

Process of Normal Labor

Objectives

1. Define key terms listed.
2. Explain *labor*, *lightening*, *vaginal show*, *effacement*, and *cervical dilation*.
3. Recognize spontaneous rupture of membranes.
4. Interpret the events that signal approaching labor.
5. List the four main variables in the birth process.
6. Describe the ability of the uterine muscles to contract and relax.
7. Differentiate three distinctive characteristics of labor contractions.
8. Differentiate between false and true labor.
9. Illustrate how frequency, duration, and intensity of contractions are monitored.
10. Describe fetal attitude, fetal lie, and fetal presentation.
11. List the six positions that the occiput of the fetal head may occupy in relation to the maternal pelvis.
12. Describe the term *station* as it relates to the maternal pelvis.
13. Distinguish six factors that influence the course of labor.
14. Interpret what is accomplished in each of the four stages of labor.
15. Summarize the response of each body system to the labor process.

Key Terms

acme (p. 96)

Braxton Hicks contractions (p. 98)

crowning (p. 95)

decrement (DĚK-rē-měnt, p. 96)

dilation (dī-LĀ-shūn, p. 96)

duration of contraction (p. 98)

effacement (ě-FĀS-měnt, p. 96)

engagement (p. 95)

episiotomy (p. 102)

extension (p. 100)

external rotation (p. 100)

false labor (p. 99)

fetal attitude (p. 92)

fetal lie (p. 92)

fetal position (p. 93)

fetal presentation (p. 92)

floating (p. 95)

frequency of contraction (p. 96)

increment (ĪN-krē-měnt, p. 96)

intensity of contraction (p. 98)

internal rotation (p. 99)

labor (p. 91)

lightening (p. 98)

molding (p. 92)

show (p. 98)

station (p. 93)

The time of labor and birth, though short compared with the length of pregnancy, is perhaps the most dramatic and significant period of pregnancy for the expectant mother, newborn, and family. The process of labor and birth is a fairly predictable sequence of events that usually occurs in a manner that results in a healthy mother and baby.

THE PROCESS OF LABOR

The process by which the fetus, placenta, and amniotic membranes are expelled from the uterus is called **labor**. What initially causes labor to begin is not known, but it is thought to be a cascade of events. Changes in maternal hormone levels; stretching of the uterus by the

growing fetus; and an interaction between the placenta and the fetal pituitary, hypothalamus, and adrenal glands all contribute to the onset of labor. Although many people focus on the uterine contractions when they define labor, the process of labor is actually an interaction of four important variables, known as the “four Ps”: the *Passageway*, *Passenger*, *Powers*, and *Psyche*. These variables are discussed in this chapter. Other factors can influence the process of labor, including (Vande Vusse, 1999):

Preparation: Attendance at prenatal classes reduces fear of the unknown.

Position: Maternal preferences for horizontal, vertical, sitting, squatting, or side-lying positions may influence the progress of labor.

Professional help: A supportive nurse or doula (specially trained labor coach) can coach the woman through the labor process.

Procedures: The number of vaginal examinations and other invasive procedures can interrupt concentration and rapport during the labor process.

People: The presence of supportive partners or family members can influence the smooth progress of labor.

MAJOR VARIABLES IN THE BIRTH PROCESS

The four factors most significant in the process of labor include (1) **passageway** or pelvis (its size and shape), (2) **passenger** (fetus) size and position, (3) **powers** (effectiveness of contractions), and (4) **psyche** (preparation and previous experience). An ideal labor is one in which the woman's bony pelvis is adequate, the fetus is of average size, and the strength of the uterine contractions increases sufficiently to cause the cervix to fully efface and dilate. The woman's psyche—her ability to relax and concentrate on muscle groups and to maintain a low level of anxiety—also plays a role in the normal progress of her labor.

PELVIS

The anatomy of the pelvis and uterus is discussed in Chapter 2. The angles of the birth canal are downward, forward, and upward, somewhat similar to the letter *J*. The pelvic curve must be negotiated by the fetus during the birth process. If the pelvic anteroposterior (AP) diameter is shortened by the sacral promontory or narrowed by the transverse diameter from the protrusion of the ischial spines or by the presence of a narrow pubic arch, the fetus will have difficulty coming through the birth canal. A clinical estimation of the pelvic measurements is an important part of prenatal care to determine adequacy for the birth process. An x-ray pelvimetry (measurement of the pelvis) is rarely performed. Other methods of estimating pelvic size such as a vaginal examination are discussed in Chapter 2 (Gabbe, Niebyl, & Simpson, 2007).

PASSENGER

The passenger includes the fetus along with the placenta, membranes, and amniotic fluid.

Fetal Head

The fetal head is engineered to withstand the pressure of uterine contractions and descent through the birth canal. Great pressure is exerted on the fetal head during labor, and even stronger pressure is applied to the head after the rupture of membranes because the amniotic fluid no longer serves as a cushion between the fetal head and the bony pelvis.

Bony Skull of the Fetal Head

The fetal head is composed of several bones separated by strong connective tissue, called *sutures*. A wider area, called a *fontanelle*, is formed where the sutures meet. The following two fontanelles are important in obstetrics:

- The *anterior fontanelle*, a diamond-shaped area formed by the intersection of four sutures (frontal, sagittal, and two coronal)
- The *posterior fontanelle*, a tiny triangular depression formed by the intersection of three sutures (one sagittal and two lambdoid)

The sutures and fontanelles of the fetal head allow it to change shape as it passes through the pelvis (**molding**). The fontanelles are important landmarks in determining how the fetus is oriented within the mother's pelvis during birth.

The main transverse diameter of the fetal head is the *biparietal diameter*, which is measured between the points of the two parietal bones on each side of the head. The AP diameter of the fetal head can vary, depending on how much the head is flexed or extended (Figure 6-1).

Fetopelvic Relationship: Terminology

Some common terms are used in a special way to describe the fetopelvic relationship. It is important to know each term to understand the course of labor and birth.

Fetal Attitude. **Fetal attitude** is the relation of the fetal parts to one another. The normal attitude of the fetus is one of flexion. The fetus is flexed with head on chest, arms and legs folded, and legs drawn up onto the abdomen. Changes in fetal attitude, particularly in the extension of the head, cause the fetus to present a larger diameter of the fetal head to the maternal pelvis. Extension of the fetal head, especially full extension in which the chin or face presents, makes vaginal birth difficult and sometimes impossible (Figure 6-2).

Fetal Lie. **Fetal lie** is the relation of the longitudinal axis of the fetus to the longitudinal axis of the mother. The ideal is a parallel relation in which the long axes of the fetus and mother are the same. In rare instances the fetus lies crosswise in the uterus (transverse lie), which necessitates a cesarean birth.

