Postpartum Emergencies

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Additionally, there is a high frequency of late maternal morbidity from a variety of causes; up to 87% of women note problems in the first 6 weeks postpartum, and as many as 76% of these patients continue to have these problems for as long as 18 months following delivery.

PATHOPHYSIOLOGY: THE PUEPERIUM

Originally, the puerperium was defined as the period of confinement during and just after birth; it is now generally accepted to mean the 6 weeks after delivery. The puerperium has also been referred to as “the fourth trimester.” This period is marked by multiple physiologic changes (Table 123.1) as the woman returns to the prepregnant state, including healing physically from any trauma during delivery, and adjusts to the many physiologic and psychologic demands involved in caring for a newborn. Just as in pregnancy, when there are so many physiologic changes, the potential exists for the normal healing process to go awry and emergencies to occur.

Certain significant changes in the physiology of the coagulation system during pregnancy persist past delivery and into the puerperium, including major changes in the coagulation and fibrinolytic system, as well as a reduction in venous blood flow in the deep venous system. Combined, these alterations increase the thrombotic potential in near-term and immediate postpartum patients.

A pregnant patient around term and immediately postpartum has significant increases in factors I, V, VII, IX, X, and XII; von Willebrand factor antigen; and ristocetin cofactor activity. The endogenous anticoagulants protein C and antithrombin remain unchanged throughout pregnancy, but levels of protein S are reduced. Fibrinolytic activity is impaired during pregnancy as a result of placentally derived plasminogen activator inhibitor type II and pregnancy-induced increases (approximately threefold) in endothelial and hepatic-derived inhibitor of plasminogen activator type I. These changes rapidly return to normal following delivery.

During normal pregnancy there is a significant reduction in blood flow to the deep venous system, as well as an increase in diameter of the major leg veins. These changes do not occur evenly in both legs. Studies of patients in the puerperium have reported greater diameter and slower blood flow in the left common femoral vein than in the right. These differences are manifested clinically; in nonpregnant patients, the left leg was affected in 55% of cases of DVT, whereas in pregnancy the

KEY POINTS

- The most common infection after childbirth is a genital tract infection.
- Because lochia will contaminate a clean-catch specimen in the first 4 to 8 weeks postpartum, urine should be obtained by catheterization in the immediate postpartum period to rule out a urinary tract infection.
- In the immediate postpartum period, an acute abdomen may not be manifested as abdominal rigidity on examination because of laxity of the abdominal wall tissue at this time.
- Leukocytosis cannot be used to help differentiate an infection in the first 2 weeks postpartum because of the physiologic leukocytosis that occurs during pregnancy and delivery.
- Fever is the most important criterion for the diagnosis of postpartum metritis.

EPIDEMIOLOGY

Despite the fact that the first postpartum visit is generally scheduled at 6 weeks, most life-threatening complications arise within the first 3 weeks following delivery and are thus likely to be seen in the emergency department (ED). These complications are primarily related to infection, hemorrhage, pregnancy-induced hypertension, and embolic events. Infection is one of the top five causes of mortality, with approximately 13% of pregnancy-related deaths between 1991 and 1999 being due to infection. In the general population, the incidence of pregnancy-induced venous thromboembolism (VTE) is approximately 0.49 to 1.72 per 1000 deliveries. The risk for VTE is five times higher in a pregnant than in a non-pregnant patient. When compared with pregnancy, the risk for VTE is even higher postpartum: a postpartum woman’s risk for VTE is 20- to 80-fold higher in the first 6 weeks, and in the first postpartum week the risk is 100-fold higher. The majority of deaths from VTE occur during the first 2 weeks of the puerperium, but a significant number of nonfatal events occur 2 to 6 weeks after delivery. Approximately 75% of cases of pregnancy-associated VTE are deep vein thrombosis (DVT) and approximately 25% are pulmonary embolism (PE).
rate was 85%. The mode of delivery also affects the deep venous system. Women who delivered by cesarean section had a lower mean velocity of blood flow in the common femoral vein during the puerperium than did those who had delivered vaginally. These changes in flow velocity and diameter take approximately 6 weeks to return to baseline. Another significant clinical difference observed in pregnant and immediate postpartum patients is that the majority of DVT events seen during this time occur in the iliofemoral segments rather than in the calf veins and are therefore more likely to result in PE. Additional underlying risk factors that increase the likelihood for thrombotic complications are age older than 35 years, delivery by cesarean section, weight greater than 175 lb, and a family or personal history of thrombosis and thrombophilia (protein C or S deficiency, factor V Leiden).

### Presenting Signs and Symptoms

The most common complaints in the postpartum period are fatigue (56%), breast problems (20%), backache (20%), depression (17%), hemorrhoids (15%), and headache (15%).

The signs and symptoms of metritis are fever, uterine tenderness, abdominal pain, and either purulent lochia or a positive culture of endometrial fluid or tissue usually between the second and seventh days postpartum. Fever (>38°C [100.4°F]) is the most important criterion for the diagnosis of metritis. Lochia may be foul smelling or have no odor.

