Learning Objectives

Upon completion of the chapter, you will be able to:

- **1.** Relate premonitory signs of labor.
- **2.** Compare and contrast true versus false labor.
- **3.** Categorize the critical factors affecting labor and birth.
- **4.** Analyze the cardinal movements of labor.
- **5.** Evaluate the maternal and fetal responses to labor and birth.
- **6.** Classify the stages of labor and the critical events in each stage.
- **7.** Characterize the normal physiologic/psychological changes occurring during all four stages of labor.
- **8.** Formulate the concept of pain as it relates to the woman in labor.

KEY TERMS

attitude

dilation

doula

duration

effacement

engagement

frequency

intensity

lie

lightening

molding

position

presentation

station

Kathy and Chuck have been eagerly awaiting the birth of their first child for what seems to them an eternity. When Kathy finally feels contractions in her abdomen, she and Chuck rush to the birthing center. After the OB nurse finishes a complete history and physical assessment, she informs Kathy and her husband that she must have experienced "false labor" and that they should return home until she starts true labor.

WOW: *Words of Wisdom*

Intense physical and emotional support promotes a positive and memorable birthing experience.

The process of labor and birth involves more than the birth of a newborn. Numerous physiologic and psychological events occur that ultimately result in the birth of a newborn and the creation or expansion of the family.

This chapter describes labor and birth as a process. It addresses initiation of labor, the premonitory signs of labor, including true and false labor, critical factors affecting labor and birth, maternal and fetal response to the laboring process, and the four stages of labor. The chapter also identifies critical factors related to each stage of labor: the "10 P's of labor."

INITIATION OF LABOR

Labor is a complex, multifaceted interaction between the mother and fetus. It is a series of processes by which the fetus is expelled from the uterus. It is difficult to determine exactly why labor begins and what initiates it. Although several theories have been proposed to explain the onset and maintenance of labor, none of these has been proved scientifically. It is widely believed that labor is influenced by a combination of factors, including uterine stretch, progesterone withdrawal, increased oxytocin sensitivity, and increased release of prostaglandins.

One theory suggests that labor is initiated by a change in the estrogen-to-progesterone ratio. During the last trimester of pregnancy, estrogen levels increase and progesterone levels decrease. This change leads to an increase in the number of myometrium gap junctions. Gap junctions are proteins that connect cell membranes and facilitate coordination of uterine contractions and myometrial stretching (Gilbert, 2011).

Although physiologic evidence for the role of oxytocin in the initiation of labor is inconclusive, the number of oxytocin receptors in the uterus increases at the end of pregnancy. This creates an increased sensitivity to oxytocin. Estrogen, the levels of which are also rising, increases myometrial sensitivity to oxytocin. With the increasing levels of oxytocin in the maternal blood in conjunction with increasing fetal cortisol levels which synthesize prostaglandins, uterine contractions are initiated." Oxytocin also aids in stimulating prostaglandin synthesis through receptors in the decidua. Prostaglandins lead to additional contractions, cervical softening, gap junction induction, and myometrial sensitization, thereby leading to a progressive cervical **dilation** (the opening or enlargement of the external cervical os) (Stables & Rankin, 2010).

PREMONITORY SIGNS OF LABOR

Before the onset of labor, a pregnant woman's body undergoes several changes in preparation for the birth of the newborn. The changes that occur often lead to characteristic signs and symptoms that

suggest that labor is near. These premonitory signs and symptoms can vary, and not every woman experiences every one of them.

Cervical Changes

Before labor begins, cervical softening and possible cervical dilation with descent of the presenting part into the pelvis occur. These changes can occur 1 month to 1 hour before actual labor begins.

As labor approaches, the cervix changes from an elongated structure to a shortened thinned segment. Cervical collagen fibers undergo enzymatic rearrangement into smaller, more flexible fibers that facilitate water absorption, leading to a softer, more stretchable cervix. These changes occur secondary to the effects of prostaglandins and pressure from Braxton Hicks contractions (Stables & Rankin, 2010).

Lightening

Lightening occurs when the fetal presenting part begins to descend into the maternal pelvis. The uterus lowers and moves into a more anterior position. The shape of the abdomen changes as a result of the change in the uterus. With this descent, the woman usually notes that her breathing is much easier. However, she may complain of increased pelvic pressure, cramping, and low back pain. She may notice an increase in vaginal discharge and more frequent urination. Also, edema of the lower extremities may occur as a result of the increased stasis of pooling blood. In primiparas, lightening can occur 2 weeks or more before labor begins; among multiparas it may not occur until labor starts (Cheng & Caughey, 2011).

Increased Energy Level

Some women report a sudden increase in energy before labor. This is sometimes referred to as nesting, because many women will focus this energy toward childbirth preparation by cleaning, cooking, preparing the nursery, and spending extra time with other children in the household. The increased energy level usually occurs 24 to 48 hours before the onset of labor. It is thought to be the result of an increase in epinephrine release caused by a decrease in progesterone (Cheng & Caughey, 2011).

Bloody Show

At the onset of labor or before, the mucous plug that fills the cervical canal during pregnancy is expelled as a result of cervical softening and increased pressure of the presenting part. These ruptured cervical capillaries release a small amount of blood that mixes with mucus, resulting in the pink-tinged secretions known as bloody show.

Braxton Hicks Contractions

Braxton Hicks contractions, which the woman may have been experiencing throughout the pregnancy, may become stronger and more frequent. Braxton Hicks contractions are typically felt as a tightening or pulling sensation of the top of the uterus. They occur primarily in the abdomen and groin and gradually spread downward before relaxing. In contrast, true labor contractions are more commonly felt in the lower back. These contractions aid in moving the cervix from a posterior position to an anterior position. They also help in ripening and softening the cervix. However, the contractions are irregular and can be decreased by walking, voiding, eating, increasing fluid intake, or changing position.

Braxton Hicks contractions usually last about 30 seconds but can persist for as long as 2 minutes. As birth draws near and the uterus becomes more sensitive to oxytocin, the frequency and intensity of these contractions increase. However, if the contractions last longer than 30 seconds and occur more often than four to six times an hour, advise the woman to contact her health care provider so that she can be evaluated for possible preterm labor, especially if she is less than 38 weeks pregnant.

Take Note!

An infant born between 34 and 36 completed weeks of gestation is identified as "late preterm" and experiences many of the same health issues as other preterm birth infants (Allen & Chubb, 2010).

Spontaneous Rupture of Membranes

One in four women will experience spontaneous rupture of the membranes before the onset of labor (Institute of Medicine, 2010). The rupture of membranes can result in either a sudden gush or a steady leakage of amniotic fluid. Although much of the amniotic fluid is lost when the rupture occurs, a continuous supply is produced to ensure protection of the fetus until birth.

After the amniotic sac has ruptured, the barrier to infection is gone and an ascending infection is possible. In addition, there is a danger of cord prolapse if engagement has not occurred with the sudden release of fluid and pressure with rupture. Due to the possibility of these complications, advise women to notify their health care provider and go in for an evaluation.

Consider This

I always pictured myself a dignified woman and behaved in ways to demonstrate that, for that was the way I was raised. My mother and grandmother always stressed that you should look good, dress well,

and do nothing to embarrass yourself in public. I did a fairly good job of living up to their expectations until an incident occurred at the end of my first pregnancy. I recall I was overdue according to my dates and was miserable in the summer heat. I decided to go to the store for some ice cream. As I waddled down the grocery aisles, all of a sudden my water broke and came pouring down my legs all over the floor. Not wanting to make a spectacle of myself and remembering what my mother always said about being dignified at all times in public, I quickly reached up onto the grocery shelf and "accidentally" knocked off a large jar of pickles right where my puddle was. As I walked hurriedly away from that mess without my ice cream, I heard on the store loudspeaker, "Clean-up on aisle 13!"

Thoughts: We tend to live by what we are taught, and in this case, this woman needed to save face from her ruptured membranes. Many women experience ruptured membranes before the onset of labor, so it is not out of the ordinary for this to happen in public. What risks can occur when membranes do rupture? What action should this woman take now to minimize these risks? How will the nurse validate this woman's ruptured membranes?

TRUE VERSUS FALSE LABOR

False labor is a condition occurring during the latter weeks of some pregnancies in which irregular uterine contractions are felt, but the cervix is not affected. In contrast, true labor is characterized by contractions occurring at regular intervals that increase in frequency, duration, and intensity. True labor contractions bring about progressive cervical dilation and effacement. **Table 13.1** summarizes the differences between true and false labor. False labor, prodromal labor, and Braxton Hicks contractions are all names for contractions that do not contribute in a measurable way toward the goal of birth.

TABLE 13.1: DIFFERENCES BETWEEN TRUE AND FALSE LABOR

Parameters	True Labor	False Labor
Contraction timing	Regular, becoming closer together, usually 4–6 min apart, lasting 30–60 sec	Irregular, not occurring close together
Contraction strength	Become stronger with time, vaginal pressure is usually felt	Frequently weak, not getting stronger with time or alternating (a strong one followed by weaker ones)
Contraction discomfort	Starts in the back and radiates around toward the front of the abdomen	Usually felt in the front of the abdomen

Parameters	True Labor	False Labor
Any change in activity	Contractions continue no matter what positional change is made	Contractions may stop or slow down with walking or making a position change
Stay or go?	Stay home until contractions are 5 min apart, last 45–60 sec, and are strong enough so that a conversation during one is not possible—then go to the hospital or birthing center.	Drink fluids and walk around to see if there is any change in the intensity of the contractions; if the contractions diminish in intensity after either or both—stay home.

Adapted from Cunningham, G., Gant, N. F., Leveno, K. J., Gilstrap, L. C., Hauth, J. C., & Wenstrom, K. D. (2010). *Williams' obstetrics* (23rd ed.). New York, NY: McGraw-Hill; Mattson, S., & Smith, J. E. (2011). *Core curriculum for maternal–newborn nursing* (4th ed.). St. Louis, MO: Saunders Elsevier; and Tharpe, N. L., Farley, C. L., & Jordan, R. (2013). *Clinical practice guidelines for midwifery & women's health* (4th ed.). Sudbury, MA: Jones & Bartlett.

Many women fear being sent home from the hospital with "false labor." All women feel anxious when they feel contractions, but they should be informed that labor could be a long process, especially if it is their first pregnancy. Encourage the woman to think of false labor or "pre-labor signs" as positive, because they are part of the entire labor continuum. With first pregnancies, the cervix can take up to 20 hours to dilate completely (Cunningham et al., 2010).

FACTORS AFFECTING THE LABOR PROCESS

Traditionally, the critical factors that affect the process of labor and birth are outlined as the "five P's":

- 1. Passageway (birth canal)
- 2. Passenger (fetus and placenta)
- 3. Powers (contractions)
- 4. Position (maternal)
- 5. Psychological response

These critical factors are commonly accepted and discussed by health care professionals. However, five additional "P's" can also affect the labor process:

- 1. Philosophy (low tech, high touch)
- 2. Partners (support caregivers)
- 3. Patience (natural timing)
- 4. Patient (client) preparation (childbirth knowledge base)
- 5. Pain management (comfort measures)

These five additional "P's" are helpful in planning care for the laboring family. These client-focused factors are an attempt to foster labor that can be managed through the use of high touch, patience, support, knowledge, and pain management.

Passageway

The birth passageway is the route through which the fetus must travel to be born vaginally. The passageway consists of the maternal pelvis and soft tissues. Of the two, however, the maternal bony pelvis is more important because it is relatively unyielding (except for the coccyx). Typically the pelvis is assessed and measured during the first trimester, often at the first visit to the health care provider, to identify any abnormalities that might hinder a successful vaginal birth. As the pregnancy progresses, the hormones relaxin and estrogen cause the connective tissues to become more relaxed and elastic and cause the joints to become more flexible to prepare the mother's pelvis for birth. Additionally, the soft tissues usually yield to the forces of labor.

Bony Pelvis

The maternal bony pelvis can be divided into the true and false portions. The false (or greater) pelvis is composed of the upper flared parts of the two iliac bones with their concavities and the wings of the base of the sacrum. The false pelvis is divided from the true pelvis by an imaginary line drawn from the sacral prominence at the back to the superior aspect of the symphysis pubis at the front of the pelvis. This imaginary line is called the linea terminalis. The false pelvis lies above this imaginary line; the true pelvis lies below it (Fig. 13.1). The true pelvis is the bony passageway through which the fetus must travel. It is made up of three planes: the inlet, the mid-pelvis (cavity), and the outlet.

