How do you recognize and treat it?

Mastitis (inflammation of the breast) usually develops in the first 2 months after delivery. Breasts are red, indurated, and painful, and nipple cracks or fissuring may be seen. *Staphylococcus aureus* is the usual cause. Treat with analgesics (e.g., acetaminophen, ibuprofen), warm and/or cold compresses, and continued breastfeeding from the affected breast(s) even if painful (use a breast pump to empty the breast if needed) to prevent further milk duct blockage and abscess formation. An antistaphylococcal antibiotic (e.g., cephalexin, dicloxacillin) is usually given for more than mild symptoms. If a fluctuant mass develops or there is no response to antibiotics within a few days, an abscess is probably present and must be drained.

40. What are the major causes of maternal mortality associated with childbirth?

In decreasing order: pulmonary embolism, pregnancy-induced hypertension (preeclampsia or eclampsia), and hemorrhage.

41. How do you recognize an amniotic fluid pulmonary embolism?

Look for a recently postpartum mother who develops sudden shortness of breath, tachypnea, chest pain, hypotension, and disseminated intravascular coagulation. Treatment is supportive.

42. What factors predispose to uterine rupture? What are the symptoms? How is it treated?

Predisposing factors include previous uterine surgery (especially a prior caesarian section with vertical incision), trauma, oxytocin, grand multiparity (several previous deliveries), excessive uterine distention (e.g., multiple gestation, polyhydramnios), abnormal fetal position, cephalopelvic disproportion, and shoulder dystocia. Uterine rupture is very painful, has a sudden and dramatic onset, and is often accompanied by maternal hypotension or shock. Other classic signs are the ability to feel fetal body parts on abdominal examination and a change in the abdominal contour. Maternal distress is usually more pronounced than fetal distress (unlike abruptio placentae, in which fetal distress is greater). Treat with immediate laparotomy and delivery. Hysterectomy is usually required after delivery.

43. Define postpartum hemorrhage. What are the common causes?

Postpartum hemorrhage is defined as a blood loss greater than 500 mL during vaginal delivery or greater than 1 L during cesarean section. The most common cause is **uterine atony** (75% to 80% of cases). Other causes include lacerations, retained placental tissue, coagulation disorders, low placental implantation, and uterine inversion. Retained placental tissue results from placenta accreta (penetration of the placenta through the endometrium into the myometrium), placenta increta (deeper penetration of the placenta into the myometrium), or placenta percreta (penetration of the placenta through the myometrium to the uterine serosa. In all three conditions, the placenta grows more deeply into the uterine wall than it should. The major risk factor for this condition is previous uterine surgery or cesarean section, and the usual treatment is hysterectomy.

44. What causes uterine atony? How is it treated?

Uterine atony is caused by overdistention of the uterus (because of multiple gestation, polyhydramnios, or macrosomia), prolonged labor, oxytocin administration, grand multiparity (a history of five or more deliveries), and precipitous labor (too fast or less than 3 hours). Treat with a dilute oxytocin infusion, and use bimanual compression to massage the uterus while the oxytocin infusion is running. If this approach fails, use ergonovine (contraindicated for maternal hypertension), prostaglandin F_2-alpha, or misoprostol. If these strategies also fail, the patient may need a hysterectomy; ligation of the uterine vessels can be attempted if the patient wants to retain fertility.

45. What is the treatment for retained products of conception?

For retained products of conception (which is probably the most common cause of a *delayed* postpartum hemorrhage), remove the placenta manually to stop the bleeding. Next try curettage in the operating room under anesthesia. If the patient has placenta accreta, placenta increta, or placenta percreta, hysterectomy is usually necessary to stop the bleeding.

46. What causes uterine inversion? How is it treated?

When the uterus inverts, it can usually be seen outside the vagina. It is usually iatrogenic, a result of *pulling too hard on the cord*. If inversion occurs, put the uterus back in place manually; you may need to use anesthesia because of pain. Give intravenous fluids and oxytocin.

47. Define postpartum fever. What are the common causes?

Postpartum fever is a temperature greater than 100.4° F (38° C) for at least 2 consecutive days and is classically due to endometritis. However, do not forget easy causes of postpartum fever, such as a urinary tract infection or atelectasis/pneumonia. Pulmonary problems are especially common after a cesarean section. Other causes include a pelvic abscess and pelvic thrombophlebitis.