Fetal Presentation. **Fetal presentation** is determined by the body part of the fetus that is lowest in the mother's pelvis (Figure 6-3). A cephalic, breech, or shoulder presentation may occur. Cephalic (head first) presentation is the most common, occurring in approximately 95% of all births, and labor most often proceeds normally. If the head is flexed, the position is referred to as a *vertex presentation*. Breech presentation occurs in approximately 3% of all births. In the breech

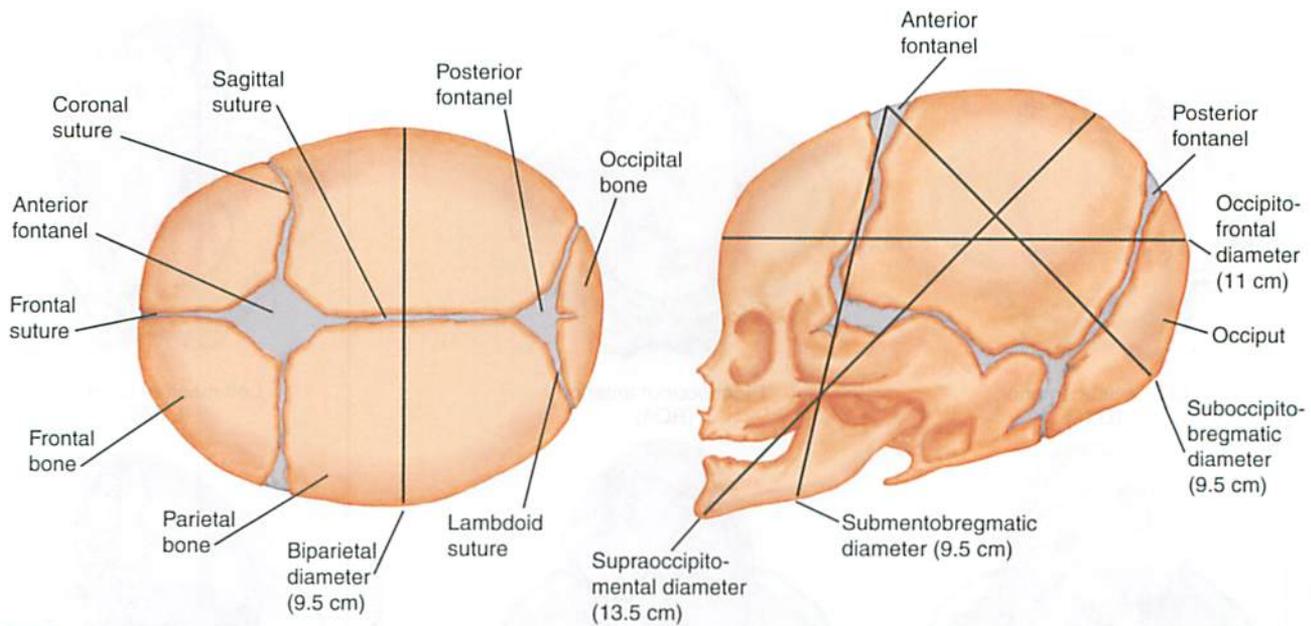


FIGURE 6-1 The fetal head with bones, sutures, and fontanelles. Note that the anterior fontanelle is diamond-shaped, whereas the posterior fontanelle is triangular.

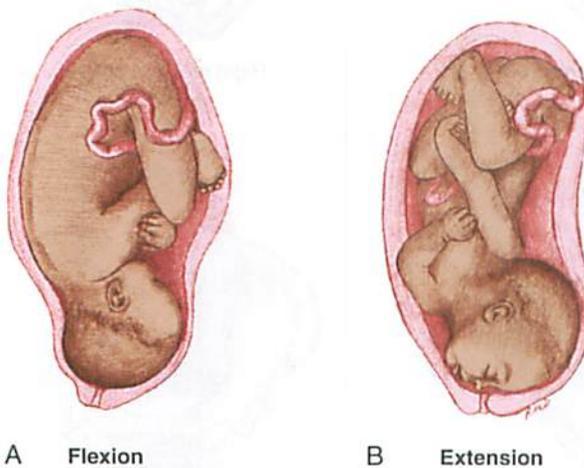


FIGURE 6-2 Attitude. **A**, Fetus is in the normal attitude of flexion, with the arms and legs flexed tightly against the trunk. **B**, Fetus is in an attitude of extension, which is abnormal. Face presentation is illustrated.

presentation, the presenting parts may be either the buttocks (complete or frank breech) or one or both feet (footling breech) (see Chapter 14). The rarest type of presentation is the transverse (or oblique), which occurs in approximately 1% of births. These are referred to as *malpresentations* and do not proceed normally.

Fetal Position. **Fetal position**, a more specific indication of the fetopelvic relationship, is the relation of some designated point on the presenting part to the four quadrants of the maternal pelvis: anterior, posterior, left side, and right side. If the reference point is directed toward the transverse diameter of the maternal

pelvis, it is referred to as a *transverse position*. The notations used to describe the fetal position are:

R or L: Right (R) or left (L) side of the maternal pelvis; correlates with the right or left side of the woman's body

O, S, or M: Designated point (landmark) of fetal presenting part: occiput (O), sacrum (S), or mentum (face) (M)

A or P: Location of the designated point to the anterior (A) (front toward symphysis pubis) or posterior (P) (back toward the sacrum) of the maternal pelvis or to the transverse diameter of the maternal pelvis (midway between symphysis and sacrum)

Anterior is recorded as *A*, posterior is recorded as *P*, and transverse is recorded as *T*. The abbreviations (notations) help the caregivers communicate the fetal position. If the back of the fetal head (occiput) is directed to the left of the woman's body and anteriorly toward the pubis, it is described as **LOA** (left occiput anterior). When the occiput is directed to the left of the woman's body and to the back toward the sacrum, it is **LOP**, and the labor is often longer with the woman experiencing more backache, which is often referred to as *back labor*. The left occiput anterior and right occiput anterior positions are the most common and facilitate a normal progression of labor. Abbreviations for fetal presentations are shown in Box 6-1.

Station. **Station** is the relation of the presenting part of the fetus to an imaginary line drawn between the ischial spines of the maternal pelvis (Figure 6-4). To