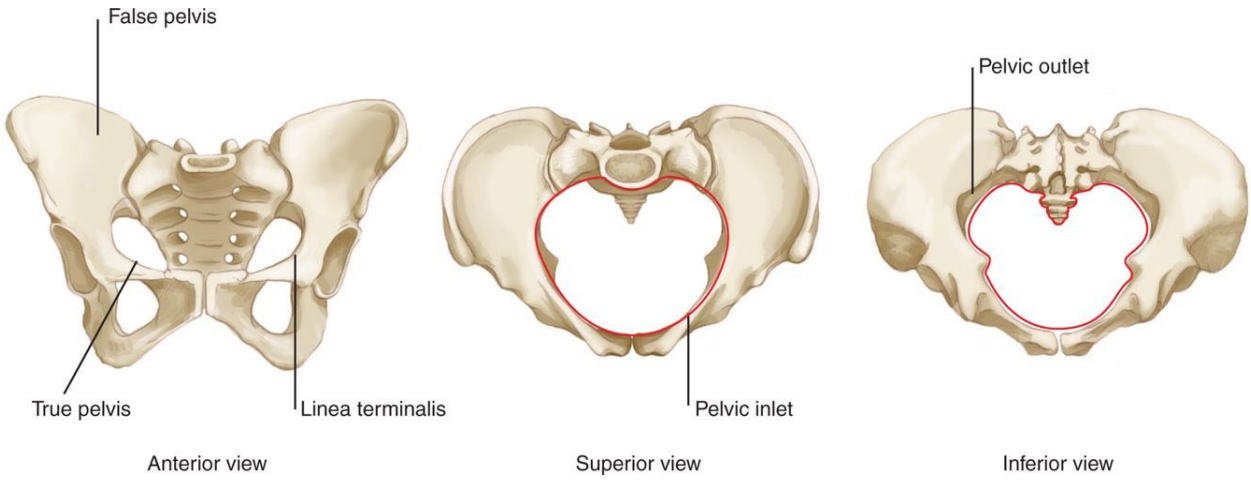


FIGURE 13.1

The bony pelvis.

PELVIC INLET

The pelvic inlet allows entrance to the true pelvis. It is bounded by the sacral prominence in the back, the ilium on the sides, and the superior aspect of the symphysis pubis in the front (Mattson & Smith, 2011). The pelvic inlet is wider in the transverse aspect (sideways) than it is from front to back.

MID-PELVIS

The mid-pelvis (cavity) occupies the space between the inlet and outlet. It is through this snug, curved space that the fetus must travel to reach the outside. As the fetus passes through this small area, its chest is compressed, causing lung fluid and mucus to be expelled. This expulsion removes the space-occupying fluid so that air can enter the lungs with the newborn's first breath.

PELVIC OUTLET

The pelvic outlet is bound by the ischial tuberosities, the lower rim of the symphysis pubis, and the tip of the coccyx. In comparison with the pelvic inlet, the outlet is wider from front to back. For the fetus to pass through the pelvis, the outlet must be large enough. False pelvis

To ensure the adequacy of the pelvic outlet for vaginal birth, the following pelvic measurements are assessed:

- Diagonal conjugate of the inlet (distance between the anterior surface of the sacral prominence and the anterior surface of the inferior margin of the symphysis pubis)
- Transverse or ischial tuberosity diameter of the outlet (distance at the medial and lowest aspect of the ischial tuberosities, at the level of the anus; a known hand span or clenched-fist measurement is generally used to obtain this measurement)
- True or obstetric conjugate (distance estimated from the measurement of the diagonal conjugate; 1.5 cm is subtracted from the diagonal conjugate measurement)

For more information about pelvic measurements, see **Chapter 12**.

If the diagonal conjugate measures at least 11.5 cm and the true or obstetric conjugate measures 10 cm or more (1.5 cm less than the diagonal conjugate, or about 10 cm), then the pelvis is large enough for a vaginal birth of what would be considered a normal-size newborn.

Pelvic Shape

In addition to size, the shape of a woman's pelvis is a determining factor for a vaginal birth. The pelvis is divided into four main shapes: gynecoid, anthropoid, android, and platypelloid (**Fig. 13.2**).

The gynecoid pelvis is considered the true female pelvis, occurring in about 50% of all women; it is less common in men (Leonard, 2012). Vaginal birth is most favorable with this type of pelvis because the inlet is round and the outlet is roomy. This shape offers the optimal diameters in all three planes of the pelvis. This type of pelvis allows early and complete fetal internal rotation during labor.

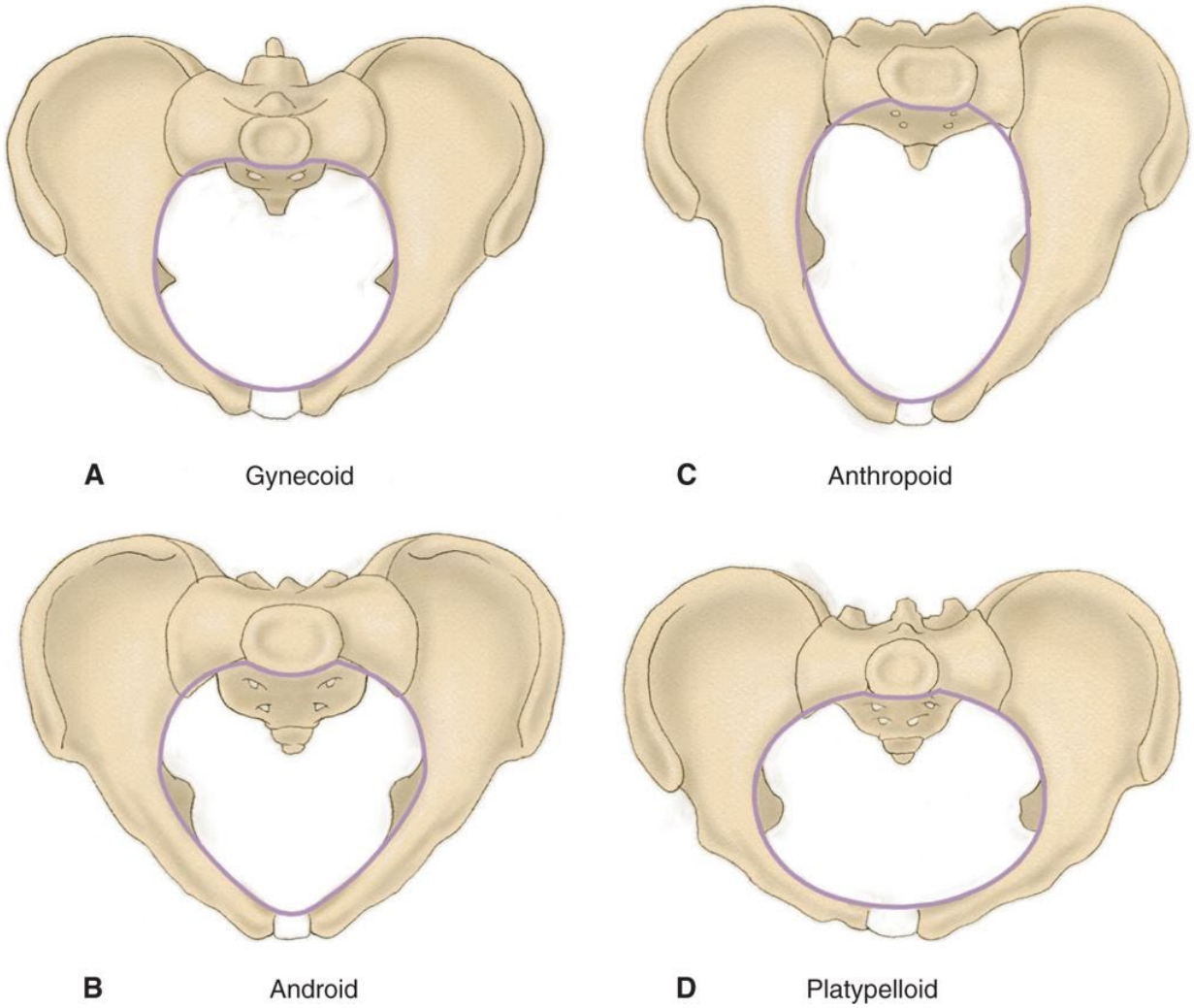


FIGURE 13.2

Pelvic shapes. **(A)** Gynecoid. **(B)** Android. **(C)** Anthropoid. **(D)** Platypelloid.

The anthropoid pelvis is common in men and occurs in 25% of women (Spiby & Munro, 2010). The pelvic inlet is oval and the sacrum is long, producing a deep pelvis (wider front to back [anterior to posterior] than side to side [transverse]). Vaginal birth is more favorable with this pelvic shape compared to the android or platypelloid shape (Tharpe, Farley, & Jordan, 2013).

The android pelvis is considered the male-shaped pelvis and is characterized by a funnel shape. It occurs in approximately 20% of women (Cunningham et al., 2010). The pelvic inlet is heart shaped and the posterior segments are reduced in all pelvic planes. Descent of the fetal head into the pelvis is slow, and failure of the fetus to rotate is common. The prognosis for labor is poor, subsequently leading to cesarean birth.

The platypelloid or flat pelvis is the least common type of pelvic structure among men and women, with an approximate incidence of 5% (Mattson & Smith, 2011). The pelvic cavity is

shallow but widens at the pelvic outlet, making it difficult for the fetus to descend through the mid-pelvis. Labor prognosis is poor with arrest at the inlet occurring frequently. It is not favorable for a vaginal birth unless the fetal head can pass through the inlet. Women with this type of pelvis usually require cesarean birth.

An important principle is that most pelves are not purely defined but occur in nature as mixed types. Many women have a combination of these four basic pelvis types, with no two pelves being exactly the same. Regardless of the shape, the newborn can be born vaginally if size and positioning remain compatible. The narrowest part of the fetus attempts to align itself with the narrowest pelvic dimension (e.g., biparietal to interspinous diameters, which means the fetus generally tends to rotate to the most ample portion of the pelvis).

Soft Tissues

The soft tissues of the passageway consist of the cervix, the pelvic floor muscles, and the vagina. Through **effacement**, the cervix effaces (thins) to allow the presenting fetal part to descend into the vagina.

Take Note!

The process of cervical effacement and dilation is similar to that of pulling a turtleneck sweater over your head.

The pelvic floor muscles help the fetus to rotate anteriorly as it passes through the birth canal. The soft tissues of the vagina expand to accommodate the fetus during birth.

Passenger

The fetus (with placenta) is the passenger. The fetal head (size and presence of molding), fetal attitude (degree of body flexion), fetal lie (relationship of body parts), fetal presentation (first body part), fetal position (relationship to maternal pelvis), fetal station, and fetal engagement are all important factors that have an impact on the ultimate outcome in the birthing process.

Fetal Head

The fetal head is the largest and least compressible fetal structure, making it an important factor in relation to labor and birth. Considerable variation in the size and diameter of the fetal skull is often seen.

Compared with an adult, the fetal head is large in proportion to the rest of the body, usually about one quarter of the body surface area (Gardner, Carter, Enzman-Hines, & Hernandez, 2011). The bones that make up the face and cranial base are fused and essentially fixed. However, the bones that make up the rest of the cranium (two frontal bones, two parietal bones, and the occipital bone) are not fused; rather, they are soft and pliable, with gaps between the plates of bone. These gaps, which are membranous spaces between the cranial bones, are called sutures, and the intersections of these sutures are called fontanelles. Sutures are important because they allow the cranial bones to overlap in order for the head to adjust in shape (elongate) when pressure is exerted on it by uterine contractions or the maternal bony pelvis. Some diameters shorten, whereas others lengthen as the head is molded during the labor and birthing process. This malleability of the fetal skull may decrease fetal skull dimensions by 0.5 to 1 cm (Mattson & Smith, 2011). After birth, the sutures close as the bones grow and the brain reaches its full growth.

The changed (elongated) shape of the fetal skull at birth as a result of overlapping of the cranial bones is known as **molding**. Along with molding, fluid can also collect in the scalp (caput succedaneum) or blood can collect beneath the scalp (cephalohematoma), further distorting the shape and appearance of the fetal head. Caput succedaneum can be described as edema of the scalp at the presenting part. This swelling crosses suture lines and disappears within 3 to 4 days. Cephalohematoma is a collection of blood between the periosteum and the bone that occurs several hours after birth. It does not cross suture lines and is generally reabsorbed over the next 6 to 8 weeks (Mattson & Smith, 2011).

Take Note!

Parents may become concerned about the distortion of their newborn's head. However, reassurance that the oblong shape is only temporary is usually all that is needed to reduce their anxiety.

Sutures also play a role in helping to identify the position of the fetal head during a vaginal examination. **Figure 13.3** shows a fetal skull. The coronal sutures are located between the frontal and parietal bones and extend transversely on both sides of the anterior fontanelles. The frontal suture is located between the two frontal bones. The lambdoidal sutures are located between the occipital bone and the two parietals, extending transversely on either side of the posterior fontanelles. The sagittal suture is located between the parietal bones and divides the skull into the right and left halves. During a pelvic examination, palpation of these sutures by the examiner reveals the position of the fetal head and the degree of rotation that has occurred.