Peritonitis is manifested as severe abdominal pain but may be misdiagnosed because abdominal rigidity, guarding, or rebound tenderness are often not present on physical examination as a result of laxity of the rectus abdominus muscles. Commonly, an adynamic ileus is the first sign.

Symptoms of toxic shock syndrome (TSS) include fever with a temperature of 39°C (102.2°F) or higher; erythematous diffuse rash: headache, photophobia, myalgias, and altered sensorium; gastrointestinal complaints, including nausea, vomiting, and watery diarrhea; and rapid progression to renal failure, hepatic failure, disseminated intravascular coagulation, and circulatory collapse.

Clinical signs and symptoms associated with cardiopulmonary complications may include fatigue, dyspnea, cough, orthopnea, hemoptysis, chest pain, palpitations, abdominal pain, tachycardia, elevated blood pressure, pulmonary rales, third heart sound, mitral regurgitant murmur, and peripheral edema.

Symptoms of postpartum mood disturbance include mild depression, irritability, confusion, mood instability, anxiety, headache, fatigue, and forgetfulness. Usually, the postpartum blues appear in the first 2 weeks after delivery and last from

### Table 123.1 Physiologic Changes in the Puerperium

<table>
<thead>
<tr>
<th>IMMEDIATELY FOLLOWING DELIVERY</th>
<th>BY POSTPARTUM TIME*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uterus palpable at the umbilicus</td>
<td>By the 2nd wk, the uterus has shrunk back into the pelvis; complete involution takes 6-8 wk</td>
</tr>
<tr>
<td>Uterine blood flow via the uterine artery = 500-600 mL/min</td>
<td>By the 2nd wk, uterine blood flow = 30-45 mL/min</td>
</tr>
<tr>
<td>Cardiac output and blood volume increased by 30% to 50%</td>
<td>By the 2nd week, values are normalized to baseline</td>
</tr>
<tr>
<td>Breasts produce colostrum</td>
<td>By day 5, mature breast milk produced</td>
</tr>
<tr>
<td>Thyroid size and function increase</td>
<td>In 3 mo, the size of thyroid decreases; by the 4th wk, biochemical changes resolve (T₃, T₄, TSH are normalized)</td>
</tr>
<tr>
<td>Bladder has enlarged capacity and insensitivity to increased intravesicular pressure; renal pelvis and ureters dilated</td>
<td>2-3 mo to return to normal</td>
</tr>
<tr>
<td>GFR increased</td>
<td>8 wk to return to prepregnant GFR</td>
</tr>
<tr>
<td>Rectus abdominis muscles lengthened</td>
<td>3-4 wk minimum to shorten; may be altered by exercise and overall baseline tone of the mother</td>
</tr>
<tr>
<td>Leukocytosis</td>
<td>2 wk to return to baseline</td>
</tr>
<tr>
<td>Fibrinogen level elevated</td>
<td>Increases on days 2-4; returns to normal levels by the end of the first week</td>
</tr>
<tr>
<td>Stretch marks</td>
<td>6-12 mo; depigmentation occurs but never fully resolves</td>
</tr>
<tr>
<td>Thicker and fuller hair</td>
<td>3-4 mo; delayed alopecia</td>
</tr>
<tr>
<td>Lower mean velocity of blood flow in the common femoral vein after cesarean section</td>
<td>6 wk to return to baseline</td>
</tr>
</tbody>
</table>

GFR, Glomerular filtration rate; T₃, triiodothyronine; T₄, thyroxine; TSH, thyroid-stimulating hormone; *Approximate time.
POSTPARTUM EMERGENCIES

are the predominant causes of TSS. These

Box 123.1

membranes, and weight on admission of more than 200 lb.

acknowledged risk factors for the development of metritis are chorio
versus 0.9% to 3.9% with vaginal deliveries.

cesarean section have a 6% to 18% incidence of metritis

of metritis is the route of delivery. Women who deliver by

In the past, uterine infections had different names based on

occasionally caused by thrombosis of the superficial or deep

pneumonia. Additionally, minor elevations in temperature are

limited ambulation, or both, predisposes some women to

infections.

Mild hypoventilation after delivery as a result of pain or

possible infections and is associated with fascial infection and
tissue necrosis.

One of the most severe complications of a pelvic infection

is necrotizing fasciitis. It has a devastatingly high mortality

of approximately 50%, even with appropriate treatment, and

may be a complication of a cesarean incision, episiotomy, or

perihepatic laceration. Risk factors for necrotizing fasciitis are
diabetes, obesity, and hypertension.

Other complications include pelvic phlegmon, which is

cellulitis that has extended to the broad ligament. These infe-
cctions can extend into any blood collections that develop after

a cesarean delivery, such as under the bladder flap, and cause

an infected hematoma. If left untreated, a phlegmon can sup-

parate into an abscess. Pelvic abscesses can develop in the

broad ligament, ovaries, rectovaginal septum, or psoas muscle.

