

TABLE 100-12 Inpatient Treatment of Postpartum Endometritis*

Cefoxitin (2 grams IV every 6 h) and vancomycin 1 gram IV every 12 h
OR
Cefotetan (2 grams IV every 12 h) and vancomycin 1 gram IV every 12 h
OR
Cefotaxime (2 grams IV every 6 h) and vancomycin 1 gram IV every 12 h
OR
Clindamycin (500 milligrams IV every 6 h) <i>plus</i> gentamicin (4.2 milligrams/kg IV daily) and vancomycin 1 gram IV every 12 h
OR
Ampicillin (2 grams IV every 4 h) <i>plus</i> gentamicin (4.2 milligrams/kg IV daily) and vancomycin 1 gram IV every 12 h
OR
Metronidazole (500 milligrams IV every 8 h) <i>plus</i> ampicillin (2 grams IV every 4 h) <i>plus</i> an aminoglycoside and vancomycin 1 gram IV every 12 h

*Consult the hospital pharmacist to determine if the antibiotic regimen selected is appropriate for breastfeeding.

TRANSFER OF THE PREGNANT PATIENT AND THE EMERGENCY MEDICAL TREATMENT IN ACTIVE LABOR ACT

There are times when a pregnant woman must be transferred to another hospital. Emergency physicians who work in a hospital that does not provide obstetric services should be familiar with the protocols in place for transfer and inpatient care of such patients. The **Emergency Medical Treatment and Active Labor Act** specifically addresses the care of pregnant women before and during transfer (see chapter 303, Legal Issues in Emergency Medicine).

A woman having contractions is considered to have an emergency medical condition if there is insufficient time for transfer before delivery or if the transfer may pose a threat to the health or safety of the child. In such a situation, the patient should not be transferred prior to delivery unless the patient requests transfer. If contractions are not present, an emergency medical condition is not automatically present, and the regular rules of providing medical care and determining the need for transfer of patients apply.

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REFERENCES

The complete reference list is available online at www.TintinalliEM.com.

CHAPTER

101

Emergency Delivery

Sarah Elisabeth Frasure

INTRODUCTION AND EPIDEMIOLOGY

The thought of a woman presenting to the ED in active labor is justifiably a cause for anxiety—the emergency physician must contend not only with the often rusty recollection of the stages of normal delivery, but also with the knowledge that there are serious and even fatal complications associated with labor. Maternal and fetal survival may depend on

TABLE 101-1 Equipment and Supplies for Emergency Delivery

Sterile gloves
Sterile towels and drapes
Povidone-iodine (Betadine) to cleanse the perineum
Sterile lubricant gel
Sterile scissors
Kelly clamps
Cord clamps
Rubber suction bulb
Towel or blanket for the infant
Gauze sponges (4×4)
Syringes (10 mL) and needles (22–24 gauge)
Placenta basin
Suture (3-0 chromic and 2-0 Vicryl) and needle driver

Note: List excludes standard adult and neonatal resuscitation equipment.

the ability to successfully manage pre-eclampsia, eclampsia, hemorrhage, shoulder dystocia, malpresentation, cord prolapse, breech delivery, or fetal distress. Every ED should be prepared to take care of a woman in active labor. Tools include a basic delivery kit, an infant warmer or isolate, and medical supplies and equipment for neonatal resuscitation (see chapter 108, “Resuscitation of Neonates” and **Tables 101-1** and **101-2**).

Out-of-hospital births occurred in 1.36% of births in 2012, and out-of-hospital births in the United States had a lower risk profile than in-hospital births, so that fewer teen, preterm, low-birth-weight, and multiple births occurred out of hospital.¹ Occasionally, planned home deliveries experience medical complications and require rapid transport to the ED to assist with labor and delivery. In a prospective study of home births in the United States and Canada, nearly 12% of 5400 women who had planned a home delivery ultimately required urgent transfer to a hospital during the course of labor. The majority of *intrapartum* transfers were performed for failure to progress, need for pain management, and maternal exhaustion. *Postpartum* transfers encompassed a variety of obstetric and/or neonatal complications such as maternal hemorrhage, retained placenta, or newborn respiratory distress.²

Out-of-hospital deliveries may also occur due to inadequate or non-existent prenatal care, transportation difficulties, remote setting, or the onset of premature labor. Occasionally, a woman may also attempt to avoid the hospital/physician fees associated with pregnancy until the delivery of her child, presenting to a hospital for the first time when in active labor.

The development of obstetric centers for high-risk pregnancy has led to a significant decline in neonatal mortality in the United States, and transports to specialized units have increased. The most common reasons for transport include preterm labor (41%), premature rupture of membranes (21%), hypertensive disease (16%), and antepartum hemorrhage (13%).³ Other indications for transport include eclampsia or pre-eclampsia, fetal distress, multiple gestation, fetal anomalies, and maternal health problems, including traumatic injuries. EMS units transporting an actively laboring patient should carry sterile delivery packs, relevant medical supplies (Table 101-1), and appropriate medications (Table 101-2). The transport team should be trained to assist in the precipitous delivery of an infant. Prehospital protocols regarding the complications of labor and delivery should be reviewed regularly to ensure that EMS personnel are adequately prepared for both normal delivery and potentially catastrophic pregnancy-related events.

For deliveries in an austere environment or in a disaster zone, the United Nations Population Fund provides a vaginal delivery kit for use during disaster relief, which includes a plastic sheet to lay on the ground, soap for washing hands and the perineum, string and a razor blade to tie and cut the umbilical cord, and a blanket to protect the newborn baby.⁴

TABLE 101-2 Medications for Emergency Delivery and Indications for Use

Classification	Medication	Dosage	Indication/Use	Contraindications
Uterotonic	Oxytocin	10–40 units/1000 mL normal saline or 10 units IM	Stimulation of uterine contraction or as uterotonic for PPH	Hypersensitivity
	Misoprostol	1000 micrograms PR once	Unlabeled use for PPH	Hypersensitivity
	Methylergonovine	0.2 milligram IM or IV or PO; may repeat at 2–4 h intervals	PPH	Hypersensitivity, hypertension
	Carboprost	250 micrograms IM every 15–90 min (total dose 2 milligrams)	PPH	Asthma
Antihypertensive	Hydralazine	5 milligrams IV, followed by 5- to 10-milligram boluses every 20 min	Pre-eclampsia/eclampsia, hypertensive emergency	Hypersensitivity
	Labetalol	20 milligrams IV, followed by doubled doses up to 80 milligrams (20–40–80–80) every 10 min; maximum total dose, 220 milligrams	Pre-eclampsia/eclampsia, hypertensive emergency	Hypersensitivity, sinus bradycardia
Anticonvulsant	Magnesium sulfate	Loading dose of 4–6 grams IV over 15 min, followed by 2 grams/h infusion; can also give 5 grams IM in each buttock	Seizure prophylaxis in pre-eclampsia/eclampsia	Myasthenia gravis
Electrolyte supplement toxicity	Calcium gluconate	1 gram IV over 5–10 min	Magnesium toxicity	Hypersensitivity, cardiac arrhythmia
Analgesic	Lidocaine 1%	1–10 mL injected locally	Local anesthetic	Hypersensitivity
	Fentanyl, 50 micrograms/mL	50 micrograms/mL	Short-acting opiate analgesic	Hypersensitivity
Opiate antagonist	Naloxone	0.4–2.0 milligrams IV every 2–3 min as need up to 10 milligrams cumulative dose	Narcotic overdose	Hypersensitivity
Antiemetic	Ondansetron	4 milligrams IV	Nausea, vomiting	Hypersensitivity

Abbreviation: PPH = postpartum hemorrhage.