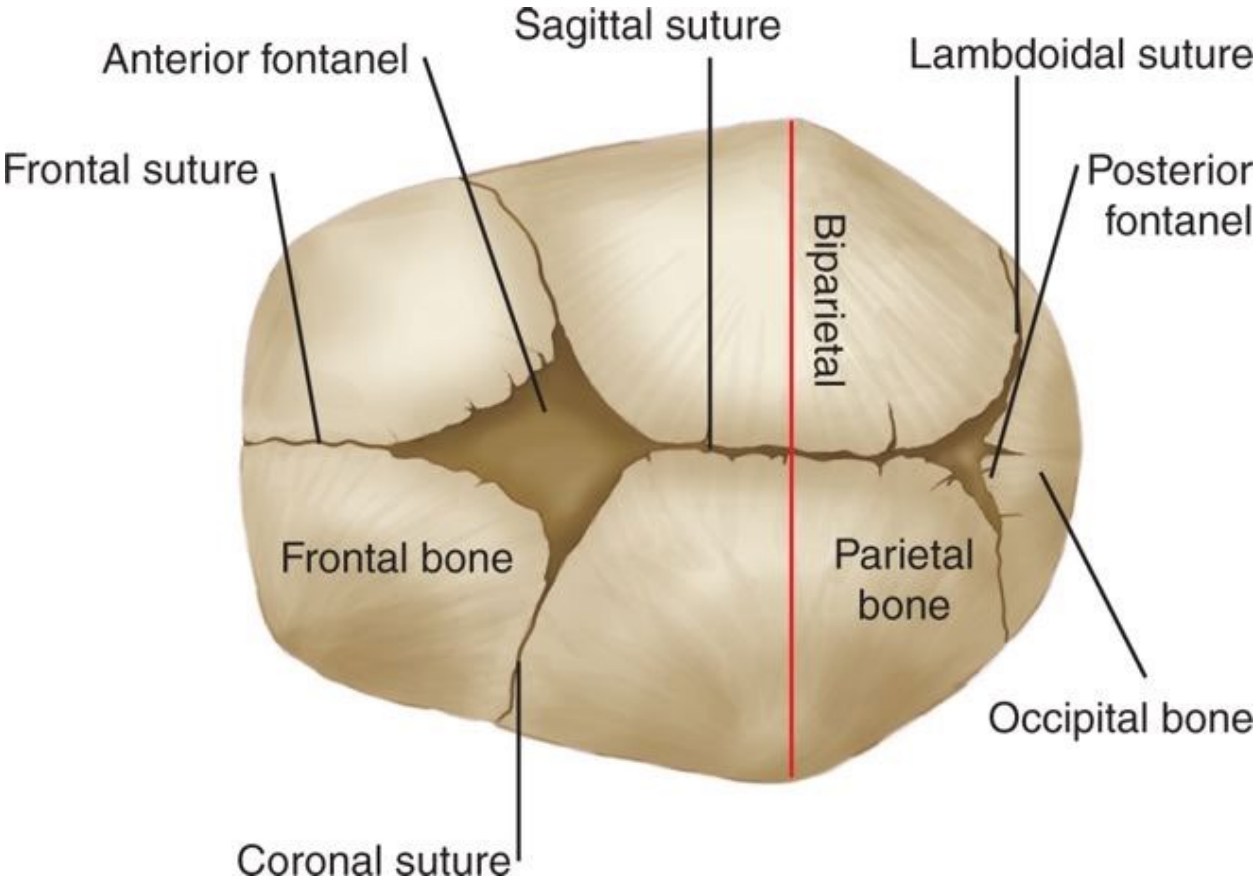


FIGURE 13.3

Fetal skull.

The anterior and posterior fontanelles are also useful in helping to identify the position of the fetal head, and they allow for molding. In addition, the fontanelles are important when evaluating the newborn. The anterior fontanelle is the famous "soft spot" of the newborn's head. It is a diamond-shaped space that measures from 1 to 4 cm. It remains open for 12 to 18 months after birth to allow for growth of the brain (Gardner et al., 2011). The posterior fontanelle corresponds to the anterior one but is located at the back of the fetal head; it is triangular. This one closes within 8 to 12 weeks after birth and measures, on average, 1 to 2 cm at its widest diameter (Weber & Kelley, 2010).

The diameter of the fetal skull is an important consideration during the labor and birth process. Fetal skull diameters are measured between the various landmarks of the skull. Diameters include occipitofrontal, occipitomental, suboccipitobregmatic, and biparietal (**Fig. 13.4**). The two most important diameters that can affect the birth process are the suboccipitobregmatic (approximately 9.5 cm at term) and the biparietal (approximately 9.25 cm at term) diameters. The suboccipitobregmatic diameter, measured from the base of the occiput to the center of the anterior fontanelle, identifies the smallest anteroposterior diameter of the fetal skull. The biparietal diameter measures the largest transverse diameter of the fetal skull: the distance between the two parietal bones. In a cephalic (head first) presentation, which occurs in 95% of all term births, if the fetus presents in a flexed position in which the chin is resting on the chest, the optimal or smallest fetal skull dimensions for a

vaginal birth are demonstrated. If the fetal head is not fully flexed at birth, the anteroposterior diameter increases. This increase in dimension might prevent the fetal skull from entering the maternal pelvis.

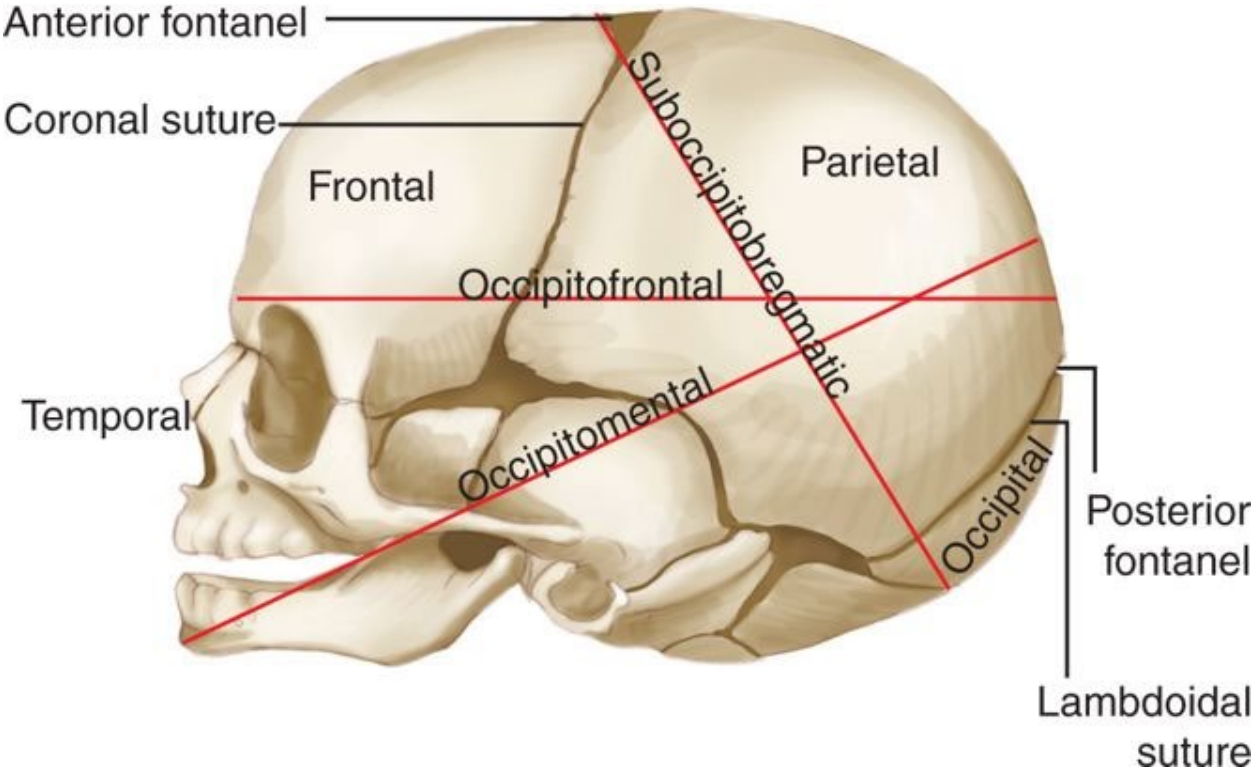


FIGURE 13.4

Fetal Attitude

Fetal attitude is another important consideration related to the passenger.
Fetal **attitude** refers to the posturing (flexion or extension) of the joints and the relationship of fetal parts to one another. The most common fetal attitude when labor begins is with all joints flexed—the fetal back is rounded, the chin is on the chest, the thighs are flexed on the abdomen, and the legs are flexed at the knees (**Fig. 13.5**). This normal fetal position is most favorable for vaginal birth, presenting the smallest fetal skull diameters to the pelvis.

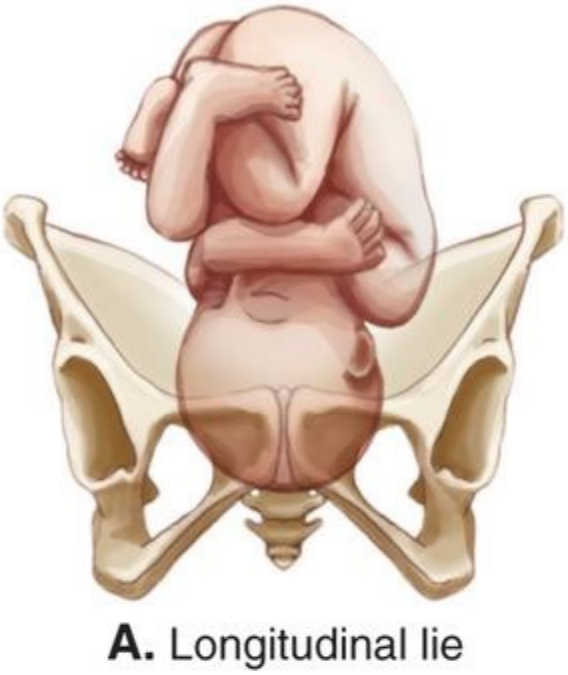
FIGURE 13.5

Fetal attitude: full flexion. Note that the smallest diameter presents to the pelvis.

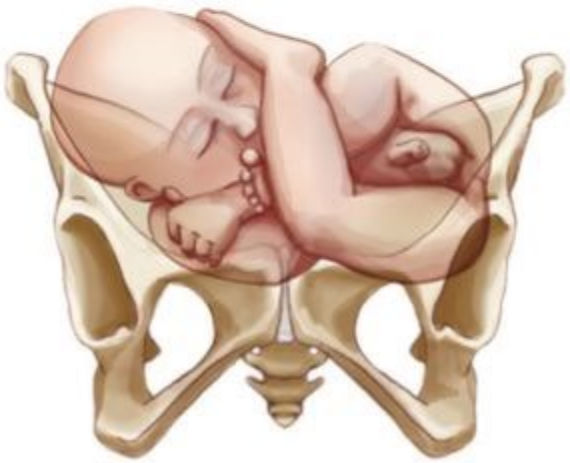
When the fetus presents to the pelvis with abnormal attitudes (no flexion or extension), their non flexed position can increase the diameter of the presenting part as it passes through the pelvis, increasing the difficulty of birth. An attitude of extension tends to present larger fetal skull diameters, which may make birth difficult.

Fetal Lie

Fetal **lie** refers to the relationship of the long axis (spine) of the fetus to the long axis (spine) of the mother. There are two primary lies: longitudinal (which is the most common) and transverse (**Fig. 13.6**).



A. Longitudinal lie



B. Transverse lie

FIGURE 13.6

Fetal lie.

A longitudinal lie occurs when the long axis of the fetus is parallel to that of the mother (fetal spine to maternal spine side-by-side). A transverse lie occurs when the long axis of the fetus is perpendicular to the long axis of the mother (fetus spine lies across the maternal abdomen and

crosses her spine). A fetus in a transverse lie position cannot be delivered vaginally (Mattson & Smith, 2011).

Fetal Presentation

Fetal **presentation** refers to the body part of the fetus that enters the pelvic inlet first (the "presenting part"). This is the fetal part that lies over the inlet of the pelvis or the cervical os. Knowing which fetal part is coming first at birth is critical for planning and initiating appropriate interventions.

The three main fetal presentations are cephalic (head first), breech (pelvis first), and shoulder (scapula first). The majority of term newborns (95%) enter this world in a cephalic presentation; breech presentations account for 3% of term births, and shoulder presentations for approximately 2% (Tharpe et al., 2013).

In a cephalic presentation, the presenting part is usually the occiput portion of the fetal head (Fig. 13.7). This presentation is also referred to as a vertex presentation. Variations in a vertex presentation include the military, brow, and face presentations.

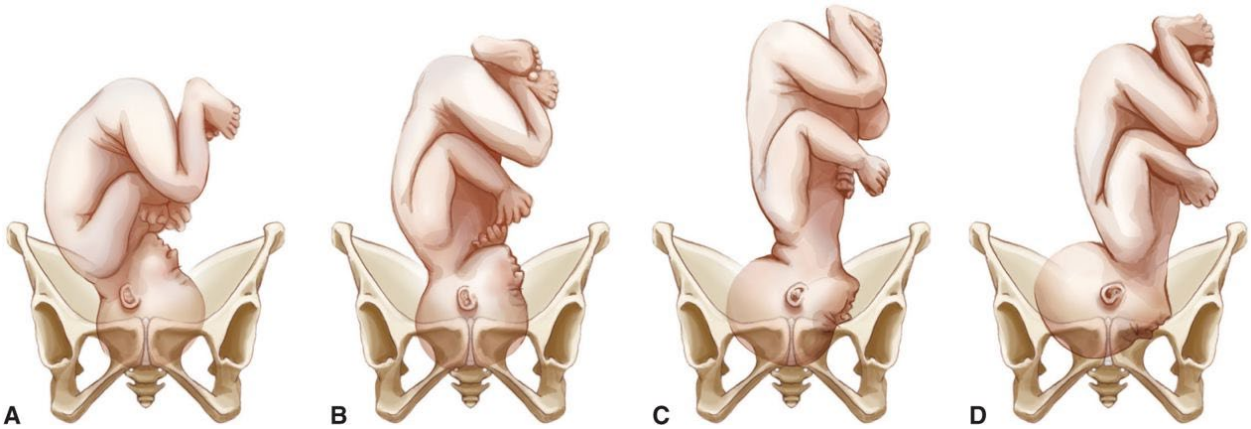


FIGURE 13.7

Fetal presentation: cephalic presentations. **(A)** Vertex. **(B)** Military. **(C)** Brow. **(D)** Face.