Infections can extend into the veins and cause septic pelvic

thrombosis, which usually involves one or both ovarian venous

plexuses and occurs more predominantly on the right because

of the slightly longer vein on the right and dextroversion of the

puerperal enlarged uterus. In 25% of patients, these clots

extend into the inferior vena cava and occasionally into the

renal veins.

Toxic Shock Syndrome

TSS is a rare but worrisome postpartum infection with a

mortality of 10% to 15%. Group A streptococci and Staphy-
lococcus aureus are the predominant causes of TSS. These

bacteria colonize the mucosa of the vaginal tract and infect

the postpartum uterus, cervix, and vagina, all of which are

susceptible as a result of the trauma that accompanies deliv-
ery. Most cases of TSS occur in the first 8 weeks postpartum,
but TSS can be seen up to week 10.

Perineal Pain

Although some discomfort is to be expected after delivery

because of disruption and distention of the soft tissues of the

birth canal, painful perineal tissue is a significant issue for

many women. In fact, perineal pain was noted by 42% of

recently delivered women to be a significant problem in the

first 2 weeks following delivery, and as might be expected, the

percentage was higher in patients with assisted vaginal deliv-

eries (84%). By 8 weeks postpartum the percentage was down

to 22% and by 12 weeks down to approximately 7%.5

Careful examination is required for these patients, espe-
cially those with persistent and significant discomfort, to look

Differential Diagnosis and Medical Decision Making

Infections

Puerperal fever is defined as a temperature of 38° C (100.4°
F) or higher that occurs on any 2 of the first 10 days postpar-
tum, exclusive of the first 24 hours; the temperature should
be taken orally by a standard technique at least four times
daily.6 The usual cause is a genital tract infection, which can
lead to significant morbidity and mortality.

In a small proportion of women, postpartum fever will
develop as a result of breast engorgement, but the fever rarely
exceeds 39° C (102.2° F) in the first few postpartum days and
usually lasts less than 24 hours.

The most common infection in the postpartum period is a
genital tract infection, but other sources must be eliminated,
especially urinary tract infection and pneumonia. The puer-
peral bladder is prone to urine retention, especially after
instrumental delivery and epidural analgesia; in addition, dilat-
tion of the ureters and renal pelvis makes them potential sites
of infection.

Mild hypoventilation after delivery as a result of pain or
limited ambulation, or both, predisposes some women to
pneumonia. Additionally, minor elevations in temperature are
occasionally caused by thrombosis of the superficial or deep
veins of the lower extremities (Box 123.1).1,6

Genitourinary

Metritis and Pelvic Infections

In the past, uterine infections had different names based on
the assumed location of the infection; however, the accepted
terminology is now metritis or metritis with cellulitis because
uterine infection often involves multiple tissue layers, usually
the decidua and myometrial and parametrial tissue.

The single most significant risk factor for the development
of metritis is the route of delivery. Women who deliver by
cesarean section have a 6% to 18% incidence of metritis
versus 0.9% to 3.9% with vaginal deliveries. Other recog-
nized risk factors for the development of metritis are cho-

a few hours to a few days. More severe symptoms may include
delusions, hallucinations, rapid mood swings, sleep distur-
bances, and obsessive thoughts about the baby.

<table>
<thead>
<tr>
<th>BOX 123.1 Differential Diagnosis of Postpartum Fever</th>
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<tbody>
<tr>
<td><strong>Most Common</strong></td>
</tr>
<tr>
<td>Metritis</td>
</tr>
<tr>
<td>Urinary tract infection</td>
</tr>
<tr>
<td>Pneumonia</td>
</tr>
<tr>
<td>Wound infection</td>
</tr>
<tr>
<td>Mastitis</td>
</tr>
<tr>
<td>Superficial or deep vein thrombosis</td>
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<td></td>
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</tbody>
</table>
for evidence of hematoma formation, abscess, or genital tract infections such as cellulitis and necrotizing fasciitis.

**Urinary Tract Dysfunction**

The puerperal bladder is predisposed to some urinary retention, as well as urinary tract infections, especially in patients who had instrumentation or prolonged labor in delivery, as well as epidural or spinal analgesia. In the immediate postpartum period, the bladder has increased capacity and relative insensitivity to increased intravesical pressure. The ureteral and renal pelvic dilation seen in late pregnancy takes approximately 2 to 3 months to resolve. These factors, combined with stasis of urine, create an excellent environment for development of a urinary tract infection. Any patient with a complaint of urinary retention should have catheterized urinalysis performed and urine sent the laboratory for culture to rule out urinary tract infection.

**LACTATION AND BREAST DYSFUNCTION**

Milk leakage, breast engorgement, and breast pain peak at 3 to 5 days postpartum.

A milk duct can be clogged by inspissated secretions or milk forming a galactocele. It may form a fluctuant mass and resultant pain.

**Mastitis**

In women who breastfeed, mastitis is a common problem that usually peaks between the second and sixth postpartum weeks. Most often the mastitis is unilateral and is caused by infant oral bacterial flora and relative obstruction of a milk duct. The most commonly isolated organism is *S. aureus*.