PHYSIOLOGY

■ RUPTURE OF MEMBRANES

Determining rupture of membranes predicts not only the likelihood of imminent labor, but also the potential for complications, such as infection or cord prolapse. Spontaneous rupture of membranes occurs during the course of active labor in the majority of patients, although it also happens *prior* to onset of labor in approximately 8% of third-trimester patients.⁵ Fifty percent of women who experience premature rupture of membranes deliver within 5 hours, and 95% give birth within 28 hours of this event.⁶ The history of spontaneous rupture of membranes typically involves report of a gush of clear or blood-tinged fluid. Occasionally, patients recount continued leaking or dampening of their underwear on standing or with a Valsalva maneuver. Thick greenish brown fluid suggests the presence of meconium in amniotic fluid.

Rupture of membranes may be confirmed by using nitrazine paper to test residual fluid in the fornix or vaginal vault while performing a sterile speculum examination. **Amniotic fluid has a pH of 7.0 to 7.4 and will turn nitrazine paper a dark blue.** Vaginal fluid, on the other hand, typically has a pH of 4.5 to 5.5; the nitrazine strip, thus, remains yellow. False-positive results may occur, however, in the presence of blood, lubricant, *Trichomonas vaginalis*, semen, or even cervical mucus. **Another test that confirms rupture of membranes is ferning, which is the observation of sodium chloride crystals on a microscope slide as amniotic fluid dries (Figure 101-1).**

Premature Rupture of Membranes Rupture of the amnion and chorion *prior* to the onset of labor is called *premature* or *prelabor rupture of membranes*. If rupture of membranes occurs prior to 37 weeks of gestation, it is termed *preterm premature rupture of membranes*. Prolonged rupture of membranes transpires if delivery does not take place within 18 hours of rupture of membranes. It is important to understand the difference between and management of premature and preterm premature rupture of membrane as these patients may present to an ED for an initial evaluation.⁷ Risk factors related to both premature rupture of membranes and preterm premature rupture of membranes include

infection, history of trauma, multiple gestation, fetal anomalies, abruptio placentae, and placenta previa. Obtain emergency obstetrics consultation for preterm premature rupture of membranes.

■ CERVICAL DILATATION

Cervical dilatation describes the diameter of the internal cervical os and indicates the progression of labor. The index and middle fingers of the examining hand are used to estimate the diameter, which is expressed in centimeters (from closed to 10 cm). **Ten centimeters indicates full dilatation.** As labor progresses, the cervix also undergoes thinning, known as **effacement**, which is described in terms of a percentage (%) of normal cervical length. Unfortunately, this estimate is poorly reproducible among examiners. **Station** indicates the level that the fetus occupies in the pelvis. The maternal ischial spines serve as the reference point and are palpable on either side of the vaginal canal (located at 4 and 8 o'clock). If the presenting fetal part remains above the ischial spines, the station is described as negative. Once the presenting

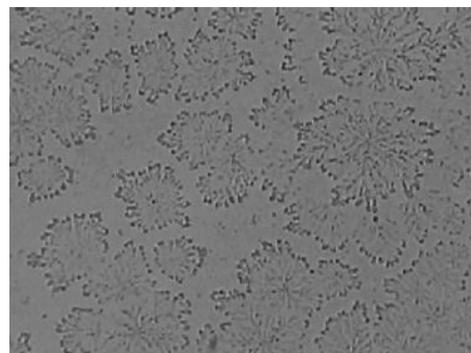


FIGURE 101-1. Typical ferning of dried amniotic fluid.

TABLE 101-3 True Versus False Labor

	True Labor	False Labor
Contractions		
Rhythm	Regular	Irregular
Intervals	Gradually shorten	Unchanged
Intensity	Gradually increases	Unchanged
Discomfort		
Location	Back and abdomen	Lower abdomen
Sedation	No effect	Usually relieved
Cervical dilatation	Yes	No

Source: Reproduced with permission from Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Rouse DJ, Spong CY (eds): *Williams Obstetrics*, 23rd ed. McGraw-Hill, Inc., 2010. Table 17-4 on AccessMedicine.com.

fetal part has reached the level of the ischial spines, the station is 0, with further descent into the pelvis described as +1 or +2. Therefore, a +3 station corresponds to visible scalp at the introitus, indicating a fetal position consistent with impending delivery.

■ TRUE VERSUS FALSE LABOR

Distinguishing **true from false labor** is an important initial step in the management of the pregnant patient (Table 101-3). **False labor** is defined as uterine contractions that do not produce cervical changes and is characterized by irregular, brief contractions that are usually confined to the lower abdomen. Commonly known as **Braxton Hicks contractions**, they are irregular in both intensity and duration. False labor may persist for several days and is commonly treated with hydration and rest.

True labor, on the other hand, is characterized by painful, repetitive uterine contractions that increase steadily in both intensity and duration and result in cervical effacement and dilatation. Specifically, true labor pains typically commence in the fundal region and upper abdomen and radiate into the pelvis and lower back. True labor leads not only to cervical dilatation and effacement, but also to the progressive descent of the fetus into the pelvis, in preparation for delivery.

■ STAGES OF LABOR

There are three **stages of labor** (Table 101-4). The first stage commences with the onset of regular uterine contractions and ends with full cervical dilatation. The first stage can be subdivided into two phases: latent and active. The latent phase is characterized by moderately uncomfortable uterine contractions that are infrequent and irregular, resulting in gradual cervical changes. In this preparatory phase the uterus orients to contractions and the cervix undergoes both effacement and softening. The active phase is typically noted to arise once the cervix has dilated to 3 to 4 cm, and results in cervical dilatation at an average rate of 1.2 cm/h in nulliparous and 1.5 cm/h in multiparous women. The second stage of labor commences at full dilatation and ends with the delivery of the infant.⁸ The mean length of the second stage of labor is 20 minutes for multiparous women

TABLE 101-4 Stages of Labor

Stage	Definition	Comments
First stage	From onset of regular uterine contractions to full cervical dilatation	—
Latent phase	Irregular, infrequent contractions	Preparatory phase, cervix softens and effaces
Active phase	Begins once cervix has dilated to 3–4 cm	Nulliparas: cervix dilates at 1.2 cm/h Multiparas: cervix dilates at 1.5 cm/h
Second stage	From full dilatation to delivery	Nulliparas: mean duration 54 min Multiparas: mean duration 20 min
Third stage	From delivery of infant to delivery of placenta	10 min; intervention not needed until >30 min

and 54 minutes for nulliparous women.⁹ The third stage of labor starts after the delivery of the infant and ends with the delivery of the placenta. The third stage usually lasts less than 10 minutes, and active intervention is usually not required until after 30 minutes, unless hemorrhage occurs.