48. What is the most common cause of endometritis (puerperal fever)? How do you recognize and treat it?

Watch for endometritis, an infection of the endometrial lining, as a cause of postpartum fever. The hallmark is uterine tenderness and the most common cause is *Streptococcus* species. Treat with clindamycin plus gentamicin after local cultures have been carried out.

49. What are the presenting symptoms of chorioamnionitis and how is it treated?
Patients with chorioamnionitis have a fever and a tender, irritable uterus, usually after delivery. Antepartum chorioamnionitis may occur in patients with PROM. Order a culture and Gram stain of the cervix and amniotic fluid, and treat the patient with antibiotics such as ampicillin plus gentamicin while awaiting the culture results.

50. What should you do if a patient has postpartum fever?
Look for clues in the history and physical examination. For example, for a patient with a history of PROM and a tender uterus on examination, endometritis is almost certainly the cause of the fever. Next, order cultures of the endometrium, vagina, blood, and urine. Start empiric antibiotic treatment if indicated. Clindamycin plus gentamicin is a good choice; add "big-gun" antibiotics if the patient is crashing.

51. What should you do if postpartum fever does not improve with antibiotics?
If a postpartum fever does not resolve with broad-spectrum antibiotics, there are two main possibilities: progression to a pelvic abscess or pelvic thrombophlebitis. A computed tomography (CT) scan will show any pelvic abscess, which should be drained, and sometimes demonstrates thrombophlebitis. Pelvic thrombophlebitis has symptoms of a persistent spiking fever, a lack of response to antibiotics, and no abscess on CT. Give heparin or low-molecular-weight heparin as a cure (and for diagnosis in retrospect).

52. What should you consider if a postpartum patient goes into shock without evident bleeding?
- Amniotic fluid embolism
- Uterine inversion
- Concealed hemorrhage (e.g., uterine rupture with bleeding into the peritoneal cavity)

FETUS AND NEWBORN

1. Define stillbirth.
A stillbirth (fetal death) is a prenatal or natal (during delivery) death after 20 weeks of gestation.

2. Name the major cause of neonatal mortality. What is the neonatal mortality rate in the United States?
The major cause of neonatal mortality is prematurity. The neonatal mortality rate in the United States is roughly 6 in 1000 births (higher in blacks).

3. List the top three causes of infant mortality in the United States.
- Congenital abnormalities
- Prematurity/low birth weight
- Sudden infant death syndrome

4. True or false: Roughly 85% of cases of mental retardation are mild.
True. Patients with mild mental retardation can have a reasonable level of independence, with assistance or guidance during periods of stress.

5. What are the common causes of mental retardation?
Although mental retardation is usually idiopathic, look for fetal alcohol syndrome (the leading preventable cause of mental retardation), Down syndrome (leading overall known cause of mental retardation), and fragile X syndrome (in males).

6. What screening tests are commonly performed for metabolic and congenital disorders?
States vary widely in their policies regarding newborn screening. All states screen for hypothyroidism and phenylketonuria at birth; screens must be performed within the first month of life. Most states screen for galactosemia and hemoglobinopathies such as sickle cell disease. Some states include screening for homocystinuria, maple syrup urine disease, congenital adrenal hyperplasia, cystic fibrosis, biotinidase deficiency, tyrosinemia, and toxoplasmosis. If any of these screens are positive, the first step is to order a confirmatory test to make sure that the screening test gave you a true-positive result.

7. How many vessels does a normal umbilical cord have? What disorder should you suspect if one of the vessels is absent?

The umbilical cord is checked at birth for the presence of the normal three vessels: two arteries and one vein. If only one artery is present, consider the possibility of congenital renal malformations.

8. Which gastrointestinal malformation causes primarily respiratory problems?

Diaphragmatic hernia, which is more common in males. Ninety percent are on the left side. The main point to know is that bowel herniates into the thorax through the diaphragmatic defect, compressing the lung and impeding lung development (pulmonary hypoplasia develops). Patients present with respiratory distress and have bowel sounds in the chest and bowel loops in the thorax on chest radiographs. Treat with surgical correction of the diaphragm.

9. What is the first step in evaluating neonatal jaundice? Why is jaundice of concern in a neonate?

The first step is to determine whether the jaundice is physiologic or pathologic. Measure total, direct, and indirect bilirubin. The main concern is **kernicterus,** which is due to high levels of unconjugated bilirubin with subsequent deposition in the basal ganglia. Look for poor feeding, seizures, flaccidity, opisthotonos, and apnea in the setting of severe jaundice.