Breech presentation occurs when the fetal buttocks or feet enter the maternal pelvis first and the fetal skull enters last. This abnormal presentation poses several challenges at birth. Primarily, the largest part of the fetus (skull) is born last and may become "hung up" or stuck in the pelvis. In addition, the umbilical cord can become compressed between the fetal skull and the maternal pelvis after the fetal chest is born because the head is the last to exit. Moreover, unlike the hard fetal skull, the buttocks are soft and are not as effective as a cervical dilator during labor compared with a cephalic presentation. Finally, there is the possibility of trauma to the head as a result of the lack of opportunity for molding.

The types of breech presentations are determined by the positioning of the fetal legs (Fig. 13.8). In a frank breech (50% to 70%), the buttocks present first with both legs extended up toward the face. In a full or complete breech (5% to 10%), the fetus sits crossed-legged above

the cervix. In a footling or incomplete breech (10% to 30%), one or both legs are presenting. Breech presentations are associated with prematurity, placenta previa, multiparity, uterine abnormalities (fibroids), and some congenital anomalies such as hydrocephaly (Fischer, 2011). A frank breech can result in a vaginal birth, but complete, footling, and incomplete breech presentations generally necessitate a cesarean birth.

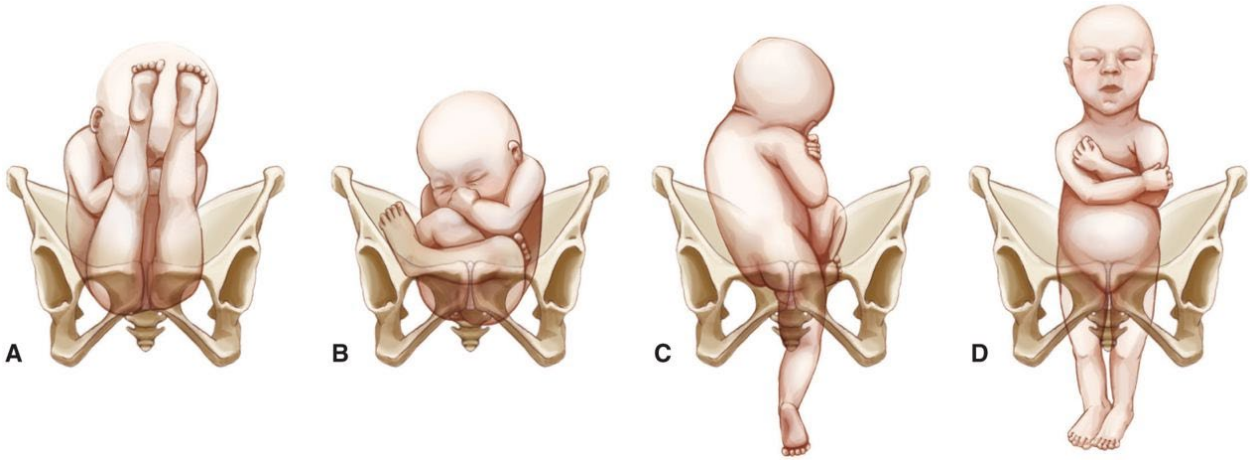


FIGURE 13.8

Breech presentations. (A) Frank breech. (B) Complete breech. (C) Single footling breech. (D) Double footling breech.

A shoulder presentation or shoulder dystocia occurs when the fetal shoulders present first, with the head tucked inside. Odds of a shoulder presentation are 1 in 300 births (Cunningham et al., 2010). The fetus is in a transverse lie with the shoulder as the presenting part. Conditions associated with shoulder dystocia include placenta previa, prematurity, high parity, premature rupture of membranes, multiple gestation, or fetal anomalies. A cesarean birth is usually necessary if identified before labor begins, but will be evaluated based on the length of gestation, the size of the fetus, the position of the placenta, and whether the membranes have ruptured (Sister, 2011).

Fetal Position

Fetal **position** describes the relationship of a given point on the presenting part of the fetus to a designated point of the maternal pelvis (Vorvick, 2011). The landmark fetal presenting parts include the occipital bone (O), which designates a vertex presentation; the chin (mentum [M]), which designates a face presentation; the buttocks (sacrum [S]), which designate a breech presentation; and the scapula (acromion process [A]), which designates a shoulder presentation.

In addition, the maternal pelvis is divided into four quadrants: right anterior, left anterior, right posterior, and left posterior. These quadrants designate whether the presenting part is directed toward the front, back, left, or right side of the pelvis. Fetal position is determined first by identifying the presenting part and then the maternal quadrant the presenting part is facing (**Fig. 13.9**). Position is indicated by a three-letter abbreviation as follows:

- The first letter defines whether the presenting part is tilted toward the left (L) or the right (R) side of the maternal pelvis.
- The second letter represents the particular presenting part of the fetus: O for occiput, S for sacrum (buttocks), M for mentum (chin), A for acromion process, and D for dorsal (refers to the fetal back) when denoting the fetal position in shoulder presentations (Cheng & Caughey, 2011).
- The third letter defines the location of the presenting part in relation to the anterior (A) portion of the maternal pelvis or the posterior (P) portion of the maternal pelvis. If the presenting part is directed to the side of the maternal pelvis, the fetal presentation is designated as transverse (T).

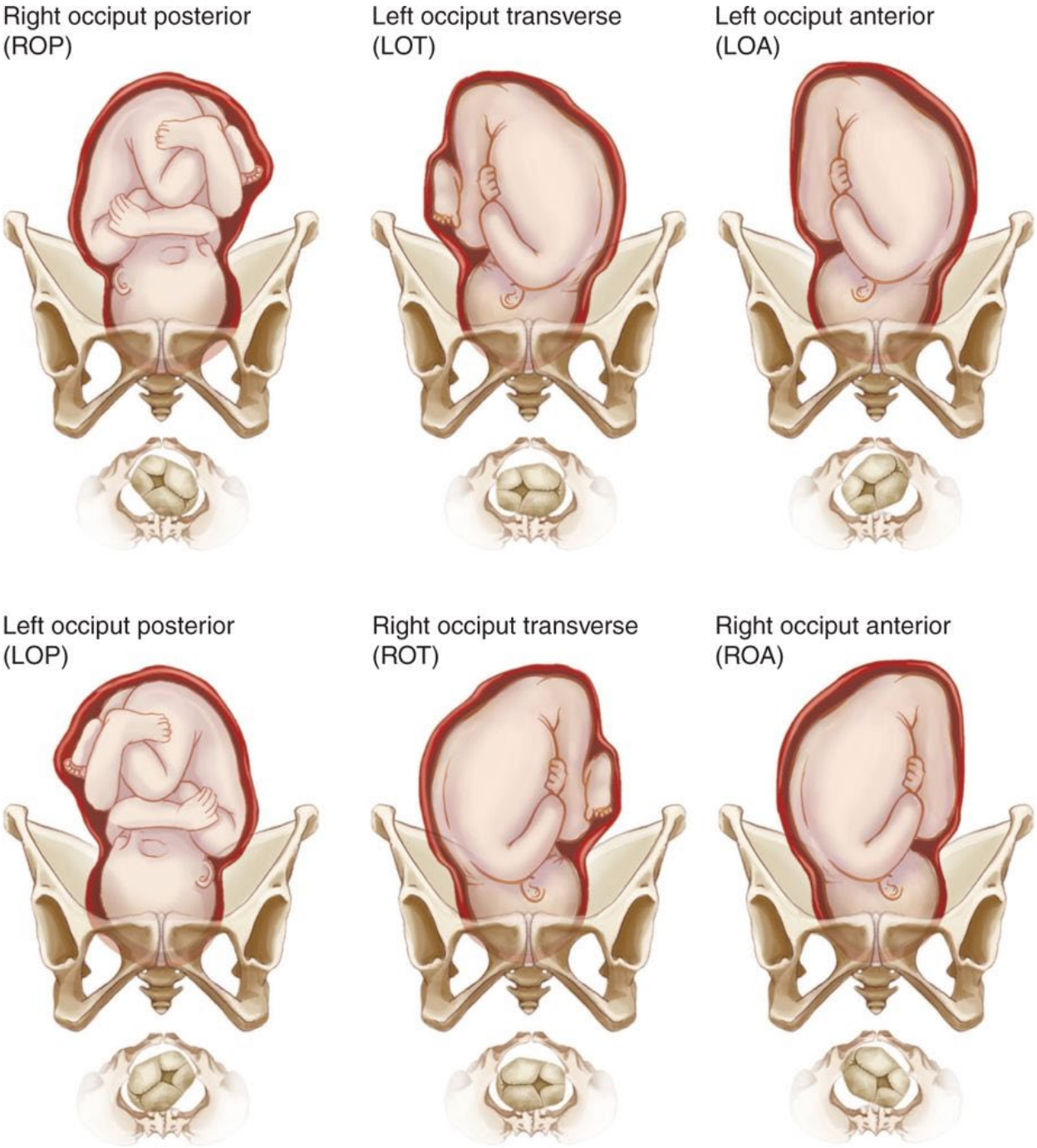


FIGURE 13.9

Examples of fetal positions in a vertex presentation. The lie is longitudinal for each illustration. The attitude is one of flexion. Notice that the view of the top illustration is seen when facing the pregnant woman. The bottom view is that seen with the woman in a dorsal recumbent position.

For example, if the occiput is facing the left anterior quadrant of the pelvis, then the position is termed left occiput anterior and is recorded as LOA. LOA is the most common (and most favorable) fetal position for birthing today, followed by right occiput anterior (ROA).

The positioning of the fetus allows the fetal head to contour to the diameters of the maternal pelvis. LOA and ROA are optimal positions for a vaginal birth. An occiput posterior position may lead to a long and difficult birth, and other positions may or may not be compatible with vaginal birth.

Fetal Station

Fetal **station** refers to the relationship of the presenting part to the level of the maternal pelvic ischial spines. Fetal station is measured in centimeters and is referred to as a minus or plus, depending on its location above or below the ischial spines. Typically, the ischial spines are the narrowest part of the pelvis and are the natural measuring point for the birth progress.

Zero (0) station is designated when the presenting part is at the level of the maternal ischial spines. When the presenting part is above the ischial spines, the distance is recorded as minus stations. When the presenting part is below the ischial spines, the distance is recorded as plus stations. For instance, if the presenting part is above the ischial spines by 1 cm, it is documented as being a −1 station; if the presenting part is below the ischial spines by 1 cm, it is documented as being a +1 station. An easy way to understand this concept is to think in terms of meeting the goal, which is the birth. If the fetus is descending downward (past the ischial spines) and moving toward meeting the goal of birth, then the station is positive and the centimeter numbers grow bigger from +1 to +4. If the fetus is not descending past the ischial spines, then the station is negative and the centimeter numbers grow bigger from −1 to −4. The farther away the presenting part from the outside, the larger the negative number (−4 cm). The closer the presenting part of the fetus is to the outside, the larger the positive number (+4 cm). **Figure 13.10** shows stations of the presenting part.

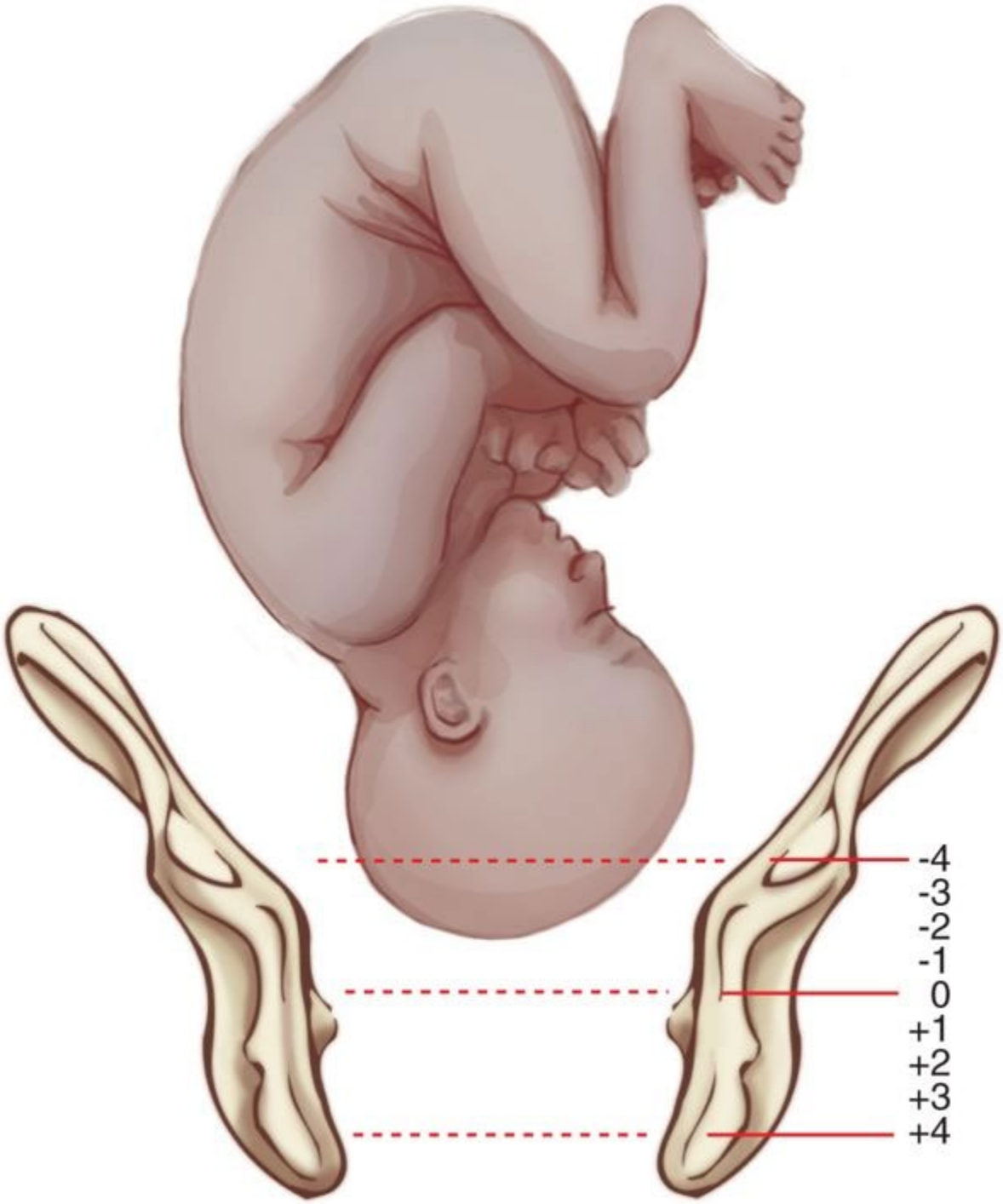


FIGURE 13.10

Fetal stations.

etal Engagement

Fetal **engagement** signifies the entrance of the largest diameter of the fetal presenting part (usually the fetal head) into the smallest diameter of the maternal pelvis (Alexander, LaRosa, Bader, & Garfield, 2010). The fetus is said to be "engaged" in the pelvis when the presenting part reaches 0 station. Engagement is determined by pelvic examination.