■ FETAL DISTRESS

Fetal distress may occur during active labor. Thus, evaluate for signs of fetal status frequently. Indicators of fetal distress include fetal bradycardia or tachycardia, or late decelerations in fetal heart rate, which are defined as persistent drops in fetal heart rate both during and more than 30 seconds after a contraction. A physician or nurse trained in fetal monitoring can identify fetal distress (Figure 101-2). Doppler measurement of fetal heart tones is not reliable to detect decelerations. If decelerations are suspected, obtain emergency obstetrics consultation, and try to increase maternal blood flow by positioning the patient in the left lateral position, provide IV hydration, and administer oxygen. Further information is provided in the Advanced Life Support Course for Obstetrics (see later section “Useful Web Resources”).

CLINICAL EVALUATION

When a patient >20 weeks’ gestation presents to the ED with signs of labor, immediately obtain both maternal vital signs (blood pressure, heart rate, respiratory rate, oxygen saturation, temperature) and the fetal heart rate. Doppler US can be used to measure fetal heart rate; a **normal fetal heart rate is generally 120 to 160 beats/min, bradycardia is defined as less than 110 beats/min, and tachycardia is greater than 160 beats/min.**¹⁰ A persistently slow fetal heart rate indicates fetal distress and requires emergency obstetric consultation. As part of the initial evaluation, obtain IV access, procure baseline laboratory studies including blood type, and send a urinalysis.

■ HISTORY

Ask about the onset and frequency of uterine contractions, fetal membrane status, presence or absence of vaginal bleeding, and presence or absence of fetal movement. The obstetric history should include parity, history of complications with prior deliveries, history of precipitous deliveries, prenatal care during this pregnancy, and estimated date of delivery. Obtain a medical and surgical history, a list of current medications, and allergies, and ask the patient about substance abuse. Inquire about symptoms of infection, such as fevers, chills, or foul-smelling vaginal discharge.

Gestational Age If the patient knows the first day of her last menstrual period, the estimated date of delivery can be calculated by adding 9 months and 7 days to that date (**Nägele’s rule**). Fundal height also provides a rapid estimate of gestational age and is measured in centimeters (cm) from the pubic symphysis to the top of the fundus (cm = weeks of gestation ± 2 weeks). Fundal height may be falsely overestimated in the obese patient. Bedside US also provides a useful assessment of gestational age in the third trimester, but estimated age can vary by ± 3 weeks.

■ PHYSICAL EXAMINATION

Monitor vital signs for evidence of maternal fever, tachycardia, or elevated blood pressure. Assess fetal heart tones for bradycardia or tachycardia. Do not keep the pregnant woman flat on her back for a prolonged time period; compression of venous return by the gravid uterus can lead to hypotension in the mother, which in turn results in decreased blood supply to the fetus. So, place the **patient in the left lateral position following the physical examination.** On abdominal examination, determine fundal height, abdominal or uterine tenderness to palpation, and presence of uterine contractions. Examine the perineum for perineal lesions, such as those caused by herpes simplex virus, which might be a contraindication for a vaginal delivery.

■ PELVIC EXAMINATION

Patients with vaginal bleeding should be evaluated with bedside US prior to speculum or bimanual examination, in order to rule out

placenta previa. Patients without vaginal bleeding should be evaluated first with a sterile speculum examination to determine if membranes have been ruptured, to note cervical dilatation and effacement, and to determine fetal station and presentation.

If rupture of membranes is suspected, perform a sterile speculum examination (do not use lubricant because lubricant may produce a false-positive nitrazine test), but do not perform a digital examination because even one digital examination increases the risk of infection.¹¹ **Also avoid digital examinations in the preterm patient in whom the prolongation of gestation is desired.**

Using sterile vaginal examination, examine the cervix for dilatation, effacement, and station.

Bedside US is the simplest method to verify presentation. Vertex presentation and lie can also be confirmed through palpation of the cranial sutures on digital examination. Palpation of small parts, such as feet or hands, often indicates malpresentation. If meconium is present

on the examining finger, be prepared for neonatal resuscitation (see chapter 108).

EMERGENCY DELIVERY

The first steps in the management of a woman in active labor are to measure vital signs and initiate supportive therapy. Obtain venous access, provide IV hydration, and initiate maternal and fetal monitoring (if available). Delivery is imminent if the pelvic examination reveals complete cervical effacement and the fetus is at the introitus. Labor can progress very rapidly, particularly in multiparous patients. Both the stage of labor and the parity of the patient should be taken into account when considering whether to transport a laboring patient to the labor and delivery suite or to another facility. **If the cervix is fully effaced and dilated or the fetal head is visible during contractions, the obstetrician**