10. What causes physiologic jaundice of the newborn? Who gets it?

Fifty percent of normal infants have physiologic jaundice, and it is even more common in premature infants. Bilirubin is mostly unconjugated because of incomplete maturation of liver function. In full-term infants, bilirubin is less than 12 mg/dL, peaks during days 2 to 4, and returns to normal by 2 weeks. In premature infants, bilirubin is less than 15 mg/dL, peaks during days 3 to 5, and may be elevated for up to 3 weeks.

11. How is pathologic jaundice recognized? What are the causes?

In pathologic jaundice, bilirubin levels are higher than those mentioned in the previous question and continue to rise or fail to decrease appropriately. ***Any* jaundice present at birth is pathologic.** Causes include the following:

Breastfeeding jaundice: occurs in 1 in 10 breastfed infants and is seen in the first week of life. This is essentially an exaggerated physiologic jaundice due to insufficient milk intake, which leads to an inadequate number of bowel movements to remove bilirubin from the body.

Breast milk jaundice: occurs in breastfed infants with peak bilirubin levels of 10 to 20 mg/dL at 2 to 3 weeks of age. Treat with temporary cessation of breastfeeding (switch to bottle feeding) until the jaundice resolves.

Illness: infection or sepsis, hypothyroidism, liver insult, cystic fibrosis, and other illnesses may prolong neonatal jaundice and lower the threshold for kernicterus. The youngest, sickest infants are at greatest risk of hyperbilirubinemia and kernicterus.

Hemolysis: occurs because of Rh incompatibility or congenital red cell diseases that cause hemolysis in the neonatal period. Look for anemia, peripheral smear abnormalities, a positive family history, and higher levels of unconjugated bilirubin.

Metabolic disorders: Crigler-Najjar syndrome causes severe unconjugated hyperbilirubinemia, whereas Gilbert syndrome causes a mild form. Rotor and Dubin-Johnson syndromes cause conjugated hyperbilirubinemia.

Biliary atresia: full-term infants with clay- or gray-colored stools and high levels of conjugated bilirubin. Treat with surgery.

Medications: avoid sulfa drugs in neonates; they displace bilirubin from albumin and may precipitate kernicterus.

12. How is pathologic jaundice treated?

Unconjugated hyperbilirubinemia that persists, rises above 15 mg/dL, or rises rapidly is treated with **phototherapy** to convert unconjugated bilirubin to a water-soluble form that can be excreted. A last resort is exchange transfusion, but do not consider this approach unless the level of unconjugated bilirubin is greater than 20 mg/dL.

13. What should you do if an infant is born to a mother with active hepatitis B?
An infant born to a mother with active hepatitis B should receive the first immunization shot and hepatitis B immune globulin at birth.

14. Describe the effects of alcohol on pregnancy.
Alcohol is a definite teratogen and is the most common cause of preventable mental retardation in the United States. You should be able to recognize the classic presentation of a child affected by fetal alcohol syndrome: mental retardation, microcephaly, microphthalmia, short palpebral fissures, midfacial hypoplasia, a smooth philtrum, and cardiac defects. No amount of alcohol consumption can be considered safe during pregnancy. Fetal alcohol syndrome rates vary but may affect as many as 1 in 1000 births in the United States.

15. What is the usual cause of vaginal bleeding in neonates? How is it treated?
Vaginal bleeding in neonates is usually physiologic and due to maternal estrogen withdrawal. No treatment is needed because the bleeding resolves on its own.

16. What causes DiGeorge syndrome? How do you recognize it?
DiGeorge syndrome is caused by a chromosomal deletion at 22q11.2. It causes hypoplasia of the third and fourth pharyngeal pouches. Look for hypocalcemia and tetany (from hypocalcemia caused by absent parathyroid glands) in the first 24 to 48 hours of life. The thymus may also be absent or hypoplastic, and congenital heart defects and typical facies are often present.

17. How do you recognize Down syndrome?
Down syndrome (trisomy 21) is the most common known cause of mental retardation in the United States. The biggest risk factor is maternal age (1 in 1500 offspring of 16-year-old mothers and 1 in 25 offspring of 45-year-old mothers). At birth look for hypotonia, a transverse palmar crease, and characteristic facies (Fig. 12-4). Congenital cardiac defects (especially ventricular septal defects) are common, and affected individuals have an increased risk of leukemia, duodenal atresia, and early Alzheimer disease.