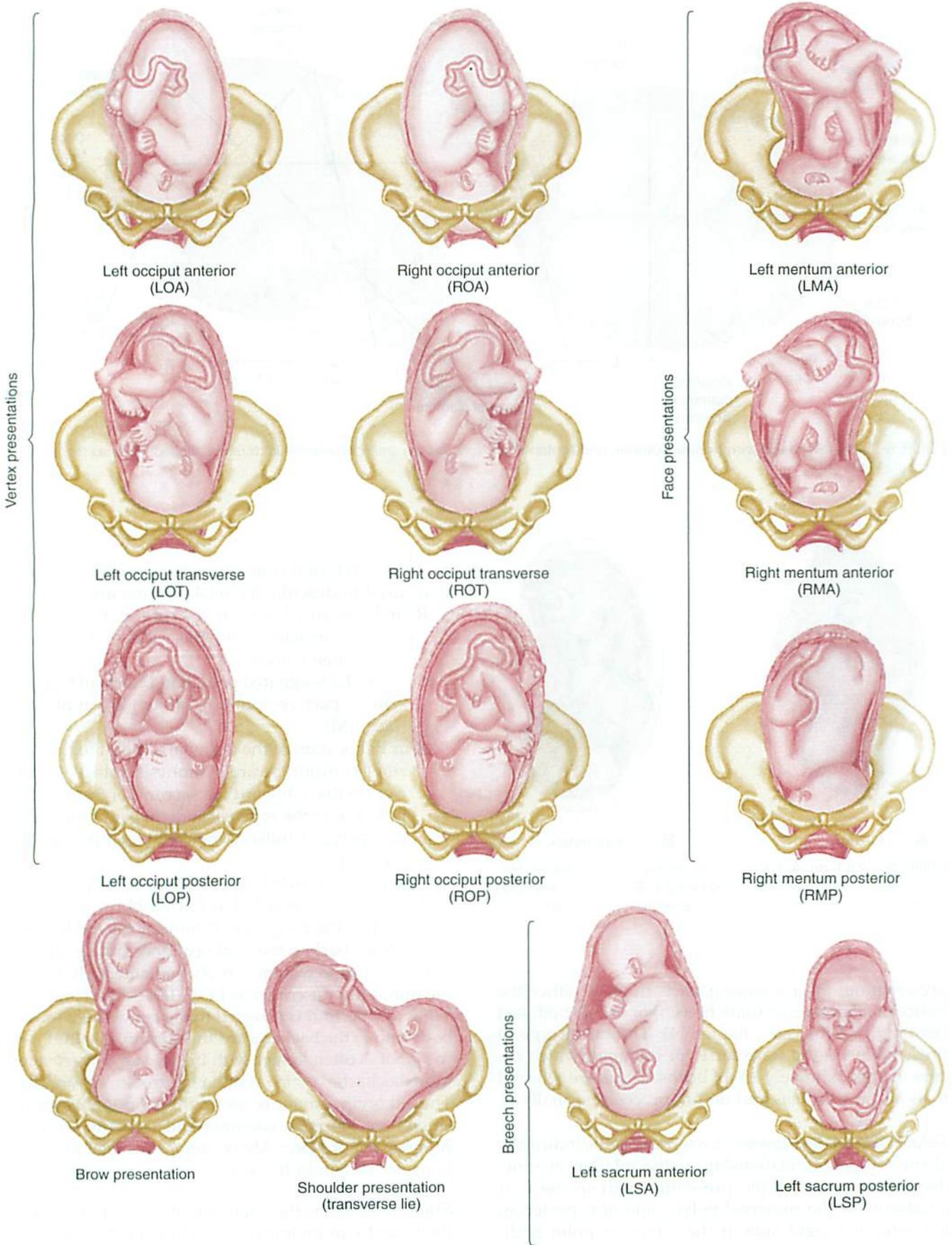


FIGURE 6-3 Various presentations.

Box 6-1 Classification of Fetal Presentations and Positions*

CEPHALIC PRESENTATIONS

Vertex

- LOA** Left occiput anterior
- ROA** Right occiput anterior
- ROT** Right occiput transverse
- LOT** Left occiput transverse
- OA** Occiput anterior
- OP** Occiput posterior

Face (Mentum)

- LMA** Left mentum anterior
- RMA** Right mentum anterior
- LMP** Left mentum posterior
- RMP** Right mentum posterior

BREECH PRESENTATIONS

- LSA** Left sacrum anterior
- RSA** Right sacrum anterior
- LSP** Left sacrum posterior
- RSP** Right sacrum posterior

*Abbreviations that designate brow (or military) and shoulder presentations are not included here because they occur infrequently.

put it simply, the station is how far the fetal presenting part has descended into the mother's pelvis. Station defines the progression of (usually) the fetal head down toward the pelvic floor. It is measured in centimeters above or below the ischial spines. When the presenting part is above the ischial spines, it is at minus station, with -5 at the inlet. When the presenting part is 1 or 2 cm below the spines, it is at the $+1$ or $+2$ station. Station $+5$ is at the outlet. When the presenting part is level with the spines, it is said to be at the 0 (zero)

station, and the head is referred to as *engaged*. This progress is significant because when **engagement** occurs, the widest biparietal diameter of the baby's head has entered the inlet (middle of pelvis). Before the head becomes engaged, it is said to be **floating**. When the station is $+2$ or $+3$, the mother's perineum begins to bulge.

Crowning takes place when the fetal head is forced against the pelvic floor and can be seen at the vaginal opening during contractions. During labor, the presenting part moves from the negative into the positive stations. Failure of the presenting part to descend in the presence of strong contractions may be caused by a disproportion between the maternal pelvis and the fetal presenting part. The movement of the presenting part downward toward the outlet of the pelvis occurs in the ninth month and is known as *lightening*. Engagement takes place when lightening occurs.

POWERS: UTERINE CONTRACTIONS

Understanding labor requires an understanding of the dramatic and unique physiology of the uterus. The uterine muscle (myometrium) is a smooth muscle that possesses the same properties as other smooth muscles in the body. Each muscle can contract and relax in a coordinated manner. Uterine contractions occur when uterine cells are stimulated to contract, and the stimulation spreads throughout the uterus. During labor, the contractions begin in the top of the uterus (fundus) and spread throughout the uterus in approximately 15 seconds. Because each contraction starts at the top, the nurse is able to ascertain the beginning of the contraction by placing her or his hands on the fundus.

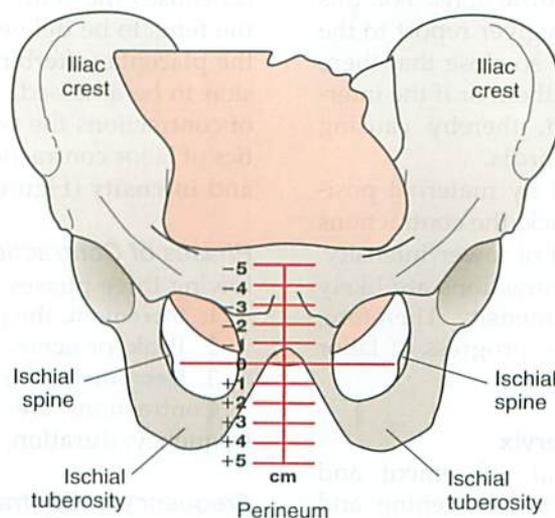


FIGURE 6-4 Stations of presenting part (degree of engagement). In this diagram, the presenting part has reached the $+1$ station. The lower pelvis, from the ischial spines to the pelvic floor, represents positive stations ($+1$, $+2$, $+3$), and the upper pelvis, from the inlet or pelvic brim to the ischial spines, represents negative stations (-3 , -2 , -1).

A unique property of the uterine muscle is its ability to retain some of the shortening achieved during the contraction. This ability is called *retraction* or **brachytaxis**. When the myometrium cells contract, the fibers of both the fundus and the body of the uterus shorten. When the contraction ends and the muscles relax, the fibers do not return to their original size but remain shorter than before the contraction. This continued shortening of the muscle fibers in the upper portion of the uterus results in a progressive decrease in the size of the uterine cavity and a thickening of the muscle tissue of the upper portion. These changes supply the force needed to advance the fetus. With less room at the top of the uterus, the fetus is forced to descend.

Uterine contractions are referred to as the *source of power* that brings about the birth of the fetus. Because these contractions cause discomfort, they are commonly called *labor pains*. The amount of discomfort produced by the contractions varies with the intensity of the contraction and the woman's tolerance of discomfort (her psyche). During labor, the woman may first perceive the contractions as back discomfort. The discomfort then radiates to the front of the abdomen.

The Uterine (Labor) Contraction

Each contraction is followed by a period of **relaxation**, the interval between contractions. This period is significant to the mother and fetus. During the contraction, there is decreased blood flow through the uterine arteries and intervillous spaces. This decline in blood flow lowers the fetal heart rate. If the mother is being observed by electronic fetal monitor, the decrease in fetal heart rate during contractions is carefully assessed (see Chapter 7). If the contractions become more frequent and prolonged, the decrease in blood flow can be cumulative and compromise the fetus. In other words, the fetus receives a decreased oxygen supply and experiences stress during contractions. For this reason, it is important that the caregiver report to the physician if labor contractions are so close that there are no relaxation periods between them or if the intervals are progressively shortened, thereby causing significant patterns of fetal bradycardia.

Labor contractions are affected by maternal position. When a woman lies on her back, the contractions are likely to be more frequent but of lower intensity. When she lies on her side, the contractions are likely to be less frequent but of greater intensity. Therefore, a side-lying position improves the progress of labor and improves oxygenation to the fetus.