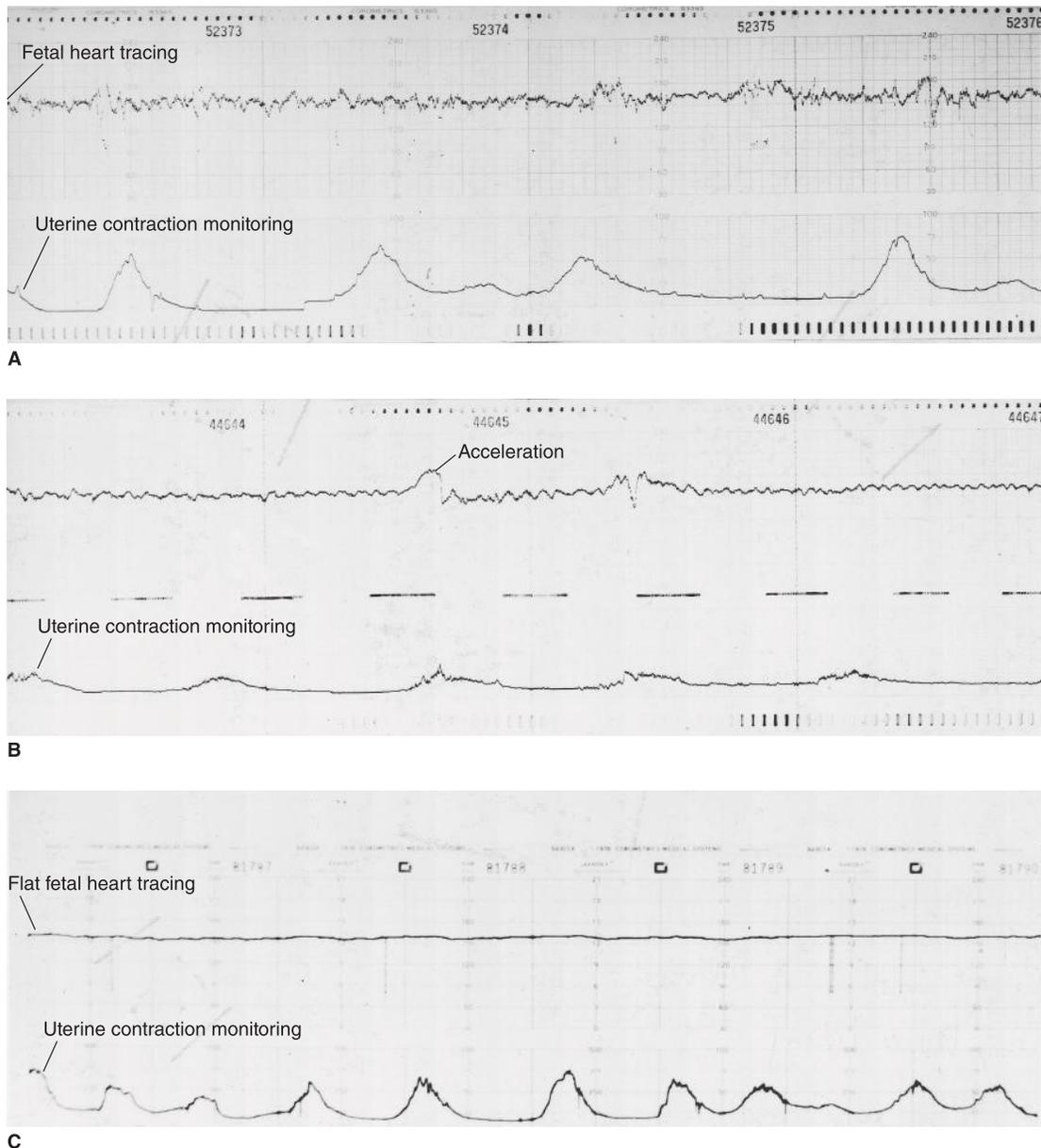
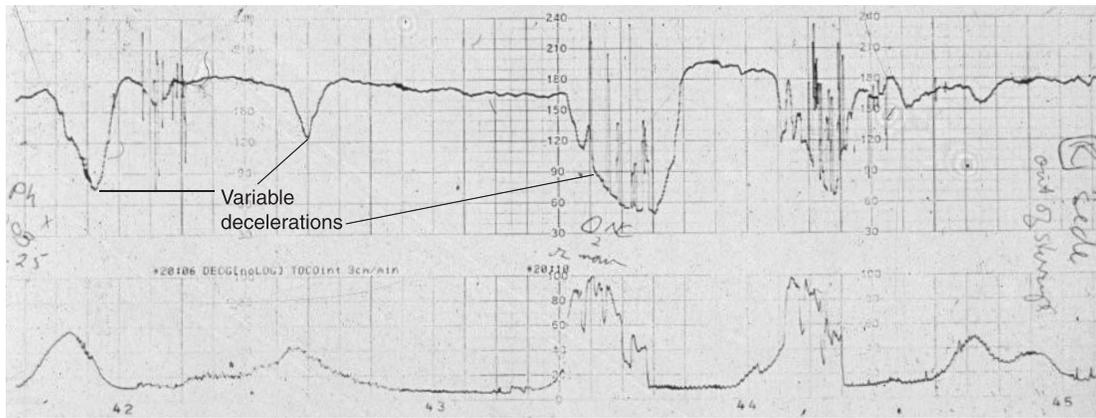
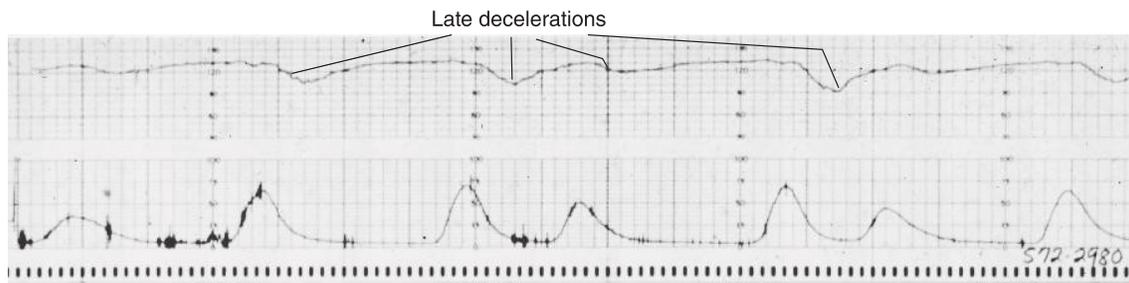


FIGURE 101-2. Fetal heart rate variability and uterine contraction patterns. **A.** Good variability. **B.** Good variability with brief accelerations. Fetal heart rises above baseline and quickly returns to normal. A reassuring pattern. **C.** Poor variability. May be due to fetal hypoxia. **D.** Variable decelerations. No relationship to uterine contractions. May represent cord compression. **E.** Late deceleration. Occurs at onset of contraction and slow return to baseline after contraction ends. Signifies uteroplacental insufficiency and fetal hypoxia. [Reproduced with permission from Pearlman MD, Tintinalli JE, Dyne PL (eds): *Obstetric and Gynecologic Emergencies: Diagnosis and Management*. McGraw-Hill, Inc., 2003. Figs. 10-9 and 10-10, pp. 131 and 132.]



D



E

FIGURE 101-2. (Continued)

(if available) should come to the ED rather than risk a precipitous delivery during transport to the delivery suite.

As the cervix fully dilates, effacement becomes complete, the fetus descends into the pelvis, and the patient will experience the urge to push. The cervix should be fully dilated before the patient begins to push in order to avoid cervical lacerations. Determine fetal presentation by palpating skull sutures and fontanelle or the buttock or extremity. Bed-side US can confirm presentation.

If time allows, prepare the perineum by washing it with mild soap and water and swabbing with povidone-iodine. Place drapes over the patient. Medical personnel attending to the patient should don gowns, masks, and gloves. Call for obstetric support.

Six cardinal movements describe the process of fetal descent during labor and delivery: (1) engagement, (2) flexion, (3) descent, (4) internal rotation, (5) extension, and (6) external rotation (Figure 101-3). The following discussion describes delivery in the cephalic, occiput anterior position. As the fetus descends through the birth canal and reaches the introitus, the perineum bulges in order to accommodate the fetal head. Gentle digital stretching of the inferior portion of the perineum can aid delivery. The perineum undergoes gradual thinning and stretching to enable passage of the newborn.

■ EPISIOTOMY

Routine **episiotomy** for a normal spontaneous vaginal delivery varies with practitioner, institution, and country. Episiotomy may be necessary to expedite a delivery in cases of fetal distress or shoulder dystocia or if forceps or vacuum devices are used (Figure 101-4).¹² The episiotomy can be performed in the midline or mediolaterally (45 degrees from the midline). Median episiotomy is easy to perform, but mediolateral episiotomy has a lower risk of extension to the anal sphincter (third-degree extension) or to the rectum (fourth-degree extension) than median episiotomy. If an episiotomy is clinically necessary, first inject 5 to 10 mL of 1% lidocaine solution with a small-gauge needle into the posterior fourchette and perineum. While protecting the infant's head, make a 2- to 3-cm incision with scissors in order to extend the vaginal opening,

either at the midline or 45 degrees from the midline. A median incision must be supported with manual pressure from below. Take care to prevent extension of the incision into the rectum.

■ COMPLETION OF DELIVERY

Do not drop the baby. The combination of amniotic fluid, blood, and vernix generates a very slippery infant. Before delivering the rest of the body, place your posterior hand underneath the axilla of the infant. Use the anterior hand to grasp the ankles of the infant with a firm grip. Following delivery, keep the infant warm and provide gentle stimulation. Do not routinely aspirate the nose and mouth. Gently bulb aspirate only if there are obvious obstructions from secretions. If delivery is uncomplicated, and the infant has responded well to initial stimulation with a clear airway and good respiratory effort, the mother may hold the child immediately while the cord is cut.

Apgar scores are calculated at 1 and 5 minutes after delivery. Scoring parameters include general color, tone, heart rate, respiratory effort, and reflexes (Table 101-5).