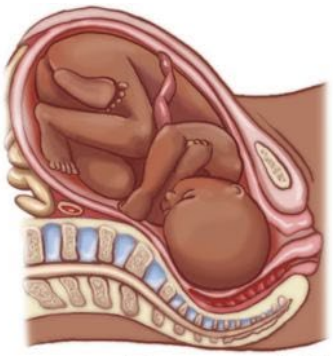
The largest diameter of the fetal head is the biparietal diameter. It extends from one parietal prominence to the other. It is an important factor in the navigation through the maternal pelvis. Engagement typically occurs in primigravidas 2 weeks before term, whereas multiparas may experience engagement several weeks before the onset of labor or not until labor begins.

Take Note!

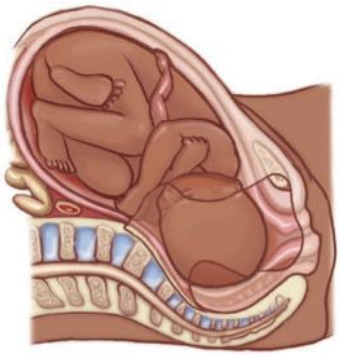
The term floating is used when engagement has not occurred, because the presenting part is freely movable above the pelvic inlet.

Cardinal Movements of Labor

The fetus goes through many positional changes as it travels through the passageway. These positional changes are known as the cardinal movements of labor. They are deliberate, specific, and very precise movements that allow the smallest diameter of the fetal head to pass through a corresponding diameter of the mother's pelvic structure. Although cardinal movements are conceptualized as separate and sequential, the movements are typically concurrent (**Fig. 13.11**).



Engagement, Descent, Flexion



Internal Rotation

External Rotation restitution)

Extension Beginning (rotation complete)

External Rotation (shoulder rotation)

Extension Complete

Expulsion

FIGURE 13.11

Cardinal movements of labor.

ENGAGEMENT

Engagement occurs when the greatest transverse diameter of the head in vertex (biparietal diameter) passes through the pelvic inlet (usually 0 station). The head usually enters the pelvis with the sagittal suture aligned in the transverse diameter.

DESCENT

Descent is the downward movement of the fetal head until it is within the pelvic inlet. Descent occurs intermittently with contractions and is brought about by one or more of the following forces:

- Pressure of the amniotic fluid
- Direct pressure of the fundus on the fetus's buttocks or head (depending on which part is located in the top of the uterus)
- Contractions of the abdominal muscles (second stage)
- Extension and straightening of the fetal body

Descent occurs throughout labor, ending with birth. During this time, the mother experiences discomfort, but she is unable to isolate this particular fetal movement from her overall discomfort.

FLEXION

Flexion occurs as the vertex meets resistance from the cervix, the walls of the pelvis, or the pelvic floor. As a result, the chin is brought into contact with the fetal thorax and the presenting diameter is changed from occipitofrontal to suboccipitobregmatic (9.5 cm), which achieves the smallest fetal skull diameter presenting to the maternal pelvic dimensions.

INTERNAL ROTATION

After engagement, as the head descends, the lower portion of the head (usually the occiput) meets resistance from one side of the pelvic floor. As a result, the head rotates about 45 degrees anteriorly to the midline under the symphysis. This movement is known as *internal rotation*. Internal rotation brings the anteroposterior diameter of the head in line with the anteroposterior diameter of the pelvic outlet. It aligns the long axis of the fetal head with the long axis of the maternal pelvis. The widest portion of the maternal pelvis is the anteroposterior diameter, and thus the fetus must rotate to accommodate the pelvis.

EXTENSION

With further descent and full flexion of the head, the nucha (the base of the occiput) becomes impinged under the symphysis. Resistance from the pelvic floor causes the fetal head to extend so that it can pass under the pubic arch. *Extension* occurs after internal rotation is complete. The head emerges through extension under the symphysis pubis along with the shoulders. The anterior fontanel, brow, nose, mouth, and chin are born successively.

EXTERNAL ROTATION (RESTITUTION)

After the head is born and is free of resistance, it untwists, causing the occiput to move about 45 degrees back to its original left or right position (restitution). The sagittal suture has now resumed its normal right-angle relationship to the transverse (bisacromial) diameter of the shoulders (i.e., the head realigns with the position of the back in the birth canal). *External rotation* of the fetal head allows the shoulders to rotate internally to fit the maternal pelvis.

EXPULSION

Expulsion of the rest of the body occurs more smoothly after the birth of the head and the anterior and posterior shoulders (Cheng & Caughey, 2011). See **Figure 13.3** for an image of a fetal skull.

Powers

The primary stimulus powering labor is uterine contractions. Contractions cause complete dilation and effacement of the cervix during the first stage of labor. The secondary powers in labor involve the use of intra-abdominal pressure (voluntary muscle contractions) exerted by the woman as she pushes and bears down during the second stage of labor.

Uterine Contractions

Uterine contractions are involuntary and therefore cannot be controlled by the woman experiencing them, regardless of whether they are spontaneous or induced. Uterine contractions are rhythmic and intermittent, with a period of relaxation between contractions. This pause allows the woman and the uterine muscles to rest. In addition, this pause restores blood flow to the uterus and placenta, which is temporarily reduced during each uterine contraction.

Uterine contractions are responsible for thinning and dilating the cervix, and they thrust the presenting part toward the lower uterine segment. The cervical canal reduces in length from 2 cm to a paper-thin entity and is described in terms of percentages from 0% to 100%. In primigravidas, effacement typically starts before the onset of labor and usually begins before dilation; in multiparas, however, neither effacement nor dilation may start until labor ensues. On clinical examination the following may be assessed:

- Cervical canal 2 cm in length would be described as 0% effaced.

- Cervical canal 1 cm in length would be described as 50% effaced.
- Cervical canal 0 cm in length would be described as 100% effaced.

Dilation is dependent on the pressure of the presenting part and the contraction and retraction of the uterus. The diameter of the cervical os increases from less than 1 cm to approximately 10 cm to allow for birth. When the cervix is fully dilated, it is no longer palpable on vaginal examination. Descriptions may include the following:

- External cervical os closed: 0 cm dilated
- External cervical os half open: 5 cm dilated
- External cervical os fully open: 10 cm dilated

During early labor, uterine contractions are described as mild, they last about 30 seconds, and they occur about every 5 to 7 minutes. As labor progresses, contractions last longer (60 seconds), occur more frequently (2 to 3 minutes apart), and are described as being moderate to high in intensity.

Each contraction has three phases: increment (buildup of the contraction), acme (peak or highest intensity), and decrement (descent or relaxation of the uterine muscle fibers; Fig. 13.12).

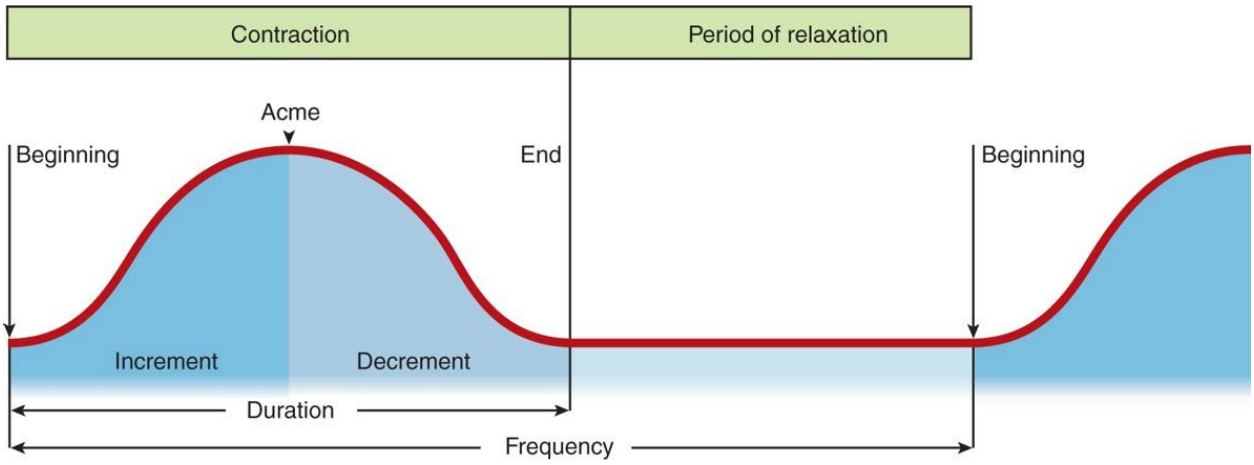


FIGURE 13.12

The three phases of a uterine contraction.

Uterine contractions are monitored and assessed according to three parameters: frequency, duration, and intensity.

- 1. **Frequency** refers to how often the contractions occur and is measured from the beginning of one contraction to the beginning of the next contraction.
- 2. **Duration** refers to how long a contraction lasts and is measured from the beginning of one contraction to the end of that same contraction.
- 3. **Intensity** refers to the strength of the contraction determined by manual palpation or measured by an internal intrauterine pressure catheter. The catheter is positioned in the uterine cavity through the cervix after the membranes have ruptured. It reports intensity by measuring the pressure of the amniotic fluid inside the uterus in millimeters of mercury. It is not recommended for routine use in low-risk laboring women due to the potential risk of infection and injury to the placenta or fetus (Lowry, 2010).

Intra-Abdominal Pressure

Increased intra-abdominal pressure (voluntary muscle contractions) compresses the uterus and adds to the power of the expulsion forces of the uterine contractions (Mattson & Smith, 2011). Coordination of these forces in unison promotes birth of the fetus and expulsion of the fetal membranes and placenta from the uterus. Interference with these forces (such as when a woman is highly sedated or extremely anxious) can compromise the effectiveness of these powers.

Position (Maternal)

Positioning for normal labor and birth has evolved. Until about 250 years ago, women were depicted in art and described in essays as sitting upright with flexed hips, squatting, or less commonly standing or kneeling during the childbirth process. These positions maintain flexion at the hip joint and somewhat straighten the pelvis (Pridjian, 2011). In the past 250 years, dorsal and dorsal lithotomy positions evolved for unclear reasons and have been ascribed to Western medicine. Medical historians say the evolution was to facilitate forceps usage, to promote men's power over women and for convenience after administration of anesthesia (Pridjian, 2011).

Maternal positioning during labor has only recently been the subject of well-controlled research. Scientific evidence has shown that nonmoving, back-lying positions during labor are not healthy (DeJonge, Van Diem, Scheepers, Buitendijk, & Lagro-Janssen, 2010). However, despite this evidence to the contrary, many women continue to lie flat on their backs during labor. Some of the reasons why this practice continues include the following:

- Belief that laboring women need to conserve their energy and not tire themselves
- Belief that nurses cannot keep track of the whereabouts of ambulating women
- Belief it is the preference of the health care professional
- Belief that the fetus can be monitored better in this position
- Belief that the supine position facilitates vaginal examinations and external belt adjustment
- Belief that a bed is "where one is supposed to be" in a hospital setting
- Belief that the position is more convenient for the delivering health professional
- Belief that laboring women are "connected to things" that impede movement (Searle, 2010)

Although many labor and birthing facilities claim that all women are allowed to adopt any position of comfort during their laboring experience, many women spend their time on their backs during labor and birth. Women should be encouraged to assume any position of comfort for them.

Take Note!

If the only furniture provided is a bed, this is what the woman will use. Furnishing rooms with comfortable chairs, beanbags, and other birth props allows a woman to choose from a variety of positions and to be free to move during labor.