18. What is the second most common known cause of inherited mental retardation?
Fragile X syndrome (X-linked recessive). Affected males often have large testicles.

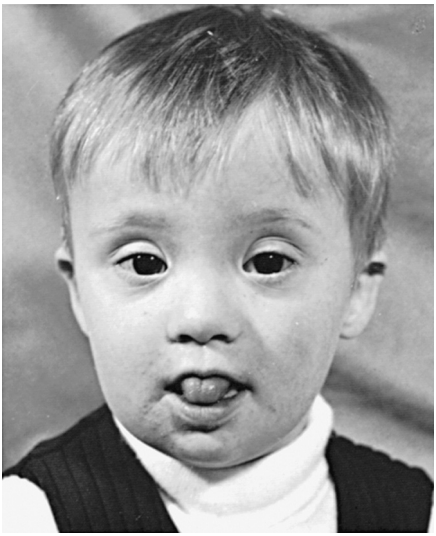

Figure 12-4. Child with Down syndrome. Note the flat facial profile, flat nasal bridge, open mouth, protruding tongue, folded ears, and epicanthic folds. (*From Kliegman RM.* Nelson textbook of pediatrics, *19th ed. Philadelphia: Saunders, 2011. Fig. 76-8A.)*

19. How do you recognize neonatal hypoglycemia? At what concentration is blood glucose considered to be low?

Signs of neonatal hypoglycemia are nonspecific, but look for jitteriness, hypotonia, lethargy, irritability, tachypnea, apnea/cyanosis, bradycardia, poor feeding, hypothermia, a weak cry, and seizures.

It is challenging and rather controversial to use a specific blood glucose concentration to determine hypoglycemia, but the American Academy of Pediatrics defines neonatal hypoglycemia as blood glucose of less than 47 mg/dL.

20. What are risk factors for neonatal hypoglycemia?

Prematurity, being large or small for gestational age, infants of diabetic mothers, and infants of mothers who were treated with oral hypoglycemic or beta-adrenergic agents.

21. What is the management of neonatal hypoglycemia?

Treatment is stepwise, depending on whether signs and symptoms are present and on how the infant responds to each intervention. Start with feeding breast milk for asymptomatic infants. The next step is an intravenous glucose infusion. Glucocorticoids are next, followed by glucagon, if necessary.

22. What presentation suggests galactosemia?

Congenital cataracts and neonatal sepsis with vomiting after breastfeeding. Patients should avoid galactose- and lactose-containing foods.

23. Define macrosomia. What is the likely cause?

Macrosomia is defined as a newborn that weighs more than 4 kg (roughly 9 lb). The cause is maternal diabetes mellitus until proven otherwise.

24. Cover the right-hand column in the following table and specify the effects of the listed classic teratogens on an exposed fetus.

AGENT	DEFECTS CAUSED
Thalidomide	Phocomelia (absence of long bones and flipper-like appearance of the hands)
Antineoplastic drugs	Many
Tetracycline	Yellow or brown teeth
Aminoglycosides	Deafness
Valproic acid	Spina bifida, hypospadias
Progesterone	Masculinization of female fetus
Cigarettes	Intrauterine growth retardation, low birth weight, prematurity
Oral contraceptive pills	VACTERL syndrome
Lithium	Cardiac (Ebstein) anomalies
Radiation	Intrauterine growth retardation, central nervous system defects, eye defects, malignancy (e.g., leukemia)
Alcohol	Fetal alcohol syndrome
Phenytoin	Craniofacial, limb, and cerebrovascular defects; mental retardation
Warfarin	Craniofacial defects, intrauterine growth retardation, central nervous system malformation, stillbirth
Carbamazepine	Fingernail hypoplasia, craniofacial defects
Isotretinoin*	Central nervous system, craniofacial, ear, and cardiovascular defects

AGENT	DEFECTS CAUSED
Iodine	Goiter, neonatal hypothyroidism
Cocaine	Cerebral infarcts, mental retardation
Diazepam	Cleft lip and/or palate
Diethylstilbestrol	Clear cell vaginal cancer, adenosis, cervical incompetence

VACTERL, **V**ertebral anomalies, imperforate **a**nus, **c**ardiac anomalies, **t**racheoesophageal fistula, **r**enal anomalies, **l**imb anomalies.
*Vitamin A is generally considered teratogenic when recommended intake levels are exceeded.