For an APGAR score of <7 refer to the chapter 108. Provide positive-pressure ventilation for all newborns with a heart rate <100 beats/min or who are gasping or apneic after 30 seconds.

CLAMPING THE UMBILICAL CORD

Do not clamp the umbilical cord of term or preterm infants for at least 1 to 3 minutes after birth. Delayed cord clamping increases neonatal iron stores. **Double-clamp the umbilical cord 3 cm distal to its insertion at the umbilicus and transect with sterile scissors.** In delivery settings where aseptic care is routine, there is no clear benefit to any additional topical care of the umbilicus. When aseptic care is *not* available, however, antiseptic topical care of the umbilicus with chlorhexidine reduces the risk of omphalitis and neonatal mortality.¹⁶ Once the umbilical cord is cut, dry the infant and either give the infant to the mother or place it in a warming unit.

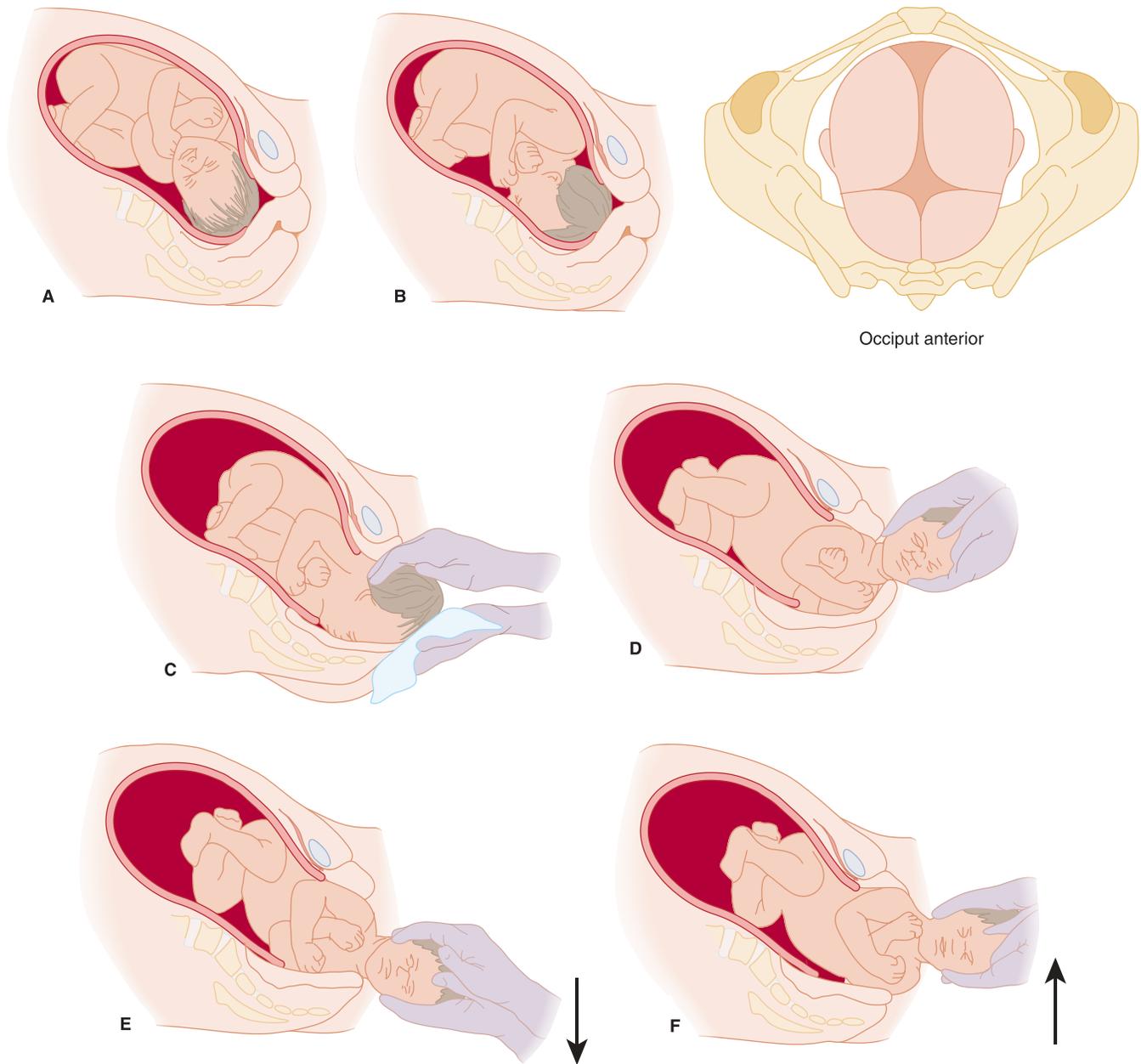


FIGURE 101-3. The movements of normal delivery for a vertex presentation. **A.** Engagement, flexion, and descent with vertex anterior. **B.** Internal rotation with occiput becoming anterior. **C.** Extension and delivery of the head. As the infant's head emerges from the introitus, support the perineum by placing a sterile towel along the inferior part of the perineum with one hand, and support the fetal head with the other hand. Ask the mother to breathe through contractions (rather than bear down) in order to deter rapid expulsion of the baby. Provide mild counterpressure for controlled extension of the fetal head. As the infant's head presents, use the inferior hand to control the fetal chin and keep the superior hand on the crown of the head, supporting the delivery. **D.** External rotation, bringing the thorax into the anteroposterior diameter of the pelvis. As the head delivers, palpate the infant's neck to assess for the presence of a nuchal cord. Nuchal cord is noted in approximately 25% to 35% of all term deliveries.¹³ If the cord is loose, move it over the infant's head, and allow delivery to proceed as usual. If the cord is wound tightly around the neck, however, apply two close clamps in the most accessible area, and then cut the cord. **E.** Delivery of the anterior shoulder. Once the head is delivered, it will turn to one side or the other. Grasp the sides of the head with both hands, and apply **gentle** downward traction (go with gravity) until the anterior shoulder is delivered. Jerky or aggressive traction may injure the brachial plexus. If you have not checked for a nuchal cord, do so now. As the head rotates, place the hands on either side of the head, providing gentle downward traction. This maneuver allows for the delivery of the anterior shoulder. **F.** Delivery of the posterior shoulder. Use an upward movement to deliver the upward shoulder. Do not apply traction. If meconium is present or the newborn is limp or poorly responsive, stimulate the baby and be prepared to begin the steps of neonatal resuscitation with ventilation and oxygenation^{14,15} (see chapter 108).

DELIVERY OF THE PLACENTA

The placenta usually delivers approximately 10 to 30 minutes after delivery of the infant. Allow the placenta to separate spontaneously and provide only *gentle* traction. Aggressive traction on the cord can lead to uterine inversion, tearing of the cord, or even disruption of the placenta,

all of which can result in severe vaginal bleeding. After the placenta has been removed, gently massage the abdomen at the level of the fundus to promote contraction. Give oxytocin (10 to 40 units in 1 L normal saline at 250 mL/h or 10 units IM) to sustain uterine contraction.