Effect of Contractions on the Cervix

Cervical changes include cervical effacement and dilation. Cervical **effacement** is the shortening and thinning of the cervix. Normally, the cervix is 2 cm (0.8 inches) in length. When effacement is complete (100%), the cervix has almost disappeared (Figure 6-5).

Cervical **dilation** is the enlargement of the cervical opening (os) from 0 to 10 cm (complete dilation). Both cervical effacement and dilation are measured by a vaginal examination. If the cervix is beginning to dilate or is thinned, the onset of labor is near. Dilation of 4 cm is significant because, at this point, the woman's active labor usually progresses to completion.

Contractions cause the cervix to efface (thin) and dilate (open) to allow the fetus to descend in the birth canal. Before labor begins, the cervix is a tubular structure about 2 cm (0.8 inch) long. Contractions simultaneously push the fetus downward as they pull the cervix upward (an action similar to pushing a ball out of the cuff of a sock). This causes the cervix to become thinner and shorter. Effacement is determined by a vaginal examination and is described as a percentage of the original cervical length. When the cervix is 100% effaced, it feels like a thin, slick membrane over the fetus.

Dilation of the cervix is also determined during a vaginal examination. Dilation is described in centimeters, with full dilation being 10 cm. Both the dilation and effacement are estimated by touch rather than being precisely measured.

When the cervix is fully dilated (second stage of labor), the woman often uses her abdominal muscles to superimpose intraabdominal pressure on the contraction pressure. The bearing-down effort with the abdominal muscles is consciously controlled and is of great assistance in the final push to expel the fetus. It is important that someone (the nurse or significant other) coach the woman in her bearing-down effort during labor contractions.

Characteristics of Uterine (Labor) Contractions

Uterine contractions are the important source of power that (1) produces cervical effacement and dilation, (2) causes the fetus to engage and rotate, (3) causes the fetus to be delivered, and (4) detaches and expels the placenta (afterbirth). Therefore, for labor progression to be assessed, it is important to know the type of contractions the woman is having. The characteristics of labor contractions include **frequency**, **duration**, and **intensity** (Figure 6-6).

Phases of Contractions. Each contraction has the following three phases:

1. **Increment**, the period of increasing strength
2. **Peak**, or **acme**, the period of greatest strength
3. **Decrement**, the period of decreasing strength

Contractions are also described by their average frequency, duration, intensity, and interval.

Frequency of Contraction. **Frequency of contraction** is the elapsed time from the beginning of one contraction until the beginning of the next contraction. Frequency is described in minutes and fractions of minutes,

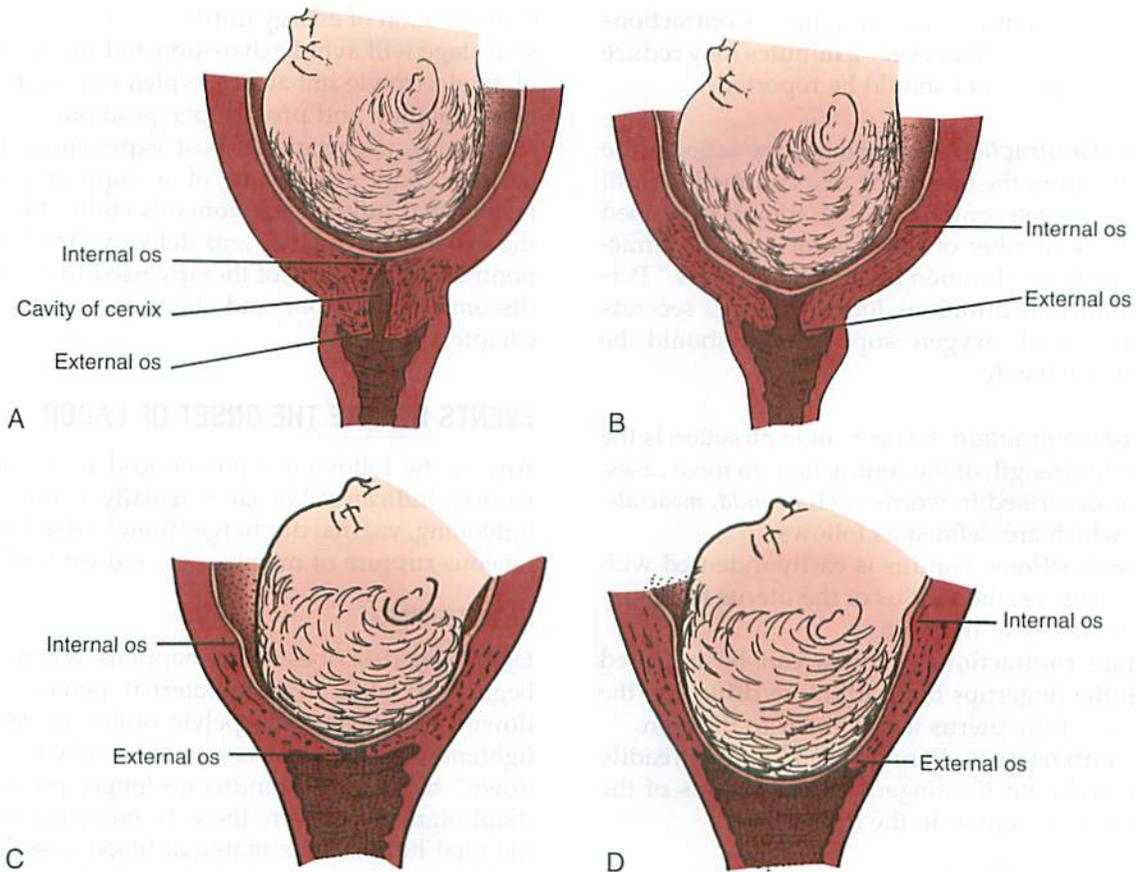


FIGURE 6-5 Cervical effacement and dilation. A, Before labor. B, Beginning effacement (dilation 2 cm). C, Complete effacement (100%). D, Complete dilation (10 cm).

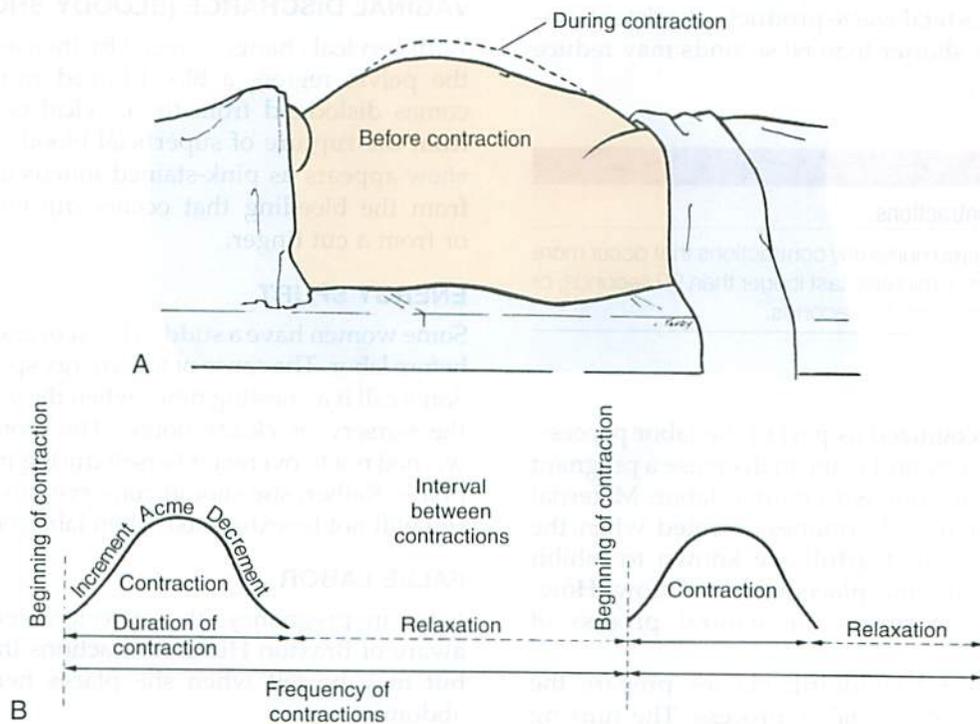


FIGURE 6-6 A, Changes in abdominal contour before and during uterine contraction. **B,** Assessment of frequency, duration, and intensity of uterine contractions during labor.

such as “contractions every 4½ minutes.” Contractions occurring more often than every 2 minutes may reduce fetal oxygen supply and should be reported.