The affected breast appears hard and reddened, and the patient complains of severe pain. An abscess develops in 10% of women with mastitis. Patients with breast abscesses may have constitutional symptoms of fevers, chills, or rigor along with fluctuate of the area. Ultrasonography can be useful in detecting an abscess.

**GASTROINTESTINAL**

Abdominal pain is a common complaint in the puerperium. In fact, one questionnaire given to women 48 hours after vaginal delivery noted that 50% of primiparous and 86% of multiparous women complained of lower abdominal pain.10

Abdominal pain can be a difficult complaint to evaluate in postpartum patients and requires a higher level of suspicion for a surgical emergency or infectious or thrombotic complications. Because patients expect to experience a certain amount of pain and discomfort after delivery, they often come late to the ED with these symptoms. During the preliminary ED evaluation it may be difficult for the emergency physician to adequately assess these patients without imaging, and the proper diagnosis may be further delayed.

**Appendicitis**

In puerperal patients with appendicitis, peritoneal tenderness may not be present as a result of laxity of the rectus abdominis muscles following pregnancy. The uterus is still enlarged for much of the puerperium, and because the appendix is displaced upward toward the right upper quadrant and the abdominal wall is lifted away from the inflamed appendix, clinically apparent signs of peritoneal irritation are minimized. The psoas, obturator, and Rovsing signs are not predictive of appendicitis in pregnant and postpartum women. Other tests have been suggested such as the Bryan sign (pain elicited by movement of the enlarged uterus to the right) for appendicitis and the Alder test (maintaining constant pressure at the area of maximum tenderness while the patient rolls from a supine position to the left side) to differentiate pain of intrauterine origin (which diminishes as the uterus falls away with the maneuver) from pain of extraneous origin. The sensitivity and specificity of these tests are unknown.

The incidence of appendicitis is not increased during the puerperium, although outcome is poorer because of delayed diagnosis. The incidence of certain pathologies such as obstruction, ileus, acute cholecystitis and peripartum, and Fitz-Hugh-Curtis syndrome (often misdiagnosed as acute cholecystis) is increased during this period. Postpartum ileus is usually associated with cesarean section; other obstructions may occur more frequently as a result of compression of the enlarged uterus. Peripartum ileus is often a sequela of latent or asymptomatic infection. Ovarian cysts and torsion need to be ruled out in the differential diagnosis, as well as complications of metritis and urinary tract infections.

Evaluation tools include a careful pelvic examination with appropriate cultures to rule out infection of the genital tract, a catheterized urine specimen to avoid contamination with lochia for urinalysis and culture, and standardized laboratory values such as electrolytes, liver function tests, serum amylase, and a complete blood count. In puerperal patients with appendicitis, urinalysis may show a sterile pyuria of more than five white blood cells per high-power field, and 15% to 30% of these patients have hematuria as a result of the proximity of the inflamed appendix to the ureter. The white blood cell count is difficult to interpret in puerperal patients because of the leukocytosis that normally occurs during the first 2 weeks of the puerperium.

Radiographs are typically nonspecific. Ultrasonography is useful to identify uterine, adnexal, ovarian, pelvic, or hepatobiliary abnormalities and may diagnose appendicitis. Contrast-enhanced computed tomography (CT) is better for identifying appendicitis and complications of metritis such as septic pelvic thrombophlebitis.11,12

**HEMATOLOGIC**

**Hemorrhage**

Severe bleeding complications usually occur early in the puerperium. The most common cause of early postpartum hemorrhage is uterine atony. Because this complication usually occurs immediately after delivery of the placenta, it is not likely to be seen in the ED unless the mother delivered at home or at a birth center without medical backup.

The second most common cause of early postpartum bleeding is vaginal or cervical laceration of the reproductive tract. Sometimes these areas of bleeding can be concealed, especially if the source is above the pelvic diaphragm; they can be very uncomfortable and not obvious on examination.

Delayed bleeding is the hemorrhagic complication most likely to be evaluated in the ED. Most cases of delayed postpartum hemorrhage are associated with infected retained placental fragments or membranes. A persistently patent cervix, particularly if associated with bright red bleeding, should suggest retained products of conception.

A rare cause of hemorrhage (0.2 to 1 case per million) is an acquired hemophilia that usually occurs within the first
4 months after delivery, occasionally as early as the first postpartum day. The mortality from such hemorrhage is 12% to 22%. Of these patients, 54% have other previously diagnosed immune system diseases such as rheumatoid arthritis, systemic lupus erythematosus, and inflammatory bowel disease. A prolonged partial thromboplastin time with a normal prothrombin time localizes the coagulation defect to the intrinsic pathway of the coagulation cascade and thus suggests hemophilia as the cause of the hemorrhage.

**Thromboembolic Complications**
The index of suspicion for VTE should remain high because although complaints of dyspnea, tachypnea, leg swelling, and leg discomfort are common at term, they may also indicate PE or DVT. One study found that approximately 24% of women in whom DVT developed during pregnancy or the puerperium were asymptomatic and 55% complained of isolated leg swelling.