Changing positions and moving around during labor and birth offer several benefits. Maternal position can influence pelvic size and contours. Changing position and walking affect the pelvis joints, which may facilitate fetal descent and rotation. Squatting enlarges the pelvic inlet and outlet diameters, whereas a kneeling position removes pressure on the maternal vena cava and helps to rotate the fetus from a posterior position to an anterior one to facilitate birth (Archer, Suresh, & Shapiro, 2011). The use of any upright or lateral position, compared with supine or lithotomy positions, may:

- Reduce the length of the first stage of labor
- Reduce the duration of the second stage of labor
- Reduce the number of assisted deliveries (vacuum and forceps)
- Reduce episiotomies and perineal tears
- Contribute to fewer abnormal fetal heart rate patterns
- Increase comfort/reduce requests for pain medication
- Enhance a sense of control by the mother
- Alter the shape and size of the pelvis, which assists in descent
- Assist gravity to move the fetus downward (Mattson & Smith, 2011)

Using the research available can bring better outcomes, heightened professionalism, and evidence-based practice to childbearing practices (Thies-Lagergren, Kvist, Christensson, & Hildingsson, 2011).

Psychological Response

Childbearing can be one of the most life-altering experiences for a woman. The experience of childbirth goes beyond the physiologic aspects: it influences a woman's self-confidence, self-esteem, and view of life, relationships, and children. Her state of mind (psyche) throughout the entire process is critical to bring about a positive outcome for her and her family. Factors promoting a positive birth experience include:

- Clear information about procedures
- Support; not being alone
- Sense of mastery, self-confidence
- Trust in staff caring for her
- Positive reaction to the pregnancy
- Personal control over breathing
- Preparation for the childbirth experience

Having a strong sense of self and meaningful support from others can often help women manage labor well. Feeling safe and secure typically promotes a sense of control and ability to withstand the challenges of the childbearing experience. Anxiety and fear, however, decrease a woman's ability to cope with the discomfort of labor. Maternal catecholamines secreted in response to anxiety and fear can inhibit uterine blood flow and placental perfusion. In contrast, relaxation can augment the natural process of labor (Leonard, 2012). Preparing mentally for childbirth is important so that the woman can work with, rather than against, the natural forces of labor.

Philosophy

Not everyone views childbirth in the same way. A philosophical continuum exists that extends from viewing labor as a disease process to a normal process. One philosophy assumes that women cannot manage the birth experience adequately and therefore need constant expert monitoring and management. The other philosophy assumes that women are capable, reasoning individuals who can actively participate in their birth experience.

The health care system in the United States today appears to be leaning toward the former philosophy, applying technological interventions to most mothers who enter the hospital system. Giving birth in a hospital in the 21st century for many women has become "intervention intensive"—designed to start, continue, and end labor through medical management rather than allowing the normal process of birth to unfold. Advances in medical care have improved the safety for women with high-risk pregnancies. However, the routine use of intravenous therapy, electronic fetal monitoring, augmentation, and epidural anesthesia has not necessarily improved birth outcomes for all women (Leonard, 2012). Perhaps a middle-of-the-road philosophy for intervening when circumstances dictate, along with weighing the risks and benefits before doing so, may be appropriate.

During the 1970s, family-centered maternity care was developed in response to the consumer reaction to the depersonalization of birth. The hope was to shift the philosophy from "technologization" to personalization to humanize childbirth. The term *family-centered birthing* is more appropriate today to denote the low-tech, high-touch approach requested by many childbearing women, who view childbirth as a normal process.

Certified nurse midwives (CNMs) are champions of family-centered birthing, and their participation in the childbirth process is associated with fewer unnecessary interventions when compared to obstetricians. CNMs subscribe to a normal birth process where the woman uses her own instincts and bodily signs during labor. In short, midwives empower women within the birthing environment (Jimenez, Klein, Hivon, & Mason, 2010).

No matter what philosophy is held, it is ideal if everyone involved in the particular birth process—from the health care provider to the mother—shares the same philosophy toward the birth process.

Partners

Women desire support and attentive care during labor and birth. Caregivers can convey emotional support by offering their continued presence and words of encouragement. Throughout the world, few women are left to labor
totally alone: emotional, physical, or spiritual support during labor is the norm for most cultures (Bainbridge, 2010). A caring partner can use massage, light touch, acupressure, hand-holding, stroking, and relaxation; can help the woman communicate her wishes to the staff; and can provide a continuous, reassuring presence, all of which bring some degree of comfort to the laboring woman (Stager, 2010). Although the presence of the baby's father at the birth provides special emotional support, a partner can be anyone who is present to support the woman throughout the experience. For many women, the

essential ingredients for a safe and satisfying birth include a sense of empowerment and success in coping with or transcending the experience, in addition to having solid, positive encouragement from a support companion.

Worldwide, women usually support other women in childbirth. **Doula** is a Greek word meaning "woman servant" or "caregiver." It now commonly refers to a woman who offers emotional and practical support to a mother or couple before, during and after childbirth. A doula believes in "mothering the mother," but clinical support remains the job of the midwife or medical staff (Hansard, 2012). The continuous presence of a trained female support person reduced the need for medication for pain relief, the use of vacuum or forceps delivery, and the need for cesarean births. Continuous support was also associated with a slight reduction in the length of labor. The doula, who is an experienced labor companion, provides the woman and her partner with emotional and physical support and information throughout the entire labor and birth experience.

A recent study in the United States found that nursing care decreases the likelihood of negative evaluations of the childbirth experience, feelings of tenseness during labor, and finding labor worse than expected. Also reported were less perineal trauma, reduced difficulty in mothering, and reduced likelihood of early cessation of breast-feeding. Continuous support by nurses included reassurance, encouragement, praise, and explaining (Gilliland, 2011).

Given the many benefits of intrapartum support, laboring women should always have the option to receive partner support, whether from nurses, doulas, significant others, or family. Whoever the support partner is, he or she should provide the mother with continuous presence and hands-on comfort and encouragement.

Patience

EVIDENCE-BASED PRACTICE 13.1: CONTINUOUS SUPPORT FOR WOMEN DURING CHILDBIRTH

STUDY

Historically, women have been attended and supported by other women during labor. However, in recent decades in hospitals worldwide, continuous support during labor has become the exception rather than the rule. Concerns about the consequent dehumanization of the birth experience have led to calls for a return to continuous support by women for women during labor.

This review of studies included 21 trials, from 11 countries, involving more than 15,000 women in a wide range of settings and circumstances. The primary outcome was to assess the effects, on mothers and their babies, of continuous, one-to-one intrapartum support compared with usual care. The secondary outcome was to determine whether the effects of continuous support are influenced by (1) routine practices and policies in the birth environment that may affect a woman's autonomy, freedom of

movement, and ability to cope with labor; (2) whether the caregiver is a member of the staff of the institution; and (3) whether the continuous support begins early or later in labor.

Findings

Women who received continuous labor support were more likely to give birth "spontaneously" (vaginally, without vacuum or forceps). They were less likely to use pain medications, were more likely to be satisfied with their experience, and had slightly shorter labors. In general, labor support appeared to be more effective when it was provided by a woman who was neither part of the hospital staff nor the woman's social network, and in settings in which epidural analgesia was not routinely available. It also appeared to be more effective when it started early in labor. No adverse effects were identified.

Nursing Implications

Knowing the results of this evidence-based study, all nurses should strive to be a real "presence" for all of their laboring couples. Based on the findings, continuous nursing support promotes positive birthing outcomes and fewer technical/surgical interventions. Both maternal and fetal well-being are preserved when nurses are present and involved during the childbirth experience. All women should have continuous support throughout their labor and birth experience to ensure a safe, personalized and human childbirth experience.

Adapted from Hodnett, E. D, Gates, S., Hofmeyr, G., J., Sakala, C., & Weston, J. (2011). Continuous support for women during childbirth. *Cochrane Database of Systematic Reviews 2011*(2). doi:10.1002/14651858.CD003766.pub3.

The birth process takes time. If more time were allowed for women to labor naturally without intervention, the cesarean birth rate would most likely be reduced. In one study, continuous support provided by midwives during labor reduced the duration of labor and the number of cesarean births; this model of support should be available to all women (Kashanian, Javadi, & Haghighi, 2010). The literature suggests that delaying interventions can give a woman enough time to progress in labor and reduce the need for surgical intervention (American College of Obstetricians and Gynecologists [ACOG], 2010). *Healthy People 2020* has two goals related to cesarean births in the United States:

- 1. Reduce the rate of cesarean births among low-risk (full-term, singleton, vertex presentation) women having their first child to 23.9% of live births, from a baseline of 26.5%.
- 2. Reduce the rate of cesarean births among women who have had a prior cesarean birth to 81.7% of live births, from a baseline of 90.8% (U.S. Department of Health and Human Services, 2010).

We are a long way from achieving these goals—the current cesarean birth rate in the United States, at 32.8%, is the highest since these data first became available from birth certificates in 1989. Cesarean birth rate is associated with increased morbidity and mortality for both mother and infant, as well as increased inpatient length of stay and health care costs (Centers for Disease Control and Prevention [CDC], 2011a,b).

It is difficult to predict how a labor will progress and therefore equally difficult to determine how long a woman's labor will last. There is no way to estimate the likely strength and frequency of uterine contractions, the extent to which the cervix will soften and dilate, and how much the fetal head will mold to fit the birth canal. We cannot know beforehand whether the complex fetal rotations needed for an efficient labor will take place properly. All of these factors are unknowns when a woman starts labor.

There is a trend in health care, however, to attempt to manipulate the process of labor through medical means such as artificial rupture of membranes and augmentation of labor with oxytocin (Glantz, 2010). The labor induction rate has doubled in the United States since the 1990s (CDC, 2011b).

Approximately one in four women is induced or has labor augmented with uterine-stimulating drugs or artificial rupture of membranes to accelerate her progress, and early term (in the 37th and 38th week) inductions have quadrupled have quadrupled from 2 to 8 percent in the United States (CDC, 2011b). An amniotomy (artificial rupture of the fetal membranes) may be performed to augment or induce labor when the membranes have not ruptured spontaneously. Doing so allows the fetal head to have more direct contact with the cervix to dilate it. This procedure is performed with the fetal head at −2 station or lower, with the cervix dilated to at least 3 cm. Synthetic oxytocin (Pitocin) is also used to induce or augment labor by stimulating uterine contractions. It is administered piggybacked into the primary intravenous line with an infusion pump titrated to uterine activity.

Elective induction of labor is at an all-time high in the United States despite known associated risks. It can lead to birth of an infant too early, a long labor, exposure to a high-alert medication with its potential side effects, unnecessary cesarean birth, and maternal and neonatal morbidity. Elective induction has a cascade of related interventions, such as an intravenous line, continuous electronic fetal monitoring, confinement to bed, amniotomy, pharmacologic labor-stimulating agents, parental pain medications, and regional anesthesia, each with its own set of potential complications and risks. These risks apply to all women having the procedure; however, for nulliparous women before 41 weeks of gestation with an unfavorable cervix, the main risk is cesarean birth after unsuccessful labor induction with the potential for maternal and neonatal morbidity and increased health care costs. When cesarean occurs, subsequent births are likely to be via cesarean as well (Simpson, 2010). Compelling evidence indicates that elective induction of labor significantly increases the risk of cesarean birth, especially for nulliparous women (Delbaere, Cammu, Martens, Tency, et al. 2012). Elective induction of labor in nulliparas is associated with increased rates of cesarean, postpartum hemorrhage, neonatal resuscitation, and longer hospitalizations without improvement in neonatal outcomes (Vardo, Thornburg, & Glantz, 2011). The belief is that many cesarean births could be avoided if women were allowed to labor longer and if the natural labor process were allowed to complete the job. The longer wait (using the intervention of patience) usually results in less intervention.

The ACOG attributes the dramatic increase in inductions in part to pressure from women, convenience for physicians, and liability concerns. They recommend a "cautious approach" regarding elective induction until clinical trials can validate a more liberal use of labor inductions (ACOG, 2012). Current medical indications for inducing labor include spontaneous rupture of membranes and when labor does not start; a pregnancy of more than 42 weeks' gestation; maternal hypertension, diabetes, or lung disease; and a uterine infection (Goldberg, 2012).

When the laboring woman feels the urge to bear down, pushing begins. Most women respond extremely well to messages from their body without being directed by the nurse. A more natural, undirected approach allows the woman to wait and bear down when she feels the urge to push. Having patience and letting nature take its course will reduce the incidence of physiologic stress in the mother, resulting in less trauma to her perineal tissue.

Patient (Client) Preparation

Basic prenatal education can help women manage their labor process and feel in control of their birthing experience. The literature indicates that if a woman is prepared before the labor and birth experience, the labor is more likely to remain normal or natural (without the need for medical intervention) (Gagnon & Sandall, 2011). An increasing body of evidence also indicates that the well-prepared woman, with good labor support, is less likely to need analgesia or anesthesia and is unlikely to require cesarean birth (Bergström, Kieler, & Waldenström, 2010).