Duration of Contraction. **Duration of contraction** is the elapsed time from the beginning of a contraction until the end of the same contraction. Duration is described as the average number of seconds for which contractions last, such as “duration of 45 to 50 seconds.” Persistent contraction durations longer than 90 seconds may reduce fetal oxygen supply and should be reported immediately.

Intensity of Contraction. **Intensity of contraction** is the approximate strength of the contraction. In most cases, intensity is described in words such as *mild*, *moderate*, or *strong*, which are defined as follows:

Mild contractions: Fundus is easily indented with the fingertips; the fundus of the uterus feels similar to the tip of the nose.

Moderate contractions: Fundus can be indented with the fingertips but with more difficulty; the fundus of the uterus feels similar to the chin.

Firm contractions: Fundus cannot be readily indented with the fingertips; the fundus of the uterus feels similar to the forehead.

Interval. The interval is the amount of time the uterus relaxes between contractions. Blood flow from the mother into the placenta gradually decreases during contractions and resumes during each interval. The placenta refills with freshly oxygenated blood for the fetus and removes fetal waste products. Persistent contraction intervals shorter than 60 seconds may reduce fetal oxygen supply.

Safety Alert

When to Report Contractions

Report to the registered nurse any contractions that occur more frequently than every 2 minutes, last longer than 90 seconds, or have intervals shorter than 60 seconds.

PSYCHE

The psyche is recognized as part of the labor process. For example, anxiety and fear can decrease a pregnant woman’s ability to cope with pain in labor. Maternal catecholamines (stress hormones secreted when the woman is anxious or fearful) are known to inhibit uterine contractility and placental blood flow. However, relaxation augments the natural process of labor.

Prenatal care and childbirth classes prepare the mother to cope with the labor process. The nursing responsibilities during labor include the use of strategies to reduce anxiety and promote relaxation.

Conservation of energy until it is needed in the expulsion stage will avoid exhaustion and the development of an electrolyte imbalance, which can occur with hyperventilation and profuse perspiration.

Culture, expectations, past experiences, language barriers, and availability of a support person are factors that influence a woman’s ability to cope with the experience of labor and delivery. Traditional and nontraditional forms of therapy used to deal with the discomforts of labor and delivery are discussed in Chapters 8 and 21.

EVENTS BEFORE THE ONSET OF LABOR

Any of the following signs noticed by the expectant woman indicates that labor usually is not far away: lightening, vaginal discharge (show), false labor, spontaneous rupture of membranes, and cervical changes.

LIGHTENING

Lightening describes what happens when the fetus begins to settle in the maternal pelvis and move downward toward the pelvic outlet. In referring to lightening, some women say, “The baby has dropped down” because the fundus no longer presses on the diaphragm. However, there is more pressure from the fetal head on the maternal blood vessels, nerves, and bladder. The physical changes that occur in the mother as a result of lightening include (1) easier breathing, (2) more frequent urination, (3) leg cramps, and (4) edema of the lower extremities.

VAGINAL DISCHARGE (BLOODY SHOW)

With cervical changes caused by increased pressure in the pelvic region, a blood-tinged mucous plug becomes dislodged from the cervical os. The blood is from the rupture of superficial blood vessels. **Bloody show** appears as pink-stained mucus and is different from the bleeding that occurs during menstruation or from a cut finger.

ENERGY SPURT

Some women have a sudden burst of energy 1 or 2 days before labor. The cause of this energy spurt is unknown. Some call it a “nesting time” when the woman prepares the nursery or cleans house. The woman should be warned not to overexert herself during this high-energy phase. Rather, she should conserve this energy so that she will not be exhausted when labor begins.

FALSE LABOR

Later in pregnancy, the expectant mother becomes aware of Braxton Hicks contractions that are painless but may be felt when she places her hand on her abdomen.

Braxton Hicks contractions are irregular contractions that begin during early pregnancy and are rarely

perceived by the pregnant woman. They may intensify as term approaches. When the woman becomes more aware of and sensitive to the Braxton Hicks contractions, she may believe that labor has started (see the discussion of true and false labor later in the chapter). Although Braxton Hicks contractions are often called *false labor*, they do play a part in preparing the cervix to dilate and in adjusting the fetal position within the uterus.

Uterine activity increases during the last 2 to 3 weeks of pregnancy, but the contractions remain uncoordinated and irregular. These contractions help demarcate the uterus into the upper segment (the muscular, contractile portion) and the lower segment, which is relaxed.

If the woman is near term and the contractions are uncomfortable, the woman may come to the hospital. If the cervix has not dilated and the contractions remain irregular or stop, the condition is called **false labor**, or prodromal labor. The conclusive difference between true labor and false labor is **cervical change** such as dilation, which occurs with true labor (Table 6-1). False labor has no clinical significance except that it causes maternal anxiety and premature admission to the hospital. The experience may be disappointing and embarrassing to the woman and her family.

SPONTANEOUS RUPTURE OF MEMBRANES

Spontaneous rupture of the amniotic membranes (SROM) occasionally occurs before labor begins. SROM is what women mean when they say, "My water broke." At term, it is not unusual for women to go into

labor within 24 hours after SROM. If labor does not begin within 24 hours, it is often induced because of the risk of infection because of the open passageway into the uterus. The induction of labor by artificially rupturing the membranes is not done until the pregnancy is near term. When the membranes rupture, there is a danger of a prolapsed cord if the fetal head has not settled in the pelvis (the umbilical cord can descend along with the discharge of amniotic fluid). Initially, there can be either a trickle or a rush of fluid. For SROM to be differentiated from urine or vaginal fluid, a Nitrazine paper test is used to determine the pH of the fluid. Amniotic fluid is slightly alkaline (which turns the paper blue), whereas urine is generally acidic. When the amniotic membranes are artificially ruptured, it is referred to as AROM; PROM refers to **premature** rupture of the membranes.

LABOR

MECHANISMS OF LABOR

The mechanisms (cardinal movements) of labor are a series of movements that reflect changes in the fetus's posture as it adapts to the birth canal. Most of the changes in posture take place during the second stage of labor; however, descent and some flexion may take place earlier.

The posture changes (mechanisms of labor) are dictated by the pelvic diameters, maternal soft tissues, the size of the fetus, and the strength of contractions. The fetus must turn and twist to locate the easiest path. In essence, labor proceeds along the path of least resistance through the adaptation of the smallest achievable fetal dimensions to the contour of the maternal pelvis. The mechanisms of labor are the series of adaptive movements of the fetal head and shoulders and include (1) engagement and descent, (2) flexion, (3) internal rotation, (4) extension, (5) external rotation, and (6) expulsion (Figure 6-7).