DVT is best diagnosed by duplex ultrasonography because no radiation is involved; if the diagnosis is still uncertain, ultrasonography can be repeated or venography can be performed. To confirm the diagnosis of PE, ventilation-perfusion lung scanning or spiral CT could be performed safely in patients in the puerperium.

Neurologic embolic events such as cerebral embolism and cerebral venous thrombosis can also occur in the puerperium. Cerebral embolism generally involves the middle cerebral artery and is commonly associated with a cardiac arrhythmia, especially atrial fibrillation associated with rheumatic heart disease. However, these emboli may also be associated with rheumatic heart disease without arrhythmia, mitral valve prolapse, and infective endocarditis.

Central venous thrombosis is a rare but serious postpartum embolic complication with a frequency of 8.9 to 11.6 cases per 100,000 deliveries. The clinical findings are extremely variable and range from isolated headache to focal deficits to encephalopathy to psychiatric manifestations to coma. The diagnosis is made by brain imaging, commonly magnetic resonance imaging with gadolinium enhancement, magnetic resonance venography, magnetic resonance angiography, CT four-vessel angiography, CT angiography, or any combination of these modalities.

**CARDIAC**
Peripartum cardiomyopathy is a rare disorder that occurs in 1 of every 15,000 pregnancies in the United States, but it is a potentially fatal complication in the puerperium. Diagnostic criteria include onset of heart failure in the last month of pregnancy or in the first 5 months postpartum, absence of a determinable cause of the cardiac failure, absence of demonstrable heart disease before the last month of pregnancy, and impairment of left ventricular systolic function as demonstrated by echocardiography. The cause of peripartum cardiomyopathy is not known. Multiparity, multiple gestations, advanced maternal age (>30 years), preeclampsia, hypertension, and African descent are documented risk factors. The mortality associated with peripartum cardiomyopathy ranges from 18% to 56%. Survival is largely dependent on recovery of left ventricular function. Most who recover significant left ventricular function show improvement by 2 months after diagnosis.

Patients who fail to recover within 6 months may require cardiac transplantation. Those who undergo transplantation have a 30% higher rate of early rejection than do patients with idiopathic cardiomyopathy, but the survival rate at 2 years is 86%. Without transplantation, patients with persistent or progressive cardiomyopathy have a 5-year mortality rate approaching 50%.

Initial diagnostic evaluation includes electrocardiography, plain chest radiography, serum tests (electrolytes, liver function panel, complete blood count), and urinalysis. The electrocardiogram may be normal or tachycardic and may show nonspecific ST-segment or T-wave changes, atrial or ventricular dysrhythmias, left ventricular hypertrophy, PR or QRS prolongation, and conduction disturbances. Plain chest radiography usually shows cardiomegaly with pulmonary venous congestion and occasionally pleural effusion.

The diagnostic study of choice is echocardiography because it can be performed at the bedside, presents no radiation risk to pregnant patients, can differentiate between PE and amniotic embolism, and can provide diagnostic information based on the degree of left ventricular dysfunction. The biggest drawback is often lack of availability in the ED.

Patients with peripartum cardiomyopathy are at especially high risk for thromboembolic events because of blood stasis from the severe left ventricular dysfunction, which may lead to left ventricular thrombi and subsequent emboli.

**ENDOCRINE**

Sheehan Syndrome
This syndrome of pituitary ischemia and necrosis associated with obstetric blood loss, first described in 1937, is an extremely rare occurrence in the developed world now that hemorrhage and shock are managed aggressively.

**Thyroiditis**
Postpartum thyroiditis is usually a self-limited autoimmune disorder marked by the development of postpartum thyroid dysfunction that occurs up to 9 months following delivery. Classically, a period of transient hyperthyroidism occurs between postpartum months 2 and 6, followed by a transient hypothyroid stage, with return to the euthyroid state by 1 year postpartum. Its incidence ranges from 1.1% to 16.7%.

Risk factors include the presence of thyroid antibodies, a previous episode of postpartum thyroiditis, type 1 diabetes mellitus, and a family history positive for thyroid disease. These patients have an increased risk for the development of permanent hypothyroidism in the following 5 to 10 years. The diagnosis is based on thyroid-stimulating hormone (TSH) levels and free triiodothyronine (T3) and thyroxine (T4) levels.

During the hyperthyroid state of postpartum thyroiditis, TSH is suppressed and free T3 and T4 levels are elevated. Symptoms include fatigue, palpitations, irritability, heat intolerance, and nervousness. Many of these symptoms are often attributed to the stress of motherhood, and the diagnosis is frequently missed. During the hypothyroid state, TSH is elevated with suppressed levels of free T3 and T4. Symptoms include impaired concentration, carelessness, lack of energy, poor memory, dry skin, cold intolerance, and aches and pains.