25. Which vitamin is a known teratogen?

Vitamin A. Female patients taking one of the vitamin A analogs as treatment for acne must have a negative pregnancy test before the medication is started and should be counseled about the risks of teratogenicity. Some form of birth control should be used, and periodic pregnancy tests should be offered.

Isotretinoin is such a significant teratogen that access to this medication is very restricted. All patients and prescribers must be in a special program designed to eliminate fetal exposure to isotretinoin. There are strict qualification criteria, including monthly pregnancy testing, and two forms of contraception are recommended.

26. Define oligohydramnios. What causes it? Why is it worrisome?

Oligohydramnios is a deficiency of amniotic fluid (<500 mL or an amniotic fluid index of <5). Causes include IUGR, PROM, postmaturity, and renal agenesis (Potter disease). Oligohydramnios may cause fetal problems, including pulmonary hypoplasia, cutaneous or skeletal abnormalities caused by compression, and hypoxia caused by cord compression.

27. Define polyhydramnios. What causes it? Why is it worrisome?

Polyhydramnios is an excess of amniotic fluid (>2 L or an amniotic fluid index of >25). Causes include maternal diabetes, multiple gestation, neural tube defects (anencephaly, spina bifida), gastrointestinal anomalies (omphalocele, esophageal atresia), and hydrops fetalis. Polyhydramnios can cause maternal problems, including postpartum uterine atony (with resultant postpartum hemorrhage) and maternal dyspnea (an overdistended uterus compromises pulmonary function).

28. Distinguish between caput succedaneum and cephalohematoma. How are these conditions treated?

Both conditions are noted in newborns after vaginal delivery. Caput succedaneum is diffuse swelling or edema of the scalp that crosses the midline, is benign, and requires no further investigation or treatment. Cephalohematomas are subperiosteal hemorrhages that are sharply limited by sutures and do not cross the midline. Cephalohematomas are usually benign and self-resolving, but in rare cases they may indicate an underlying skull fracture. Order a radiograph or CT scan to rule out fracture if given the option.

29. What should you know about infant respiratory distress syndrome?

Infant respiratory distress syndrome is due to atelectasis from a deficiency of surfactant; it is seen almost exclusively in premature infants and infants of diabetic mothers. Look for rapid, labored respirations; substernal retractions; cyanosis; grunting; and/or nasal flaring. Arterial blood gas results show hypoxemia and hypercarbia; radiography reveals diffuse atelectasis (described as diffuse, granular infiltrates). Treat with oxygen, give a surfactant, and intubate if necessary. Complications include intraventricular hemorrhage and pneumothorax or bronchopulmonary dysplasia (complications of acute or chronic mechanical ventilation).

30. What prenatal tests help to indicate whether respiratory distress syndrome will occur?

Measurement of amniotic fluid in the pregnant mother can indicate whether the fetus is producing adequate surfactant. A lecithin-to-sphingomyelin ratio of greater than 2:1 or the presence of **phosphatidylglycerol** in the amniotic fluid indicates fetal lung maturity and a low

likelihood of infant respiratory distress syndrome. The fluorescence polarization test reflects the ratio of surfactant to albumin in amniotic fluid and is a direct measure of surfactant concentration. An elevated ratio indicates fetal lung maturity.

31. Define diaphragmatic hernia. How is it recognized clinically?

A defect in the diaphragm allows the bowel to herniate into the chest. Diaphragmatic hernia is mentioned in the pulmonary section because the presenting symptom is respiratory difficulty, not gastrointestinal problems. Herniated bowel pushes on the developing lung and causes lung hypoplasia on the affected side. Look for a scaphoid abdomen and bowel sounds in the chest. Herniated bowel can be seen on chest radiographs; 90% of cases are left sided.

32. How do you recognize and diagnose a tracheoesophageal fistula? How is it treated?

The most common type (85% of cases) of tracheoesophageal fistula is an esophagus with a blind pouch proximally and a fistula between a bronchus/carina and the distal esophagus (Fig. 12-5). Look for a neonate with excessive oral secretions, coughing or cyanosis on attempted feeding, abdominal distention, and aspiration pneumonia. The diagnosis is made on the basis of an inability to insert a nasogastric tube; alternatively, an injection of air via a nasogastric tube under x-ray (i.e., fluoroscopy) guidance shows only the proximal esophagus. Treatment is early surgical correction.