Descent cannot be isolated from the other adaptive movements because it occurs throughout the labor process. As the head moves toward the pelvic inlet, it is described as floating.

Engagement occurs when the biparietal diameter of the fetal head reaches the level of the ischial spine of the mother's pelvis (presenting part is at a 0 station or lower). This descent may occur before or after labor begins and is caused by the pressure of contractions and of the amniotic fluid.

Flexion occurs as the fetal head descends. The head flexes so that the chin rests on the chest. Flexion enables the smallest fetal diameter to enter the maternal birth canal. It normally occurs when the fetal head meets resistance from the pelvis and soft tissues of the pelvic floor.

Internal rotation occurs as the fetal head rotates from the transverse position to the anterior position,

Table 6-1 Comparison of True Labor and False Labor

CHARACTERISTIC	TRUE LABOR	FALSE LABOR
Show (pinkish mucus)	Usually present; increases as the cervix changes	None present
Contractions	Regular with increases in intensity and duration	Irregular; no change in frequency and intensity
Discomfort	Often begins in lumbar region and then is felt in abdomen	Often located in abdomen
Activity	Contractions often intensified by activity (walking)	Contractions often lessened by walking
Cervical changes*	Effacement and progressive dilation of cervix	No cervical changes

*The most distinguishing characteristics between true and false labors are the cervical changes that occur in true labor.

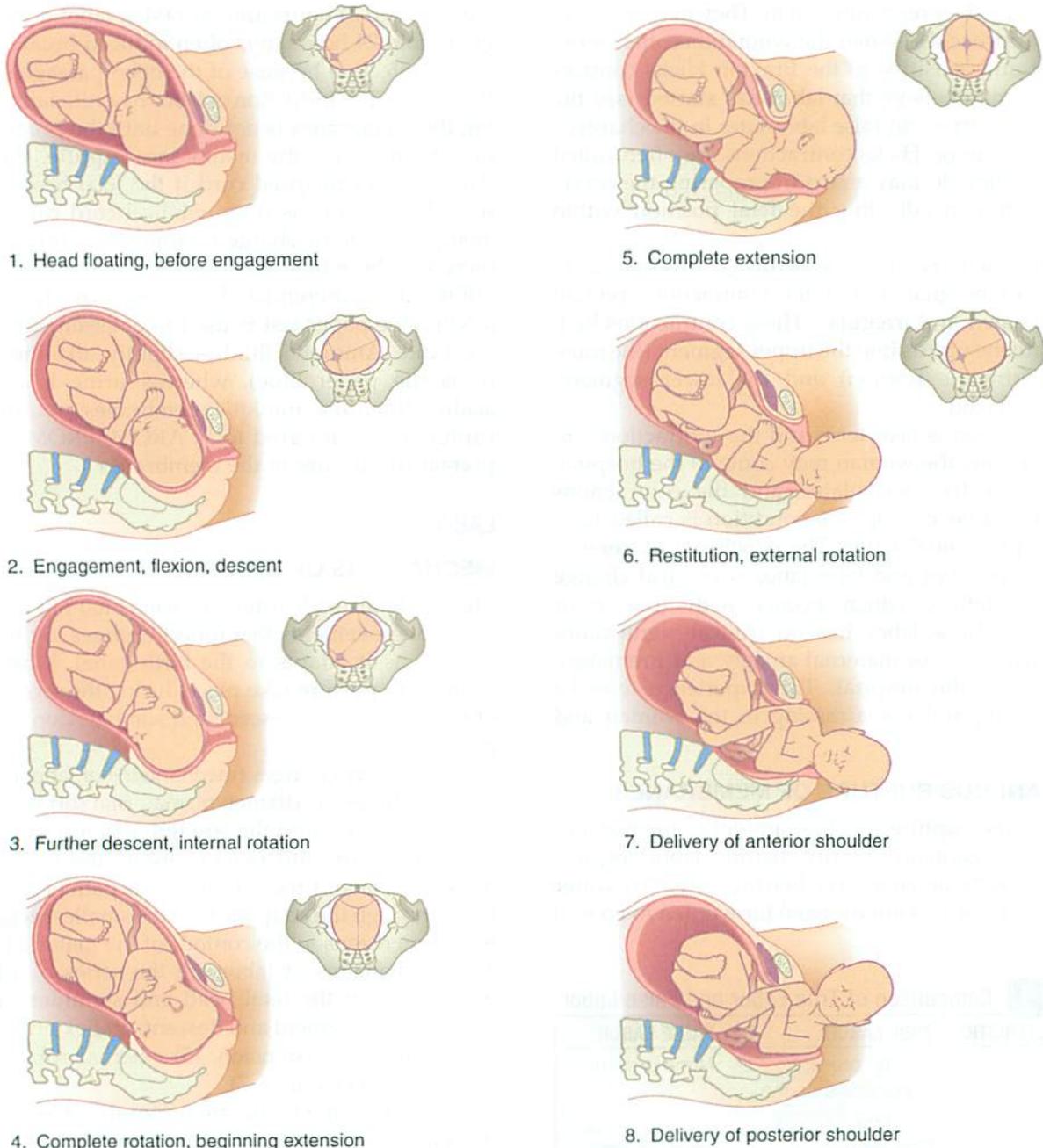


FIGURE 6-7 Mechanisms of normal labor in a left occipitoanterior vertex position. 1, Head floating before engagement; 2, engagement, flexion, and descent occur as the head moves toward the pelvic inlet; descent continues; 3, descent and internal rotation to occiput anterior (OA) position; 4, complete rotation and beginning extension as the head reaches the pelvic floor; 5, the head is born by complete extension; 6, restitution and external rotation, returning to left OA (LOA) position and alignment with the shoulders; 7, delivery of the anterior shoulder; 8, with delivery of the posterior shoulder, expulsion occurs as the body of the baby is rapidly born.

aligning itself with the AP diameter of the maternal pelvis. Pressure from the pelvic floor encourages the fetal head to rotate anteriorly and rest beneath the symphysis pubis.

Extension begins as the fetal head reaches the pelvic floor, at which point it pivots under the symphysis pubis and advances upward. This results from a combination of pressure from the uterine contractions, abdominal pressure exerted by the mother's pushing, and resistance

from the pelvic floor. As extension occurs, the occiput appears at the vaginal opening (crowning), followed by the forehead, nose, mouth, and chin. Extension is complete when the entire head is born.

External rotation, often called restitution, occurs after the head is delivered. The head immediately rotates back to the transverse position to be in alignment with the shoulders, and then the shoulders align themselves to the AP diameter of the pelvic outlet.

Expulsion usually proceeds as follows. First, the anterior shoulder rotates forward under the symphysis pubis and is delivered, followed by delivery of the posterior shoulder; then the delivery of the rest of the baby's body is rapid. The expulsion, or birth of the fetus, ends the second stage of labor.

Placental expulsion, or delivery of the afterbirth, is not one of the mechanisms of labor but normally occurs between 5 and 30 minutes after the birth of the baby. The uterus begins to contract, reducing its size, immediately after the birth of the baby, and the placenta is sheared off from the endometrium (lining of the uterus). Signs of placental separation are (1) lengthening of the cord, (2) change in the shape of the uterus, and (3) a trickle or gush of blood from the vagina. If the dull (maternal) side of the placenta appears first, it is referred to as a **Duncan mechanism**; if the shiny (fetal) side appears first, it is referred to as a **Schultze mechanism** (see Figure 7-15). Periodic studies have not shown any significant differences between the two mechanisms. Placentas implanted low in the uterus are usually delivered by the Duncan mechanism. Placentas implanted near the fundus of the uterus are usually delivered by the Schultze mechanism. The delivery of the placenta ends the third stage of labor.