**NEUROLOGIC**
Headache is a common complaint in postpartum patients; it has been noted by about 15% of patients to occur in the first 2 weeks after delivery. The differential diagnosis of the cause of headache is extensive, and certain life-threatening
complications need to be excluded, such as central venous thrombosis, stroke, meningitis, and intracranial bleeding from an undiagnosed aneurysm or arteriovenous malformation. The patient’s personal and medical history is of the greatest importance to aid in diagnosis because it may suggest a cause such as migraine, post–dural puncture headache, or pneumocephalus.

The pain from pneumocephalus associated with epidural anesthesia is a result of direct injection of air into the subarachnoid space and is immediately felt as back pain at the level of needle insertion that spreads to the posterior aspect of the neck and then to the occipital and frontal areas. Generally, this complication, which occurs when the patient is in labor, resolves with supportive care, and the patient has no neurologic deficits.16

Post–dural puncture headache is also associated with epidural anesthesia. It is a “nonthrobbing” headache that is worsened on change of posture from a horizontal to an upright position. These headaches are postulated to be caused by persistent loss of cerebrospinal fluid at a dural puncture site. Most of these headaches begin within 5 days of the procedure. Auditory and ocular symptoms may occur with prolonged or severe manifestations.

Other less common causes of headache in postpartum patients include central venous thrombosis (see the earlier section “Thromboembolic Complications”) and late postpartum preeclampsia, which may be manifested as hypertension with blood pressure greater than 140 mm Hg systolic and 90 mm Hg diastolic, proteinuria, and a headache not responsive to analgesics. Late postpartum eclampsia occurs in 3% to 26% of eclamptic patients. Late postpartum preeclampsia or eclampsia is defined as the development of signs and symptoms after 48 hours and before 4 weeks following delivery. Most patients with postpartum preeclampsia or eclampsia do not have a preceding history of gestational preeclampsia or eclampsia. A postpartum woman with a new history of convulsions occurring more than 48 hours after delivery plus proteinuria and hypertension should be considered eclamptic while other causes are being ruled out. Neuroimaging generally demonstrates a posterior reversible encephalopathy syndrome.17

PSYCHIATRIC

Fatigue is one of the most common complaints during the puerperium. Some fatigue is normal given the demands of taking care of a newborn infant after the physical rigors of labor and delivery; however, this complaint should be taken seriously because it can be the first symptom of anemia, new-onset diabetes, hypothyroidism, or a psychiatric disorder.

The most common postpartum mood disturbance is the postpartum blues, which affects 50% to 80% of new mothers. Physicians must evaluate the patient to differentiate postpartum blues from the more severe symptoms associated with postpartum depression. Up to 20% of women with postpartum blues will have a major depressive episode in the first postnatal year. Multiple risk factors for postpartum depression have been identified: personal or family history of depression, previous episode of postpartum depression, depression or anxiety during pregnancy, an unplanned or unwanted pregnancy, recent stressful life events, poor social support, and marital discord. Neonatal medical problems or the occurrence of postpartum blues also increases the risk for postpartum depression.

Usually beginning within the first 4 weeks after delivery, postpartum depression is highly variable in severity and duration. It occurs in 5% to 20% of new mothers and is especially prevalent in adolescent mothers. The diagnosis of depression is difficult to make in a postpartum mother because the typical signs and symptoms have significant overlap with normal issues of the puerperium, such as disturbances in sleep, weight, and energy.

The most severe form of psychiatric disease in the postpartum period is postpartum psychosis. Fortunately, this condition is rare and occurs in fewer than 2 of every 1000 deliveries. The onset of postpartum psychosis is usually within the first 3 weeks after delivery and occasionally within a few days after delivery. Many of these patients have a history of schizophrenia or bipolar disorder. Symptoms include delusions, hallucinations, rapid mood swings, sleep disturbances, and obsessive thoughts about the baby.

TREATMENT AND FOLLOW-UP

GENITOURINARY

Metritis and Pelvic Infections

Low-risk patients in whom mild metritis develops after being sent home following vaginal delivery can be treated with an oral microbial agent such as doxycycline or azithromycin. Patients with moderate to severe metritis, as well as those who have delivered by cesarean section, should be treated with broad-spectrum intravenous antibiotics to cover mixed flora and should be observed in the hospital.

Most patients should improve with antibiotics within 48 to 72 hours, and failure to improve suggests a complication of metritis such as parametrial phlegmon, pelvic or incisional abscess, infected hematoma, septic pelvic thrombi, retention of fetal parts, or bacteria resistant to the treatment regimen.

Treatment of pelvic abscesses includes intravenous antibiotics and possible percutaneous drainage. In cases of septic pelvic thrombi, intravenous antibiotics are currently the mainstay of therapy because studies indicate that the use of heparin does not alter the outcome.