The estimated blood loss during a vaginal delivery is usually less than 500 mL. Uterine atony, however, which occasionally follows a precipitous

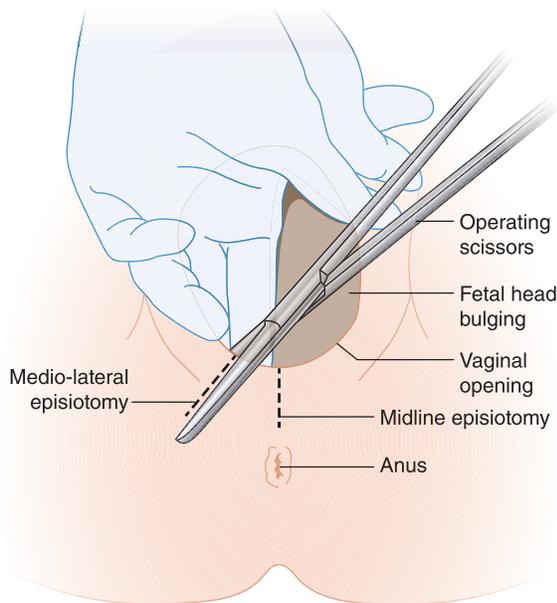


FIGURE 101-4. Methods for episiotomy.

delivery, can lead to excessive vaginal bleeding. In that case, give additional oxytocin or another uterotonic of choice (see Table 101-2). As contractile agents are administered, provide vigorous bimanual massage.¹⁷ Delay episiotomy or laceration repair until an experienced obstetrician is available to close the laceration and inspect for fourth-degree perineal lacerations.

COMPLICATIONS OF LABOR AND DELIVERY

■ UMBILICAL CORD PROLAPSE

Umbilical cord compression is life threatening to the fetus. Obtain immediate obstetric assistance, as emergent cesarean delivery is indicated. **Should the bimanual examination reveal a palpable, pulsating umbilical cord, elevate the presenting fetal part to reduce compression on the cord. Keep your hand in the vagina while the patient is transported and prepared for surgery to prevent further compression of the cord by the fetal head. Place the mother in the Trendelenburg position. Do not try to reduce the prolapsed cord.**¹⁸

■ SHOULDER DYSTOCIA

Shoulder dystocia is the impaction of fetal shoulders at the pelvic outlet after delivery of the head. Typically, the anterior shoulder is trapped behind the pubic symphysis and prevents delivery of the rest of the infant.^{19,20} Complications of shoulder dystocia include fetal brachial plexus



FIGURE 101-5. Clinical appearance of shoulder dystocia. The infant's head is impacted against the perineum. [Reprinted with permission from Buckley RG, Knoop KJ: Gynecologic and obstetric conditions, in Knoop KJ, Stack LB, Storrow AB (eds): *Atlas of Emergency Medicine*, 2nd ed. New York, McGraw-Hill, 2002, Figure 10.46.]

injury (due to overaggressive traction), clavicle fracture, fetal hypoxia (due to impaired respirations and/or compression of the umbilical cord), postpartum hemorrhage, and fourth-degree perineal lacerations.

Prior to delivery of the head, the head may retract between contractions. Shoulder dystocia then becomes evident when routine downward traction fails to deliver the anterior shoulder once the head has been delivered. After the infant's head is delivered, the head retracts tightly against the perineum (turtle sign; **Figure 101-5**).²¹ Several steps can be used to relieve shoulder dystocia (**Table 101-6**). Immediately place the mother in the extreme lithotomy position, with her legs sharply flexed up to the abdomen and the knees held as widely apart as possible (**McRoberts maneuver; Figure 101-6**). Either the mother or an assistant should keep the legs held widely apart. **Simultaneously apply suprapubic pressure. If a second assistant is available, he or she should place their hands in a CPR position, and apply downward pressure just above the pubic symphysis for 1 to 2 minutes to disimpact the anterior shoulder. Do not apply pressure to the uterine fundus, as this maneuver can further impact the shoulder.** Suprapubic pressure serves to rotate the shoulder under the pubic symphysis.²¹ The combination of the McRoberts position and suprapubic pressure relieves about 50% of shoulder dystocias.

The **Gaskin maneuver (Figure 101-7)** can also be employed. It is a simple maneuver, but with IVs and monitors in place or with an exhausted mother, it can be difficult to achieve. Place the patient on all fours. Exert gentle downward traction on the infant's head. In order to remember the direction of traction, remember to "go with gravity."

TABLE 101-5 Apgar Scoring for Newborns

	Sign	0 Points	1 Point	2 Points
A	Activity (muscle tone)	Absent	Arms and legs flexed	Active movement
P	Pulse	Absent	Below 100 beats/min	Above 100 beats/min
G	Grimace (reflex irritability)	No response	Grimace	Sneezing, coughing, pulling away
A	Appearance (skin color)	Blue-gray, pale	Normal, except extremities	Normal over entire body
R	Respiration	Absent	Slow, irregular	Good, crying

TABLE 101-6 Steps to Relieve Shoulder Dystocia

Steps	Comments
Flex thighs and keep knees apart as much as possible	McRoberts maneuver
Apply suprapubic pressure	Keep patient in McRoberts position. Place one hand with wrist clenched, immediately above the pubic symphysis; if an assistant is available, place two clenched wrists in CPR position just above pubic symphysis. Compress for 1 min. Do not compress uterine fundus. This worsens impaction.
Move patient to all-fours position	Gaskin maneuver. Deliver with gentle downward traction on the infant's head.
Corkscrew maneuvers	Typically require episiotomy. See text.

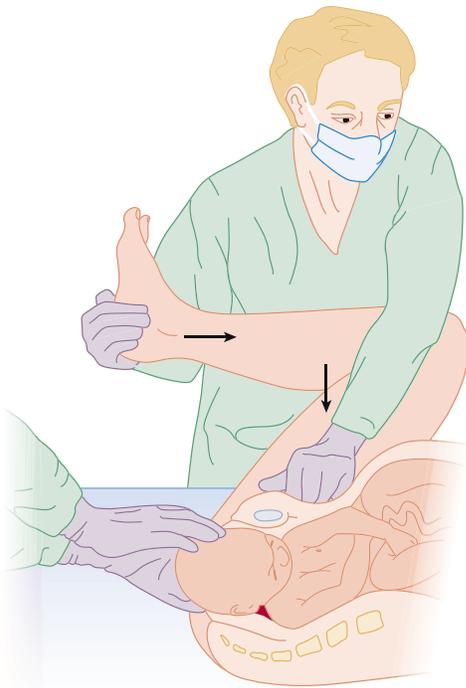


FIGURE 101-6. McRoberts maneuver. Sharply flex the thighs up onto the abdomen, as shown by the horizontal arrow, and keep the knees spread widely. Simultaneously provide suprapubic pressure (vertical arrow). [Adapted with permission from Cunningham FG, Leveno KL, Bloom SL, et al: *Williams Obstetrics*, 22nd ed. New York, McGraw-Hill, 2005, Figure 20-14.]

In 80% of cases, this maneuver allows the posterior shoulder to successfully deliver.²²

Should the previous maneuvers fail, rotational maneuvers, which move the shoulders into an oblique position, can be performed. Allow 2 minutes for these maneuvers. The maneuvers typically require an episiotomy. For the Rubin maneuver, place fingers behind the anterior fetal shoulder, and push the shoulder with your fingertips toward the baby's



FIGURE 101-7. Gaskin maneuver for shoulder dystocia.