THE FOUR STAGES OF LABOR

Labor is divided into four stages. Each stage has its own changes that set it apart from the others. The powers of labor and variables mentioned earlier that influence the course of labor should be considered in the assessment of each stage.

First Stage

The first stage of labor is the longest and most variable stage. The first stage begins with the onset of regular contractions and is complete when the cervix is fully dilated and effaced. The first stage is referred to as the **stage of dilation and effacement**. The contractions bring about two important changes in the cervix: (1) complete effacement of the cervical canal (100%) and (2) complete dilation of the cervix (10 cm).

The first stage of labor is divided into **latent**, **active**, and **transition** phases, each characterized by certain physical and psychological changes. The first stage of labor may last from 8 to 20 hours in the primipara and 5 to 14 hours in the multipara.

Latent Phase. The latent phase is the early, slow part of labor, which begins with the onset of regular contractions and lasts until the cervix has dilated to at least 4 cm. During this phase, the contractions become stabilized and are usually mild. They occur every 10 to 15 minutes and last approximately 15 to 20 seconds. At this point, the woman feels that she is able to cope with discomfort. She is often talkative and smiling and relieved that labor has finally started. She is

encouraged to be out of bed, watching TV, or talking with her partner. This is a good time to ask the woman whether she has any questions about what to expect and, if she is anxious, to teach her some of the relaxation techniques. At this time, she is able to focus clearly on what is being taught.

Active Phase. The active phase causes the woman different degrees of discomfort. The contractions are stronger and last longer, with the result that cervical dilation progresses from 4 to 7 cm. Fetal descent proceeds. The duration of contractions increases to 30 to 45 seconds. They occur approximately 5 minutes apart and are of moderate to strong intensity. During this phase, the woman can be assisted in her breathing techniques and relaxation. She may continue to walk until she is uncomfortable or until her amniotic membranes rupture. As her contractions increase, her anxiety and discomfort increase. She may begin to doubt her ability to cope with the labor contractions.

Transition Phase. The transition phase is the last part of the first stage. Cervical dilation continues at a slower rate but becomes complete (8 to 10 cm). The contractions are now more frequent, last longer (60 to 90 seconds), and are stronger. During this phase, the woman may exhibit the decreased ability to cope with her contractions and pain. The woman often becomes very restless, frequently changing positions and feeling as if she has been abandoned. It is crucial that the nurse stay with the woman at this time as a backup or relief for the support person. The woman often needs to be reminded of how to relax and focus or refocus with each contraction. She may also become irritable and not want to be touched during her contractions (Box 6-2). The woman often fears losing control and is completely self-focused.

Box 6-2 Characteristics of the Transition Phase

- Restlessness
- Sense of bewilderment and sometimes anger
- Statements that she "cannot continue" or "can't take it"
- Difficulty in following directions; need for instruction with each contraction
- Requests for medication to ease the pain
- Hyperventilation caused by increased breathing rate
- Perspiration on face
- Belching or hiccupping
- Nausea and vomiting
- Increasing rectal pressure; statements that she has to have a bowel movement
- Feelings of warmth; throwing off covers (exposure may embarrass partner)
- Irritability
- Contractions often only 1 to 2 minutes apart and last up to 90 seconds

The woman may feel a splitting sensation by the force of the contractions and pressure of the fetal head near the opening of the cervix. As the fetal head descends, she likely will feel the urge to push because of the pressure from the fetal head on the sacral nerves. As she pushes, her abdominal muscles exert additional pressure, which helps the fetal head descend. As the fetal head continues its descent, the perineum begins to bulge and flatten, and soon the fetal head can be seen at the vaginal opening. The first stage of labor ends when the cervix is completely dilated and effaced.

Second Stage

The second stage of labor (**stage of expulsion**) begins when the cervix is completely dilated (10 cm) and ends with the birth of the baby. At this time, the woman usually feels the urge to bear down (as if she has to have a bowel movement). She may now use her abdominal muscles to assist the involuntary uterine contractions as a force to cause the descent of the baby. She should be coached not to hold her breath more than 5 seconds at a time when she pushes. Prolonged breath holding may trigger Valsalva's maneuver, which results from the closing of the glottis, thereby increasing intrathoracic and cardiovascular pressure. This can diminish the perfusion of oxygen across the placenta and result in fetal hypoxia and abnormalities in the fetal heart rate. An open-glottis method should be used in which air is released through the mouth during pushing. This method avoids the intrathoracic buildup of pressure.

The second stage generally lasts from a few minutes to 2 hours. Descent of the fetal head causes bulging of the perineum. Crowning occurs when the fetal head is seen in the external opening of the vagina. Between contractions, the fetal head appears to recede. With succeeding contractions and the woman pushing, the birth is imminent. The uterine contractions are forceful but now are usually only every 2 to 3 minutes in frequency and last 60 to 90 seconds. There usually is an increase in bloody show.

As the fetal head reaches the perineal floor, it appears at the vaginal opening. To prevent laceration, the physician or midwife may perform an **episiotomy** (a midline or mediolateral incision in the perineum). An episiotomy may also be done to shorten the second stage. An episiotomy is not routine but is used when indicated. The physician or midwife supports the fetal head as it delivers and rotates, either to the left or to the right; the mouth and then nose of the baby are suctioned as they

appear. When the head is delivered, a quick check is made to ensure that the umbilical cord is not around the baby's neck (nuchal cord). After the head rotates to align the occiput with the baby's back, the shoulders and the rest of the baby's body is delivered. After the second stage of labor ends with the birth of the baby, the woman usually is relieved.

Third Stage

The third stage of labor is referred to as the **placental separation stage**. It begins with the birth of the baby and ends with the expulsion of the placenta. This process can last up to 30 minutes, with an average length of 5 to 10 minutes. After the birth of the fetus, the umbilical cord is clamped in two places and cut between the two clamps. The mouth and nose of the baby may be suctioned again to clear them of mucus (see Chapter 7). An oxytocin drug (commonly Pitocin) may be given to the woman to keep the uterus firm and lessen the maternal blood loss immediately after the placenta has been delivered.

Fourth Stage

The fourth stage of labor (**stage of recovery**) begins with the delivery of the placenta and lasts through the first 1 to 4 hours or until the mother's vital signs are stable. Major readjustments of the mother's body occur. Blood loss can range from 250 to 500 mL, which can cause the blood pressure to drop and the pulse rate to increase. The uterine muscles must stay contracted to compress the open blood vessels at the placental site and minimize blood loss. The uterus is palpable as a firm rounded mass at or below the level of the umbilicus. For the first hour after delivery, it is critical to observe the mother for excessive bleeding and assess the firmness of the contracting uterus.

The mother may feel thirsty and hungry, and she may experience a shaking chill. Nursing care is discussed in Chapter 7. The mother is interested in touching and holding her baby, and she should be encouraged to begin the mother-infant attachment process. Family bonding and the initiation of breastfeeding are an important part of the fourth stage of labor.

PHYSIOLOGIC CHANGES IN LABOR

Labor can affect all systems in the body. The major changes that occur in the various body systems in response to labor are shown in Table 6-2.