Empiric treatment of necrotizing fasciitis varies widely. Treatment typically consists of a four-antibiotic regimen that includes gram-positive coverage with a penicillin or extended-spectrum penicillin; gram-negative coverage with aminoglycosides, cephalosporins, or carbapenems; anaerobic coverage with clindamycin; empiric coverage for methicillin-resistant S. aureus (MRSA) such as vancomycin; and emergency operative débridement of the area.18

Toxic Shock Syndrome

Treatment of TSS includes aggressive fluid management with crystalloids, supportive care, and pressors as needed. Antibiotics do not alter the course of TSS, but they decrease the recurrence rate by 50%. An agent to cover gram-positive organisms plus coverage for MRSA, such as vancomycin combined with an aminoglycoside such as gentamicin, is appropriate.19

Perineal Pain

Early application of cold compresses or ice packs to soft tissue trauma reduces swelling and discomfort. Sitz baths are also recommended to alleviate discomfort. Acetaminophen or
nonsteroidal antiinflammatory drugs (generally considered safe in breastfeeding patients) are the initial medications of choice for pain.

**Urinary Tract Dysfunction**
Most patients with urinary retention will note incomplete voiding and will not require catheterization, but they should be referred to the urology or urogynecology department for urodynamic testing.

Stress urinary incontinence is another complaint that occurs in the postpartum period. The ED usually lacks the facilities to address this complaint, but these patients should be referred to the urology or urogynecology department for work-up and management.

**LACTATION AND BREAST DYSFUNCTION**

**Breast Engorgement**
During the state of engorgement, breast pain can be partially alleviated by a supportive brassiere or breast binder, avoidance of nipple stimulation, ice packs, and oral analgesics.1,6

**Galactocele**
Warm compresses may help the situation resolve spontaneously, but in patients with a large amount of pain and fluctuance, needle aspiration may be required.

**Mastitis**
First-line agents for the treatment of mastitis are penicillin, cephalosporin, clindamycin, and erythromycin (for penicillin-sensitive patients); all are considered safe in lactating women. The infection should show improvement within 48 hours. Lack of improvement over this period suggests an abscess or resistant organism. Abscesses require incision and drainage with packing or ultrasound-guided needle aspiration, which has a success rate of 80% to 90%.

If resistant organisms are suspected, milk from the affected breast should be sent on a swab for culture, and an antimicrobial agent effective against MRSA should be started. Continued breastfeeding on the affected side is important to help clear the infection. If the baby is having difficulty latching on because of surrounding erythema or induration, the affected breast can be pumped gently. Patients should be referred for a follow-up visit within 72 hours to their primary care physician or gynecologist to ensure that they are responding to the medication prescribed.

**HEMATOLOGIC**

**Postpartum Bleeding**
Treatment consists of broad-spectrum antibiotics and emergent obstetric consultation for dilation and curettage. Disseminated intravascular coagulation can occur in these cases and may require aggressive management with platelets, fresh frozen plasma, and packed red blood cells.1

Hemorrhage from acquired hemophilia should prompt a hematology consultation. Management of the hemorrhage consists of the administration of blood products to replace the blood loss, coagulation factor, and immunosuppressants. Selection of a product for control of acute bleeding depends on the clinical severity and on coagulation factor VIII inhibitor titers. Immunosuppressive therapy with corticosteroids and cytotoxic drugs, alone or in combination, has been the mainstay of therapy in stable patients. In most of these cases, the acquired hemophilia spontaneously remits within months of delivery.20

**Deep Vein Thrombosis**
Treatment of postpartum patients with DVT consists of unfractionated or low-molecular-weight heparin and transition to warfarin (Coumadin), which is safe in lactating patients because it does not significantly cross over into breast milk.4,21

**Central Venous Thrombosis**
Management includes anticonvulsants to control seizures, emergency neurology consultation, and antimicrobials if septic thrombosis is suspected. Heparin therapy is controversial because of the bleeding complications that may develop.6

**CARDIAC**
Treatment of postpartum cardiomyopathy is the same as that for nonischemic dilated cardiomyopathy. Management should be supportive with restriction of sodium (no more than 4 g daily of salt) and fluid (no more than 2 L of daily fluid intake). Preload- and afterload-reducing agents plus positive inotropic agents, if the patient is acutely ill, are the cornerstones of treatment. For antepartum patients, afterload reduction can be accomplished with hydralazine; positive inotropy with digoxin; and preload reduction with diuretics, nitroglycerin, and beta-blockers. Postpartum patients should receive angiotensin-converting enzyme inhibitor therapy, which has been shown to improve survival in patients with dilated cardiomyopathy.14 Breastfeeding mothers should curtail breastfeeding because angiotensin-converting enzyme inhibitors are excreted in breast milk and their safety is unproved.32

**ENDOCRINE DISORDERS**

**Thyroiditis**
Most women in the hyperthyroid stage need no treatment or intervention. Symptomatic patients in this stage can usually be managed with beta-blockers and referral to an endocrinologist. The hypothyroid stage is multifactorial, and management is more difficult; these patients should also be referred to an endocrinologist for long-term follow-up. Patients with a TSH level greater than 10 mU/L or who are symptomatic with a TSH level between 4 and 10 mU/L should be treated with levothyroxine. Women who are planning to become pregnant again should be cautioned to wait until they have discussed the issue with an endocrinologist because even subclinical hypothyroidism can cause an increased miscarriage rate and may result in impaired cognitive performance in the child.22