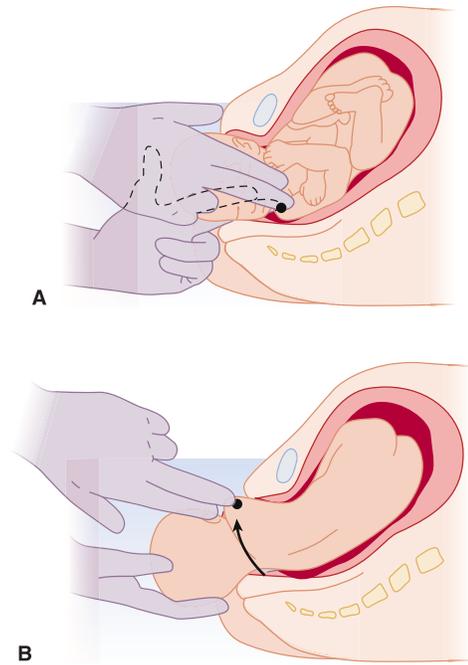


FIGURE 101-8. Corkscrew maneuver. A. Place fingertips behind anterior shoulder and in front of posterior shoulder. B. Then gently rotate clockwise until shoulder delivers.

chest. This may reduce the dimension of the shoulder girdle and allow for delivery. For the **Woods corkscrew maneuver** (Figure 101-8), keep fingertips behind the anterior shoulder, and with the opposite hand, apply pressure to the back of the posterior shoulder, and rotate the shoulder girdle clockwise into an oblique position, allowing delivery. The **reverse corkscrew maneuver** is in the opposite direction. Place your fingers in front of the posterior shoulder and behind the anterior shoulder, and apply pressure counterclockwise.²³

■ BREECH PRESENTATION

Breech presentations occur in 3% to 4% of term pregnancies. Risks of breech presentations include umbilical cord prolapse, trauma, hypoxia, and fetal distress. Breech presentations occur most frequently in the delivery of *premature* infants; approximately 25% to 30% of all preterm infants (<28 weeks' gestation) present in breech position.²⁴ Given the increased perinatal/neonatal morbidity and mortality associated with vaginal breech deliveries, cesarean section is recommended in breech presentations.²⁴

Head entrapment is a major concern in a breech delivery. In a normal cephalic delivery, the larger head dilates the cervical canal, which ensures that the rest of the infant's body can follow. In a breech delivery, however, the head emerges last and may become stuck in an incompletely dilated cervix.

In frank and complete breech deliveries, the buttocks dilate the cervix almost as effectively as the fetal head; therefore, delivery may proceed in an uncomplicated fashion. **In these cases, allow the delivery to proceed spontaneously** (Figure 101-9). The emergency physician subsequently places the index and middle fingers over the infant's maxillary bones (not in the infant's mouth) to help keep the head flexed, allowing the mother to expel the infant. It is important to refrain from pulling on the fetus, because this may impact the head in the pelvis or even entrap the extended fetal arm. **Footling and incomplete breech positions are not safe for vaginal delivery due to the risk of cord prolapse or incomplete dilatation of the cervix.** In any breech delivery, obstetric consultation should be obtained immediately.

■ PRETERM DELIVERY

The incidence of preterm delivery is approximately 12% and contributes substantially to perinatal morbidity and mortality.²⁵ Preterm labor is also

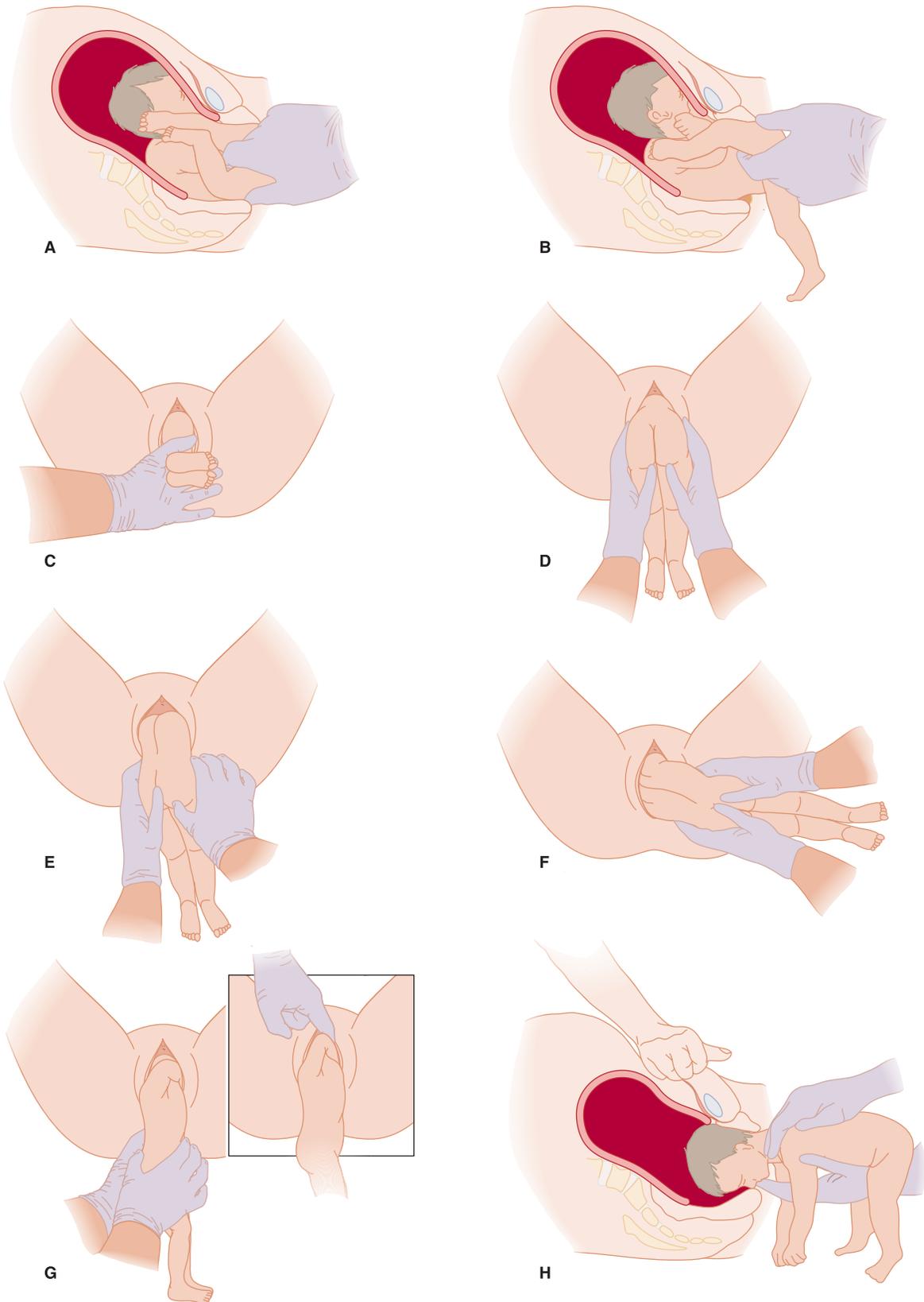


FIGURE 101-9. Breech delivery. **A.** Grasp the thigh to allow delivery of the leg. **B.** Grasp the other leg to allow its delivery. **C.** Grasp the feet at the ankles and rotate the sacrum anteriorly. **D.** The sacrum is rotated anteriorly. Maternal efforts deliver the baby to the level of the umbilicus. Wrap the trunk and legs in a towel. **E.** Maternal efforts further deliver to the level of the scapulae. Apply steady, gentle traction until scapulae come into view. **F.** Once the axilla is visible, the shoulder can be delivered. Rotate counterclockwise to deliver the anterior shoulder. (It does not matter which shoulder is delivered first.) **G.** Delivery of the anterior arm. When the scapulae appear, gently rotate the baby until one humerus can be followed down, rotated across the chest, and swept out. Then turn the baby clockwise to allow delivery of the other arm. **H.** Deliver the vertex of the skull by placing fingers at the maxillary process, and keep body parallel to the horizontal. Do not pull. Do not lift above the parallel to avoid neck hyperextension. Apply suprapubic pressure to aid delivery of the head.