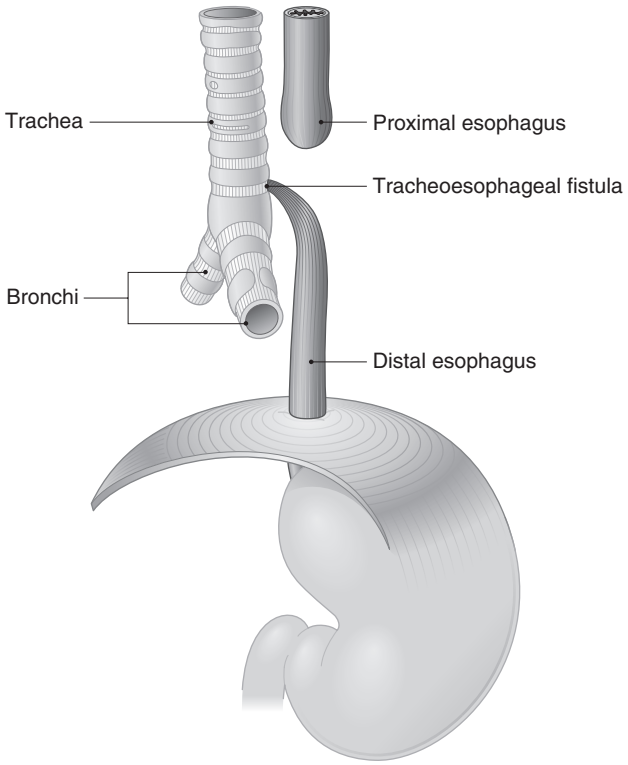

Figure 12-5. Tracheoesophageal fistula. Diagram of the most common type of esophageal atresia and tracheoesophageal fistula. (*From Gilbert-Barness E. Potter's pathology of the fetus, infant and child, 2nd ed. Philadelphia: Mosby, 2007. Fig. 25-6).*

PERINATAL INFECTIONS

1. **What are the three common causes of neonatal conjunctivitis?**
   Chemicals, *Neisseria gonorrhoeae*, and *Chlamydia trachomatis*.

2. **What causes chemical conjunctivitis? How do you recognize it?**
   Chemical conjunctivitis is caused by the silver nitrate (or erythromycin) drops that are given to all newborns to prevent gonorrheal conjunctivitis. The drops may cause chemical conjunctivitis (with no purulent discharge) that appears within 12 hours of administration and resolves within 48 hours. Chemical conjunctivitis is always the best guess if conjunctivitis develops in the first 24 hours of life.

3. **How can you distinguish gonorrheal from chlamydial conjunctivitis?**
   In cases of suspected **gonorrheal conjunctivitis,** look for symptoms of gonorrhea in the mother. The infant has an extremely purulent discharge starting between 2 and 5 days after birth. Infants who were given prophylactic drops should not develop gonorrheal conjunctivitis. Treatment involves systemic ceftriaxone or cefotaxime.

   In cases of **chlamydial (inclusion) conjunctivitis,** the mother often reports no symptoms. The infant has mild to severe conjunctivitis beginning between 5 and 14 days after birth. Oral erythromycin is recommended for chlamydial conjunctivitis and pneumonia; topical therapy for chlamydial conjunctivitis is not effective.

4. **If you forget everything else about neonatal conjunctivitis, what point should you remember to help you distinguish among the three causes discussed?**
   The varying time frames during which they occur.

5. **What is the definition of neonatal sepsis? What pathogens typically cause neonatal sepsis? What are the risk factors?**
   Neonatal sepsis is a syndrome that manifests as systemic signs of infection and/or isolation of a bacterial pathogen in the bloodstream of an infant 28 days old or younger. Early-onset sepsis usually is due to vertical transmission from amniotic fluid or during vaginal delivery from bacteria colonizing or infecting the mother's lower genital tract. Late-onset sepsis comes either from maternal vertical transmission or from contact with care providers or environmental sources. GBS and *E. coli* are the most common causes. *Listeria monocytogenes* is another cause of sepsis but is rare and is usually seen during outbreaks of listeriosis. *S. aureus* is an emerging pathogen; enterococci and other gram-negative rods can also cause neonatal sepsis.

6. **What are the maternal and neonatal risk factors for neonatal sepsis?**
   Intrapartum maternal fever, delivery at less than 37 weeks of gestation, chorioamnionitis, a 5-minute APGAR score of 6 or less, evidence of fetal distress, maternal GBS colonization, and a duration of 18 hours or longer since membrane rupture.