**NEUROLOGIC**
Headaches that result from the pneumocephalus associated with epidural anesthesia generally occur when the patient is in labor and resolve with supportive care.13

Treatment of post–dural puncture headaches includes hydration and analgesic agents initially. If these measures fail, an anesthesia consultation to consider an epidural blood patch is recommended.16,23

Postpartum preeclampsia or eclampsia can develop as late as 2 or more weeks postpartum. Magnesium sulfate therapy should be initiated with a loading dose of 4 g administered over a 30-minute period, followed by a maintenance dose of 2 g/hr for at least 24 hours after the last seizure, along with close monitoring and observation. More detail about the...
diagnosis and management of these patients can be found in Chapter 121.

PSYCHIATRIC
Postpartum blues is generally a self-limited and benign condition, but patients should be evaluated for a personal or family history of depression, as well as the strength of their social support structure. Patients with postpartum blues should be referred to their primary care physicians for follow-up. Those with risk factors for a major depressive episode should be educated about the signs and symptoms of major depression and be encouraged to seek help if they experience these symptoms. Patients who show signs of psychosis or major depression require psychiatric evaluation and follow-up before they can be discharged. Patients with postpartum psychosis require emergency hospitalization because 5% of these patients commit suicide and 4% commit infanticide.24

PATIENT TEACHING TIPS
After starting antibiotics for mastitis, improvement should be seen by 48 to 72 hours; if the condition does not improve or worsens, an abscess or resistant organism may be the cause of the infection, and reevaluation is necessary. Patients with mastitis should be instructed to continue breastfeeding on the affected side to help clear the infection.

To avoid complications in a second pregnancy, patients with hypothyroidism should not become pregnant again until management of the disorder is successful and cleared by an endocrinologist.

Patients with abdominal pain should be counseled on the difficulty of making intraabdominal diagnoses in the puerperium and should have clear follow-up and return visit instructions.

Patients with postpartum blues should be reassured that this is normal and usually resolves within a few days. If no improvement in symptoms is seen by the end of a week, patients should be reevaluated either in the emergency department or by a psychiatrist.

DOCUMENTATION
The mode of delivery is an important factor in puerperium complications; delivery by cesarean section is associated with higher rates of infection, as well as other disorders. Note the method of delivery, pregnancy and delivery complications, and associated risk factors.

Document social support for the patient and infant. Give and record instructions about potential complications.

Patients with abdominal pain are at increased risk for complications; provide clear instructions on where and when follow-up should be carried out, list reasons to return to the emergency department, and discuss potential causes of abdominal pain.

In patients with headache in the first 3 postpartum weeks, document the timing of the headache, worsening with change of position, and quality of the headache.

REFERENCES
References can be found on Expert Consult @ www.expertconsult.com.

RED FLAGS
Metritis should improve within 48 to 72 hours with antibiotics; failure to improve suggests complications such as parametrial phlegmon, pelvic or incisional abscess, infected hematoma, septic pelvic thrombi, retained products of conception, or bacterial resistance.

Initial diagnosis of peripartum cardiomyopathy (PPCM) may be difficult to make, and it is often manifested by symptoms similar to amniotic fluid or pulmonary thromboembolism. Patients with PPCM are at high risk for thromboembolic events. Severe left ventricular dysfunction from PPCM results in blood stasis and may lead to left ventricular thrombi and subsequent emboli.

Postpartum thyroiditis is associated with a period of transient hyperthyroidism occurring 2 to 6 months postpartum; symptoms include fatigue, palpitations, irritability, heat intolerance, and nervousness. These symptoms are often attributed to the stress of motherhood, and the correct diagnosis may be missed.

Sterile pyuria and hematuria may be seen in patients with appendicitis. The uterus is still enlarged for much of the puerperium, with the appendix displaced upward toward the right upper quadrant and the abdominal wall lifted away from the inflamed appendix, which minimizes clinically apparent signs of peritoneal irritation.

Patients with postpartum psychosis may have symptoms such as delusions, hallucinations, rapid mood swings, sleep disturbances, and obsessive thoughts about the baby. These patients require emergency hospitalization because approximately 5% commit suicide and 4% commit infanticide.

TIPS AND TRICKS
Because lochia will contaminate a clean-catch urine specimen during the first 30 to 60 days postpartum, a catheterized urine specimen should be obtained and sent to the laboratory to rule out urinary tract infection.

The second most common cause of early postpartum bleeding is laceration of the reproductive tract. In some of these cases, areas of bleeding may be concealed, especially if the source is above the pelvic diaphragm; this condition is very uncomfortable and not always obvious on examination.

Although 75% of deep vein thrombosis events occur ante-partum, 66% of pulmonary thromboembolism events occur postpartum.

The psoas, obturator, and Rovsing signs are not predictive of appendicitis in pregnant and postpartum patients.
REFERENCES