a major cause of precipitous delivery in EDs. Preterm infants present more frequently in the breech position. The delivery maneuvers are similar to those described above. Be prepared to initiate neonatal resuscitation. The decision as to whether to initiate resuscitative efforts in the ED is often difficult because patients may deliver an extremely premature fetus of unknown gestational age. **Survival of the newborn increases significantly for each completed week from 21 weeks of gestation (0% survival) to 25 weeks of gestation (75% survival).**²⁶ When gestational age is known, initiate resuscitation of newborns 22 weeks of gestation or older. It is justified to cease resuscitative efforts after 10 minutes, and certainly, after 15 minutes of asystole.

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REFERENCES

The complete reference list is available online at www.TintinalliEM.com.

CHAPTER

102

Vulvovaginitis

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INTRODUCTION

Vaginal discharge is caused by a wide variety of disorders, including vaginitis, cervicitis, and pelvic inflammatory disease.¹ Vaginitis is a spectrum of diseases that cause vulvovaginal symptoms including burning, irritation, itching, odor, and abnormal discharge. The factors associated with acute vaginitis are listed in **Table 102-1**. **The most common infectious causes of vaginitis in symptomatic premenopausal women are bacterial vaginosis (40% to 45%), vulvovaginal candidiasis (20% to 25%), and trichomoniasis (15% to 20%).** Vulvovaginal candidiasis, contact vaginitis, and atrophic vaginitis may occur in virgins and postmenopausal women; however, the other forms of infectious vulvovaginitis are generally found in sexually active women. In approximately 30% of women with vaginal complaints, the disorder remains undiagnosed even after comprehensive testing.²⁻⁴

The clinical diagnosis may be challenging, because women may have more than one disease, and signs and symptoms are frequently not specific to a particular cause. Polymicrobial infection is not uncommon.

Although infectious vaginitis rarely requires hospitalization, it may have serious sequelae. Both bacterial vaginosis and trichomoniasis have been shown to be associated with premature rupture of membranes, preterm labor, and low infant birth weight.^{5,6} Trichomoniasis is associated with pelvic inflammatory disease in patients infected with human immunodeficiency virus and increases risk of human immunodeficiency virus acquisition and transmission.^{7,8} When overgrowth of certain bacteria occurs, the protective effect of vaginal lactobacilli strains, which inhibit the growth of bacteria and destroy human immunodeficiency virus in vitro, is lost.¹

TABLE 102-1 Factors Associated with Acute Vulvovaginitis

Infections
Irritant or allergic contact
Local response to a vaginal foreign body
Lack of estrogen in perimenopausal and postmenopausal women (atrophic vaginitis)
Postirradiation changes

PHYSIOLOGY

In females of childbearing age, estrogen causes the development of a thick vaginal epithelium with a large number of superficial glycogen-containing cells and serves a protective function. Glycogen is used by the normal flora, such as lactobacilli and acidogenic corynebacteria, to form lactic and acetic acids. The resulting acidic environment favors the normal flora and discourages the growth of pathogenic bacteria. Lack of estrogen or a dominance of progesterone results in an atrophic condition, with loss of the protective superficial cells and their contained glycogen, and subsequent loss of the acidic environment.

Normal vaginal secretions vary in consistency from thin and watery to thick, white, and opaque. The quantity may also vary from a scant to a rather copious amount. Secretions are odorless and produce no symptoms. The normal vaginal pH varies between 3.8 and 4.5. Alkaline secretions from the cervix before and during menstruation, as well as alkaline semen, reduce acidity and predispose to infection. Before menarche and after menopause, the vaginal pH varies between 6 and 7. Because of scant nerve endings in the vagina, the patient usually does not have symptoms until both the vagina and vulva are involved in an inflammatory or irritant process.

Vulvovaginal inflammation is the most common gynecologic disorder in prepubertal girls and includes both infectious causes (e.g., bacterial, fungal, pinworm) and noninfectious causes (e.g., contact/irritant, lichen sclerosis, foreign body). Factors thought to contribute to vaginitis in prepubertal females include less protective covering of the vestibule by the labia minora, low estrogen concentration resulting in a thinner epithelium, exposure to chemical irritants such as bubble bath, poor hygiene, front-to-back wiping and the short distance between the vagina and anus, foreign bodies, chronic medical conditions (eczema, seborrhea, and other chronic diseases), and sexual abuse. Infectious causes include respiratory and enteric bacterial organisms such as *Haemophilus influenzae*, *Staphylococcus aureus*, group A streptococci and *Streptococcus pneumoniae*, *Escherichia coli*, *Shigella flexneri*, *Neisseria gonorrhoeae*, and *Chlamydia*, as well as *Candida* and pinworms. Infectious causes may be more common in adolescents, especially those who are sexually active.⁴

GENERAL APPROACH

Obtain a detailed gynecologic history and perform a pelvic examination. History should include details of vaginal discharge, odor, irritation, itching, burning, bleeding, dysuria, and dyspareunia. Inquire about associated abdominal pain, new sexual partners, use of barrier protection during intercourse, relationship of symptoms to menses, use of antibiotics and contraceptives, and hygiene practices. Note the presence of vulvar edema or erythema, vaginal discharge, cervical inflammation, and abdominal and cervical motion tenderness.

During speculum examination, obtain a swab of the discharge and test for gonorrhea and chlamydial infection. If a patient refuses pelvic examination or it is not feasible, the patient may submit a self-swab of vaginal secretions or a urine sample.⁹

Microscopic examination of secretions and evaluation of pH are useful diagnostic tools. However, microscopes and reagents are not available in all EDs, microscopic examination is time consuming and tedious, and results depend on operator skill. To test pH, obtain a sample from the mid portion of the vaginal sidewall to avoid false elevations in pH caused by mucus. **Sampling from the posterior fornix may yield inaccurate results because cervical mucus, blood, semen, douches, and vaginal medications can elevate the pH.** Microscopic evaluation of fresh vaginal secretions using both normal saline solution and 10% potassium hydroxide slide preparation and fishy odor on whiff test help provide evidence for a diagnosis¹⁰ (**Tables 102-2 and 102-3**). Signs of vulvar inflammation and minimal discharge suggest the possibility of mechanical, chemical, allergic, or other noninfectious causes of vulvovaginitis.

BACTERIAL VAGINOSIS

Bacterial vaginosis is the most common cause of vaginitis and accounts for up to 50% of cases in acutely symptomatic women.