Prenatal education teaches the woman about the childbirth experience and increases her sense of control. She is then able to work as an active participant during the labor and birth experience (Bergström et al., 2010). The research also suggests that prenatal preparation may affect intrapartum and postpartum psychosocial outcomes (Issel, Forrestal, Slaughter, Wiencrot, & Handler, 2011). For example, prenatal education covering parenting communication classes had a significant effect on postpartum anxiety and postpartum adjustment. Prenatal education should be viewed as an opportunity to strengthen families by providing anticipatory guidance and improving family members' life skills. In short, prenatal education helps to promote healthy families during the transition to parenthood and beyond (Mattson & Smith, 2011).

Take Note!

Learning about labor and birth allows women and couples to express their needs and preferences, enhance their confidence, and improve communication between themselves and the staff.

Pain Management

Labor and birth, although a normal physiologic process, can produce significant pain. Pain during labor is a nearly universal experience. Controlling the pain without harm to the fetus or labor process is the major focus of pain management during childbirth.

Pain is a subjective experience involving a complex interaction of physiologic, spiritual, psychosocial, cultural, and environmental influences (Anim-Somuah, Smyth, & Jones, 2011). Cultural values and learned behaviors influence perception and response to pain, as do anxiety and fear, both of which tend

to heighten the sense of pain (Anim-Somuah et al., 2011). The challenge for care providers is to find the right combination of pain management methods to keep the pain manageable while minimizing the negative effect on the fetus, the normal physiology of labor, maternal–infant bonding, breast-feeding, and a woman's perception of the labor itself (King & Brucker, 2011). **Chapter 14** presents a full discussion of pain management during labor and birth.

PHYSIOLOGIC RESPONSES TO LABOR

Labor is the physiologic process by which the uterus expels the fetus and placenta from the body. During pregnancy, progesterone secreted from the placenta suppresses the spontaneous contractions of a typical uterus, keeping the fetus within the uterus. In addition, the cervix remains firm and noncompliant. At term, however, changes occur in the cervix that make it softer. In addition, uterine contractions become more frequent and regular, signaling the onset of labor.

The labor process involves a series of rhythmic, involuntary, usually quite uncomfortable uterine muscle contractions. The contractions bring about a shortening that causes effacement and dilation of the cervix and a bursting of the fetal membranes. Uterine contractions of an intensity of 30 mm Hg or greater initiate cervical dilation. Then, accompanied by both reflex and voluntary contractions of the abdominal muscles (pushing), the uterine contractions result in the birth of the baby (Gilbert, 2011). During labor, the mother and fetus make several physiologic adaptations.

Maternal Responses

As the woman progresses through childbirth, numerous physiologic responses occur that assist her to adapt to the labor process. The labor process stresses several of the woman's body systems, which react through numerous compensatory mechanisms. Maternal physiologic responses include:

- Heart rate increases by 10 to 20 bpm.
- Cardiac output increases by 12% to 31% during the first stage of labor and by 50% during the second stage of labor.
- Blood pressure increases by up to 35 mm Hg during uterine contractions in all labor stages.
- The white blood cell count increases to 25,000 to 30,000 cells/mm^3, perhaps as a result of tissue trauma.
- Respiratory rate increases and more oxygen is consumed related to the increase in metabolism.
- Gastric motility and food absorption decrease, which may increase the risk of nausea and vomiting during the transition stage of labor.
- Gastric emptying and gastric pH decrease, increasing the risk of vomiting with aspiration.
- Temperature rises slightly, possibly due to an increase in muscle activity.
- Muscular aches/cramps occur as a result of the stressed musculoskeletal system.
- Basal metabolic rate increases and blood glucose levels decrease because of the stress of labor (Cheng & Caughey, 2011).

A woman's ability to adapt to the stress of labor is influenced by her psychological and physical state. Among the many factors that affect her coping ability are:

- Previous birth experiences and their outcomes (complications and previous birth outcomes)
- Current pregnancy experience (planned versus unplanned, discomforts experienced, age, risk status of pregnancy, chronic illness, weight gain)
- Cultural considerations (values and beliefs about health status)
- Support system (presence and support of a valued partner during labor)
- Childbirth preparation (attended childbirth classes and has practiced paced breathing techniques)
- Exercise during pregnancy (muscles toned; ability to assist with intra-abdominal pushing)
- Expectations of the birthing experience (viewed as a meaningful or stressful event)
- Anxiety level (excessive anxiety may interfere with labor progress)
- Fear of labor and loss of control (fear may enhance pain perception, augmenting fear)
- Fatigue and weariness (not up for the challenge/duration of labor) (Mattson & Smith, 2011)

Fetal Responses

Although the focus during labor may be on assessing the mother's adaptations, several physiologic adaptations occur in the fetus as well. The fetus is experiencing labor along with the mother. If the fetus is healthy, the stress of labor usually has no adverse effects. The nurse needs to be alert to any abnormalities in the fetus's adaptation to labor. Fetal responses to labor include:

- Periodic fetal heart rate accelerations and slight decelerations related to fetal movement, fundal pressure, and uterine contractions
- Decrease in circulation and perfusion to the fetus secondary to uterine contractions (a healthy fetus is able to compensate for this drop)
- Increase in arterial carbon dioxide pressure (PCO_2)
- Decrease in fetal breathing movements throughout labor
- Decrease in fetal oxygen pressure with a decrease in the partial pressure of oxygen (PO_2) (Gardner et al., 2011)

Take Note!

Respiratory changes during labor help to prepare the fetus for extrauterine respiration immediately after birth.

STAGES OF LABOR

Labor is typically divided into four stages: dilation, expulsive, placental, and restorative. Table 13.2 summarizes the major events of each stage.

TABLE 13.2: STAGES AND PHASES OF LABOR

	First Stage	Second Stage	Third Stage	Fourth Stage
Description	From 0–10 cm dilation; consists of three phases	From complete dilation (10 cm) to birth of the newborn; may last up to 3 hr	Separation and delivery of the placenta; usually takes 5–10 min, but may take up to 30 min	1–4 hr after the birth of the newborn; time of maternal physiologic adjustment
Phases	**Latent phase** (0–3 cm dilation) – Cervical dilation from 0 to 3 cm – Cervical effacement from 0% to 40% – Nullipara, lasts up to 9 hr; multipara, lasts up to 5–6 hr – Contraction frequency every 5–10 min – Contraction duration 30–45 sec – Contraction intensity mild to palpation	**Pelvic phase** (period of fetal descent) **Perineal phase** (period of active pushing) – Nullipara, lasts up to 1 hr; multipara, lasts up to 30 min – Contraction frequency every 2–3 min or less – Contraction duration 60–90 sec – Contraction intensity strong by palpation – Strong urge to push during the later perineal phase	**Placental separation:** detaching from uterine wall **Placental expulsion:** coming outside the vaginal opening	

	First Stage	Second Stage	Third Stage	Fourth Stage
	Active phase (4–7 cm dilation) – Cervical dilation from 4 to 7 cm – Cervical effacement from 40% to 80% – Nullipara, lasts up to 6 hr; multipara, lasts up to 4 hr – Contraction frequency every 2–5 min – Contraction duration 45–60 sec – Contraction intensity moderate to palpation **Transition phase** (8–10 cm dilation) – Cervical dilation from 8 to 10 cm – Cervical effacement from 80% to 100%			

	First Stage	Second Stage	Third Stage	Fourth Stage
	– Nullipara lasts up to 1 hr; multipara, lasts up to 30 min – Contraction frequency every 1–2 min – Contraction duration 60–90 sec – Contraction intensity strong by palpation			

Adapted from Cheng, Y. W., & Caughey, A. B. (2011). Normal labor and delivery. *eMedicine*. Retrieved from http://emedicine.medscape.com/article/260036-overview; Cunningham, G., Gant, N. F., Leveno, K. J., Gilstrap, L. C., Hauth, J. C., & Wenstrom, K. D. (2010). *Williams' obstetrics* (23rd ed.). New York, NY: McGraw-Hill; Leonard, P. (2012). Childbirth education: A handbook for nurses. *Nursing Spectrum*. Retrieved from http://ce.nurse.com/60057/Childbirth-Education-A-Handbook-for-Nurses; and Mattson, S., & Smith, J. E. (2011). *Core curriculum for maternal–newborn nursing* (4th ed.). St. Louis, MO: Saunders Elsevier.

The first stage is the longest: it begins with the first true contraction and ends with full dilation (opening) of the cervix. Because this stage lasts so long, it is divided into three phases, each corresponding to the progressive dilation of the cervix.

Stage two of labor, or the expulsive stage, begins when the cervix is completely dilated and ends with the birth of the newborn. The expulsive stage can last from minutes to hours. The contractions typically occur every 2 to 3 minutes, lasting 60 to 90 seconds and are strong by palpation. The woman is usually intent on the work of pushing during this stage.

The third stage, or placental expulsion, starts after the newborn is born and ends with the separation and birth of the placenta. Continued uterine contractions typically cause the placenta to be expelled within 5 to 30 minutes. If the newborn is stable, bonding of infant and mother takes place during this stage through touching, holding, and skin-to-skin contact.

The fourth stage, or the restorative stage or immediate postpartum period, lasts from 1 to 4 hours after birth. This period is when the mother's body begins to stabilize after the hard work of labor and the loss of the products of conception. The fourth stage is often not

recognized as a true stage of labor, but it is a critical period for maternal physiologic transition as well as new family attachment. Close monitoring of both the mother and her newborn are done during this stage (Downe, 2010).

First Stage

During the first stage of labor, the fundamental change underlying the process is progressive dilation of the cervix. Cervical dilation is gauged subjectively by vaginal examination and is expressed in centimeters. The first stage ends when the cervix is dilated to 10 cm in diameter and is large enough to permit the passage of a fetal head of average size. The fetal membranes, or bag of waters, usually rupture during the first stage, but they may have burst earlier or may even remain intact until birth. For the primigravida, the first stage of labor lasts about 12 hours. However, this time can vary widely; for the multiparous woman, it is usually only half that.

During the first stage of labor, women usually perceive the visceral pain of diffuse abdominal cramping and uterine contractions. Pain during the first stage of labor is primarily a result of the dilation of the cervix and lower uterine segment, and the distention (stretching) of these structures during contractions. The first stage is divided into three phases: latent or early phase, active phase, and transition phase.

Latent or Early Phase

The latent or early phase gives rise to the familiar signs and symptoms of labor. This phase begins with the start of regular contractions and ends when rapid cervical dilation begins. Cervical effacement occurs during this phase, and the cervix dilates from 0 to 3 cm.

Contractions usually occur every 5 to 10 minutes, last 30 to 45 seconds, and are described as mild by palpation. Effacement of the cervix is from 0% to 40%. Most women are very talkative during this period, perceiving their contractions to be similar to menstrual cramps. Women may remain at home during this phase, contacting their health care professional about the onset of labor.

For the nulliparous woman, the latent phase typically lasts about 9 hours; in the multiparous woman, it lasts about 6 hours (Cheng & Caughey, 2011). During this phase, women are apprehensive but excited about the start of their labor after their long gestational period.

Think back to the couple who were sent home from the hospital birthing center. Three days later Kathy awoke with a wet sensation and intense discomfort in her back, spreading around to her abdomen. She decided to go for a walk, but her contractions didn't diminish. Instead, her contractions continued to occur every few minutes and grew stronger in intensity. She and Chuck decided to go back to the hospital birthing center. Was there a difference in the location of Kathy's discomfort this time? What changes will the admission nurse find in Kathy if this is true labor?

Active Phase

Cervical dilation begins to occur more rapidly during the active phase. The cervix usually dilates from 4 to 7 cm, with 40% to 80% effacement taking place. This phase can last up to 6 hours for the nulliparous woman and 4.5 hours for the multiparous woman (Mattson & Smith, 2011). The fetus descends farther in the pelvis. Contractions become more frequent (every 2 to 5 minutes) and increase in duration (45 to 60 seconds). The woman's discomfort intensifies (moderate to strong by palpation). She becomes more intense and inwardly focused, absorbed in the serious work of her labor. She limits interactions with those in the room. If she and her partner have attended childbirth education classes, she will begin to use the relaxation and paced breathing techniques that they learned to cope with the contractions. The typical dilation rate for the nulliparous woman is 1.2 cm/hour; for the multiparous woman, it is 1.5 cm/hour (Cunningham et al., 2010).

Transition Phase

The transition phase is the last phase of the first stage of labor. During this phase, dilation slows, progressing from 8 to 10 cm, with effacement from 80% to 100%. The transition phase is the most difficult and, fortunately, the shortest phase for the woman, lasting approximately 1 hour in the first birth and perhaps 15 to 30 minutes in successive births (Tharpe et al., 2013). During transition, the contractions are stronger (hard by palpation), more painful, more frequent (every 1 to 2 minutes), and they last longer (60 to 90 seconds). The average rate of fetal descent is 1 cm/hour in nulliparous women and 2 cm/hour in multiparous women. Pressure on the rectum is great, and there is a strong desire to contract the abdominal muscles and push.

Other maternal features during the transitional phase include nausea and vomiting, trembling extremities, backache, increased apprehension and irritability, restless movement, increased bloody show from the vagina, inability to relax, diaphoresis, feelings of loss of control, and being overwhelmed (the woman may say, "I can't take it anymore") (Cunningham et al., 2010).

In assessing Kathy, the nurse finds she is 4 cm dilated and 50% effaced with ruptured membranes. In what stage and phase of labor would this assessment finding place Kathy?

Second Stage

The second stage of labor begins with complete cervical dilation (10 cm) and effacement and ends with the birth of the newborn. Although the previous stage of labor primarily involved the thinning and opening of the cervix, this stage involves moving the fetus through the birth canal and out of the body. The cardinal movements of labor occur during the early phase of passive descent in the second stage of labor.