7. **What are the clinical manifestations of neonatal sepsis?**
   The signs and symptoms are subtle and nonspecific, so be careful. Look for temperature instability, jaundice, respiratory distress, hepatomegaly, anorexia, vomiting, lethargy, cyanosis, and apnea. Also look for abdominal distention, irritability, and diarrhea, although these are less common.

8. **How do you evaluate an infant with suspected neonatal sepsis?**
   Blood culture, CBC, chest x-ray (if respiratory abnormalities are present), and lumbar puncture. Neutropenia is a fairly specific marker for neonatal sepsis. A urine culture should be ordered if the child is older than 6 days.

9. **How do you treat neonatal sepsis?**
   Treat empirically with ampicillin and gentamicin for early-onset sepsis to cover GBS and *E. coli*. Empirical treatment for late-onset neonatal sepsis (infants older than 7 days of age) is ampicillin and gentamicin if the infant is being admitted from the community. For an infant who has been hospitalized since birth, substitute vancomycin for ampicillin to cover antimicrobial-resistant organisms.

10. What else do you need to know about GBS?

GBS, also known as *Streptococcus agalactiae*, is the most common cause of neonatal meningitis or sepsis. The organism is often part of the normal vaginal flora and may be acquired from the birth canal. GBS is penicillin sensitive. Expectant mothers are cultured for GBS; if it is present around the time of delivery, then prophylactic intravenous penicillin (preferred) or intravenous ampicillin is given to the mother to prevent meningitis in the newborn.

11. What are the TORCH syndromes? What do they cause?

TORCH is an acronym for several maternal infections that can cross the placenta and cause intrauterine fetal infections that may result in birth defects. Most TORCH infections can cause mental retardation, microcephaly, hydrocephalus, hepatosplenomegaly, jaundice, anemia, low birth weight, and IUGR. These infections include:

T = ***T****oxoplasma gondii:* look for exposure to cats. Specific defects include intracranial calcifications and chorioretinitis.

O = **O**ther agents: varicella zoster causes limb hypoplasia and scarring of the skin. Syphilis causes rhinitis, saber shins, Hutchinson teeth, interstitial keratitis, and skin lesions.

R = **R**ubella: worst in the first trimester (some recommend abortion if the mother has rubella in the first trimester). Always check antibody status on the first visit for patients with a poor immunization history. Look for cardiovascular defects, deafness, cataracts, and microphthalmia.

C = **C**ytomegalovirus: most common infection of the TORCH group. Look for deafness, cerebral calcifications, and microphthalmia.

H = **H**erpes: look for vesicular skin lesions (with positive Tzanck smears) and a history of maternal herpes lesions.

12. What do you need to know about HIV testing and transmission from a mother to her child?

In untreated HIV-positive patients, HIV is transmitted to the fetus in roughly 25% of cases. When triple-drug therapy is given to the mother prenatally and zidovudine is given to the infant for 6 weeks after birth, HIV transmission is reduced to roughly 2%. A noninfected infant may still have a positive HIV antibody test at birth because maternal antibodies can cross the placenta. Within 6 to 18 months, however, the test result reverts to negative. This is why infants of infected mothers are tested using a direct HIV DNA polymerase chain reaction test at birth, at 4 to 6 weeks of age, and 2 months after the second test. Babies who have these three negative tests should have an HIV antibody test at 12 and 18 months of age. Cesarean section may reduce HIV transmission to the child.

13. What should you do if a pregnant woman has genital herpes?

A decision is generally made when the mother goes into labor (not beforehand). If, at the time of true labor, the mother has active, visible genital herpes lesions, perform a cesarean section to prevent transmission to the fetus. If, at the time of true labor, the mother has no visible genital herpes lesions, the child can be delivered vaginally.

14. What should you do for a child if the mother has chronic hepatitis B or chickenpox?

If the mother has chronic hepatitis B, give the infant the first hepatitis B vaccine shot and hepatitis B immunoglobulin at birth. If the mother contracts chickenpox in the last 5 days of pregnancy or the first 2 days after delivery, give the infant varicella zoster immunoglobulin.

15. What subtype of maternal antibody can cross the placenta?

IgG is the only type of maternal antibody that crosses the placenta. This may be an important diagnostic point: an elevated neonatal IgM concentration is never normal, whereas an elevated neonatal IgG often represents maternal antibodies.