Contractions occur every 2 to 3 minutes, last 60 to 90 seconds, and are described as strong by palpation. The average length of the second stage of labor in a nullipara is approximately 1 hour and less than half that time for the multipara. During this expulsive stage, the mother usually feels more in control and less irritable and agitated. She is focused on the work of pushing.

There are two ways of directing the second stage of labor: spontaneous pushing and directed pushing. Spontaneous pushing represents a natural way of managing the second stage of labor;

however, lately, and as a result of epidural analgesia, health care professionals frequently resort to directed pushing without taking into account the negative repercussions it has on the woman and her fetus (Naranjo, Puertas, & Lopez, 2011).

Traditionally, women have been taught to hold their breath to the count of 10, inhale again, push again, and repeat the process several times during a contraction. This sustained, strenuous style of pushing has been
shown to lead to hemodynamic changes in the mother and interfere with oxygen exchange between the mother and the fetus. In addition, it is associated with pelvic floor damage: the longer the push, the more damage to the pelvic floor. Research does not support a policy of directed pushing, and some evidence suggests it may be harmful. Therefore, the practice of directed pushing should be abandoned (Cooke, 2010). The newest protocol from the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN, 2010) recommends an open-glottis method in which air is released during pushing to prevent the buildup of intrathoracic pressure. Doing so also supports mother's involuntary bearing-down efforts (James, 2011).

During the second stage of labor, pushing can either follow the mother's spontaneous urge or be directed by the caregiver. Evidence is mounting that the management of the second stage, particularly pushing, is a modifiable risk factor in long-term perinatal outcomes (Prins, Boxem, Lucas, & Hutton, 2011). Valsalva (holding breath) bearing down and supine maternal positions are linked to negative maternal–fetal hemodynamics and outcomes. Delaying pushing for up to 90 minutes after complete cervical dilation resulted in a significant decrease in the time mothers spent pushing without a significant increase in total time in second stage of labor. In clinical practice, health care providers sometimes resist delaying the onset of pushing after the second stage of labor has begun because of a belief that it will increase labor time. The adoption of a physiologic, woman-directed approach to bearing down is advocated (Kelly et al., 2010).

Evidence-based practice focuses on a physiologic approach to the second stage of labor. Behaviors demonstrated by laboring women during this time include pushing at the onset of the urge to bear down; using their own pattern and technique of bearing down in response to sensations they experience; using open-glottis bearing down with contractions; pushing with variations in strength and duration; pushing down with progressive intensity; and using multiple positions to increase progress and comfort. This approach is in stark contrast to management by arbitrary time limits and the directed bearing-down efforts seen in practice today (James, 2011).

Laboring down (promotion of passive descent) is an alternative strategy for second-stage management in women with epidurals. Using this approach, the fetus descends and is born without coached maternal pushing.

The second stage of labor has two phases (pelvic and perineal) related to the existence and quality of the maternal urge to push and to obstetric conditions related to fetal descent. The early phase of the second stage is called the pelvic phase, because it is during this phase that the fetal head is negotiating the pelvis, rotating, and advancing in descent. The later phase is called the perineal phase, because at this point the fetal head is lower in the pelvis and is distending the perineum. The occurrence of a strong urge to push characterizes the later

phase of the second stage and has also been called the phase of active pushing (Gilbert, 2011).

The later perineal phase occurs when the mother feels a tremendous urge to push as the fetal head is lowered and is distending the perineum. The perineum bulges and there is an increase in bloody show. The fetal head becomes apparent at the vaginal opening but disappears between contractions. When the top of the head no longer regresses between contractions, it is said to have crowned. The fetus rotates as it maneuvers out. The second stage commonly lasts up to 3 hours in a first labor and up to an hour in subsequent ones (**Fig. 13.13**).

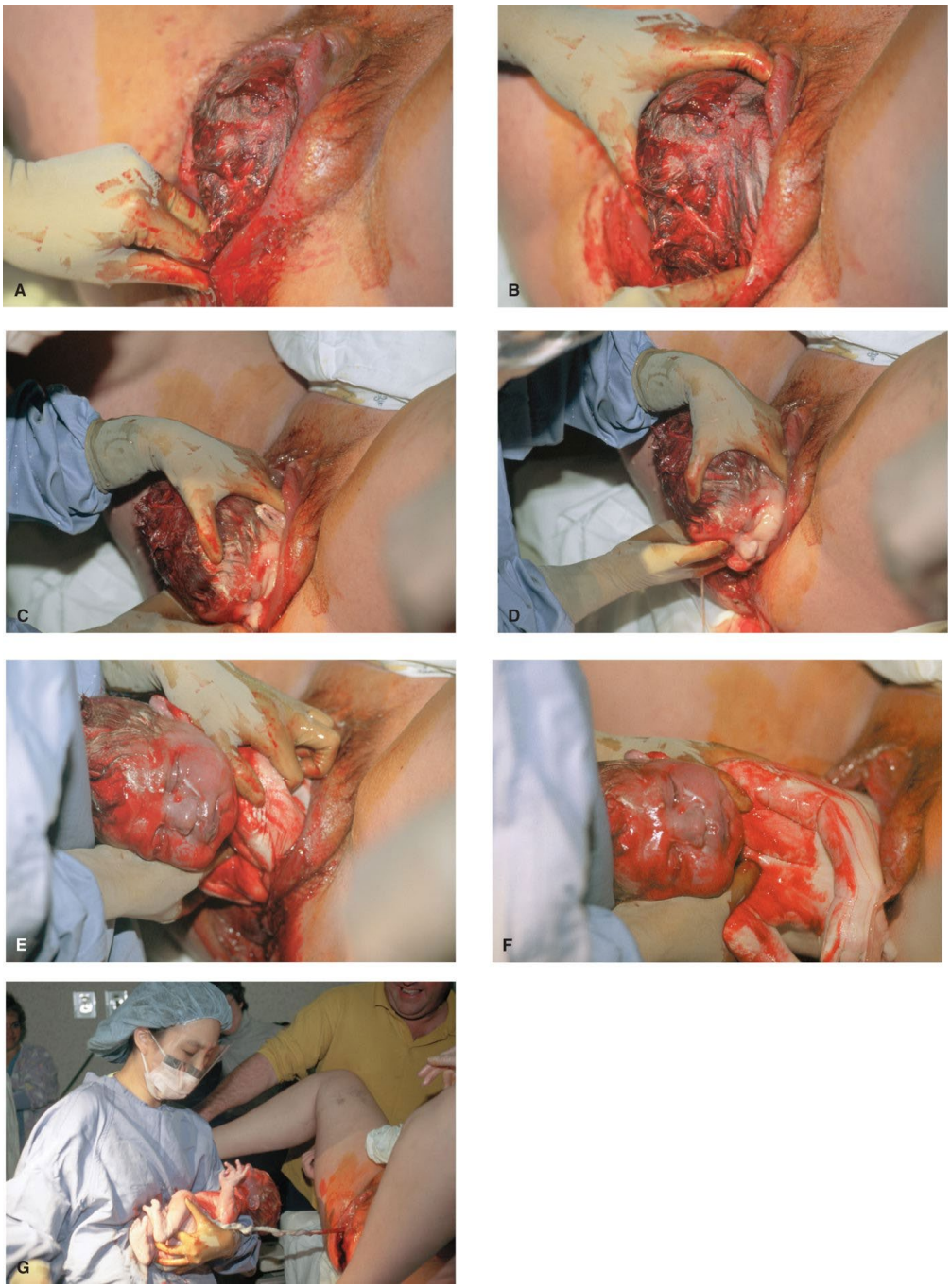


FIGURE 13.13

Birth sequence from crowning through birth of the newborn. (A) Early crowning of the fetal head. Notice the bulging of the perineum. (B) Late crowning. Notice that the fetal head is appearing face down. This is the normal OA position. (C) As the head extends, you can see that the occiput is to the mother's right side—ROA position. (D) The cardinal movement of extension. (E) The shoulders are born. Notice how the head has turned to line up with the shoulders—the cardinal movement of external rotation. (F) The body easily follows the shoulders. (G) The newborn is held for the first time. (© B. Proud.)

Third Stage

The third stage of labor begins with the birth of the newborn and ends with the separation and birth of the placenta. It consists of two phases: placental separation and placental expulsion.

Placental Separation

After the infant is born, the uterus continues to contract strongly and can now retract, decreasing markedly in size. These contractions cause the placenta to pull away from the uterine wall. The following signs of separation indicate that the placenta is ready to deliver:

- The uterus rises upward.
- The umbilical cord lengthens.
- A sudden trickle of blood is released from the vaginal opening.
- The uterus changes its shape to globular.

Spontaneous birth of the placenta occurs in one of two ways: the fetal side (shiny gray side) presenting first (called Schultz's mechanism or more commonly called "shiny Schultz's") or the maternal side (red raw side) presenting first (termed Duncan's mechanism or "dirty Duncan").

Placental Expulsion

After separation of the placenta from the uterine wall, continued uterine contractions cause the placenta to be expelled within 2 to 30 minutes unless there is gentle external traction to assist. After the placenta is expelled, the uterus is massaged briefly by the attending physician or midwife until it is firm so that uterine blood vessels constrict, minimizing the possibility of hemorrhage. Normal blood loss is approximately 500 mL for a vaginal birth and 1,000 mL for a cesarean birth (Schorn, 2010).

If the placenta does not spontaneously deliver, the health care professional assists with its removal by manual extraction. On expulsion, the placenta is inspected for its intactness by the health care professional and the nurse to make sure all sections are present. If any piece is still attached to the uterine wall, it places the woman at risk for postpartum hemorrhage because it becomes a space-occupying object that interferes with the ability of the uterus to contract fully and effectively.

Fourth Stage

The fourth stage begins with completion of the expulsion of the placenta and membranes and ends with the initial physiologic adjustment and stabilization of the mother (1 to 4 hours after birth). This stage initiates the postpartum period. The mother usually feels a sense of peace and excitement, is wide awake, and is very talkative initially. The attachment process begins with her inspecting her newborn and desiring to cuddle and breast-feed him or her. The mother's fundus should be firm and well contracted. Typically it is located at the midline between the umbilicus and the symphysis, but it then slowly rises to the level of the umbilicus during the first hour after birth (Mattson & Smith, 2011). If the

uterus becomes boggy, it is massaged to keep it firm. The lochia (vaginal discharge) is red, mixed with small clots, and of moderate flow. If the woman has had an episiotomy during the second stage of labor, it should be intact, with the edges approximated and clean and no redness or edema present.

The focus during this stage is to monitor the mother closely to prevent hemorrhage, bladder distention, and venous thrombosis. Usually the mother is thirsty and hungry during this time and may request food and drink. Her bladder is hypotonic and thus she has limited sensation to acknowledge a full bladder or to void. Vital signs, the amount and consistency of the vaginal discharge (lochia), and the uterine fundus are usually monitored every 15 minutes for at least 1 hour. The woman will be feeling cramp-like discomfort during this time due to the contracting uterus.

KEY CONCEPTS

- Labor is a complex, multifaceted interaction between the mother and fetus. Thus, it is difficult to determine exactly why labor begins and what initiates it.
- Before the onset of labor, a pregnant woman's body undergoes several changes in preparation for the birth of the newborn, often leading to characteristic signs and symptoms that suggest that labor is near. These changes include cervical changes, lightening, increased energy level, bloody show, Braxton Hicks contractions, and spontaneous rupture of membranes.
- False labor is a condition seen during the latter weeks of some pregnancies in which irregular uterine contractions are felt, but the cervix is not affected.
- The critical factors in labor and birth are designated as the 10 P's: passageway (birth canal), passenger (fetus and placenta), powers (contractions), position (maternal), psychological response, philosophy (low tech, high touch), partners (support caregivers), patience (natural timing), patient (client) preparation (childbirth knowledge base), and pain management (comfort measures).
- The size and shape of a woman's pelvis are determining factors for a vaginal birth. The female pelvis is classified according to four main shapes: gynecoid, anthropoid, android, and platypelloid.
- The labor process is comprised of a series of rhythmic, involuntary, usually quite uncomfortable uterine muscle contractions that bring about a shortening (effacement) and opening (dilation) of the cervix, and a bursting of the fetal membranes. Important parameters of uterine contractions are frequency, duration, and intensity.
- The diameters of the fetal skull vary considerably, with some diameters shortening and others lengthening as the head is molded during the labor and birth process.
- Pain during labor is a nearly universal experience for childbearing women. Having a strong sense of self and meaningful support from others can often help women manage labor well and reduce their sensation of pain.
- Preparing mentally for childbirth is important for women to enable them to work with the natural forces of labor and not against them.

- As the woman experiences and progresses through childbirth, numerous physiologic responses occur that assist her adaptation to the laboring process.
- Labor is typically divided into four stages that are unequal in length.
- During the first stage, the fundamental change underlying the process is progressive dilation of the cervix. It is further divided into three phases: latent phase, active phase, and transition.
- The second stage of labor is from complete cervical dilation (10 cm) and effacement through the birth of the infant.
- The third stage is that of separation and birth of the placenta. It consists of two phases: placental separation and placental expulsion.
- The fourth stage begins after the birth of the placenta and membranes and ends with the initial physiologic adjustment and stabilization of the mother (1 to 4 hours).