Table 6-2 Physiologic Changes in Labor and Nursing Interventions

PHYSIOLOGY	CLINICAL SYMPTOMS	NURSING INTERVENTIONS
Cardiovascular System		
Uterine contractions release 400 mL of blood into vascular system, causing increase in cardiac output.	BP increases by 10 mm Hg; pulse rate slows.	Assess BP between contractions. Assess level of consciousness.
Ascending vena cava and descending aorta are compressed by weight of uterus.	Supine hypotension can occur.	Have woman avoid lying on back; encourage left side-lying position.
Holding the breath and forceful pushing increase intrathoracic pressure and reduce venous return and can cause fetal hypoxia.	Forceful rather than spontaneous pushing (Valsalva's maneuver) causes redness of face, increase in BP, slowing of pulse rate.	Encourage open-glottis pushing and discourage forceful pushing during second stage.
WBC count increases to 25,000/mm ³ .	Increase in WBC count is not related to infection.	Correct interpretation of laboratory results intrapartum and postpartum is important.
Alterations in the fetal heart rate and rhythm may occur in response to contraction patterns.	The normal fetal heart rate is 110-160 beats/minute.	Monitor fetal heart rate frequently. Time the frequency and duration of contractions.
Respiratory System		
Increased physical activity of labor increases oxygen consumption. Anxiety can also increase oxygen consumption.	Respiratory rate increases.	Encourage relaxation between contractions.
Paced breathing techniques can prevent the development of respiratory alkalosis.	Tingling of the hands and feet, dizziness, or numbness may indicate hyperventilation, which can cause respiratory alkalosis.	Coach the laboring woman in breathing techniques.
Renal System (Kidneys)		
Breakdown in muscle tissue resulting from work of labor can cause proteinuria.	A full bladder may be palpable above the symphysis pubis.	Palpate above symphysis to detect a full bladder. Encourage voiding every 2 hours; catheterize if bladder is distended and if the woman is unable to void.
Full bladder can be obstructed by full uterus and fetal head.	Spontaneous voiding may occur during contractions.	Do not confuse spontaneous urination with rupture of bag of waters. Nitrazine paper can detect whether fluid discharge is urine or amniotic fluid.
Musculoskeletal System		
Muscle activity increases during labor. Increased joint laxity can cause backaches.	Diaphoresis, fatigue, and increased temperature may occur.	Observe for diaphoresis, fatigue, and increased temperature. Encourage rest between contractions. Use comfort measures for diaphoresis and positioning for back and joint pain.
Neurologic System		
Euphoria changes to self-centeredness as labor progresses. Amnesia during second stage is common, and fatigue and elation occur in third and fourth stages. Endorphins produce natural, general sedation, whereas ischemia of perineal tissues by pressure of presenting part causes decrease in perception of perineal pain.	Behavior of patient may change during each stage of labor.	Provide support and acceptance of behavior. Allow sleep whenever possible. Provide for safety and privacy.

Continued

Table 6-2 Physiologic Changes in Labor and Nursing Interventions—cont'd

PHYSIOLOGY	CLINICAL SYMPTOMS	NURSING INTERVENTIONS
Gastrointestinal (GI) System		
Mouth breathing during labor dries the lips and tongue.	Dry lips and mouth may be noted.	Assess for signs of dehydration. Use ice chips to moisten lips and tongue during active labor.
GI motility is decreased during labor.	Nausea and vomiting of undigested food may occur.	Do not allow food or drink during active labor. Rectal pressure and urge to defecate may indicate imminent delivery.
Endocrine System		
Estrogen increases and progesterone decreases. Metabolism increases during labor; work of labor may decrease glucose levels.	Increased metabolism may influence blood glucose level.	Encourage rest whenever possible between contractions and during fourth stage. Close monitoring of mother with diabetes (including blood glucose levels) during labor is essential.
Blood		
The increased blood volume during pregnancy enables a 500-mL blood loss during delivery without problem unless woman is anemic.	Blood pressure may decline; pulse rate may increase.	Monitor vital signs during labor and delivery. Report decrease in blood pressure and increase in pulse rate, which may indicate hypovolemia.
Increased levels of fibrinogen and other clotting factors during pregnancy prevent hemorrhage during delivery but increase risk for thrombosis.		If possible, avoid prolonged use of stirrups to support legs during delivery.
The increased fetal hemoglobin level enables fetus to carry increased level of oxygen during labor. Placental exchange of oxygen and waste occurs between contractions.	Contractions that exceed 90 seconds may impact fetal oxygenation.	Monitor contraction patterns and fetal heart rate closely during labor. Contractions that exceed 90 seconds should be reported to the health care provider.

BP, Blood pressure; WBC, white blood cell.

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Key Points

- The four *Ps*—pelvis, passenger, powers, and psyche—are essential components of labor and birth. Each of these components involves both the maternal and fetal adjustments.
- It is necessary for the maternal passage (pelvis) to be adequate in shape and size to accommodate the descent and birth of the fetus.
- The passenger (fetus) negotiates through the maternal pelvis and usually passes head first through the various diameters of the pelvis. As the fetus descends, bony structures and soft tissues exert pressure, which forces the fetus to negotiate the birth canal by a series of passive movements (mechanisms of labor or cardinal movements).
- The powers (uterine contractions) are coordinated and of ample quality and strength to efface and dilate the cervix. With the aid of maternal expulsive efforts, contractions help expel the fetus, and birth occurs.
- The maternal psyche allows the woman to cope with the physical demands and pain of labor to push the fetus out of the birth canal.
- The conclusive difference between true and false labor is that progressive dilation and effacement of the cervix occur in true labor.
- Labor contractions increase in intensity, duration, and frequency. They are involuntary and intermittent during the first stage and are augmented by maternal bearing-down efforts during the second stage.
- The time between contractions is necessary to allow resumption of the placental blood flow and exchange of oxygen and waste products between the maternal and fetal circulations.
- The systemic response to labor guides both nursing assessments and nursing interventions during labor.
- The woman's cultural attitudes and beliefs about labor and birth influence whether labor is a stressful or positive experience.

Additional Learning Resources

SG Go to your Study Guide on pages 483–484 for additional Review Questions for the NCLEX[®] Examination, Critical Thinking Clinical Situations, and other learning activities to help you master this chapter content.

Evolve Go to your Evolve website (<http://evolve.elsevier.com/Leifer/maternity>) for the following FREE learning resources:

- Animations
- Answer Guidelines for Critical Thinking Questions
- Answers and Rationales for Review Questions for the NCLEX[®] Examination
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- Glossary with pronunciations in English and Spanish
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- Skills Performance Checklists and more!



Online Resources

- www.awhonn.org
- www.gowingo.com/health

Review Questions for the NCLEX[®] Examination

1. The relation of the presenting part of the fetus to an imaginary line drawn between the ischial spines of the maternal pelvis is referred to as:
 1. Engagement
 2. Lie
 3. Presentation
 4. Station
2. The best position to promote progress for a woman in labor is:
 1. Supine
 2. Semi-Fowler's
 3. Side-lying
 4. Prone
3. A woman in labor reports that her "contractions are occurring every 3 minutes." The characteristic of labor the woman is most likely describing is:
 1. Duration
 2. Increment
 3. Frequency
 4. Intensity
4. When assessing the intensity of contractions of a laboring woman, the nurse finds that the fundus is easily indented with the fingertips. The nurse will document the intensity of contractions for this woman as:
 1. Mild
 2. Moderate
 3. Firm
 4. Severe
5. Expected physical changes that occur in the mother as a result of lightening include: (*Select all that apply.*)
 1. Hypotension
 2. Easier breathing
 3. More frequent urination
 4. Leg cramps
6. A woman has just entered the fourth stage of labor. The most important nursing assessment during this stage of labor is:
 1. Fetal heart rate
 2. Cervical dilation
 3. Uterine firmness
 4. Pain
7. The anterior fontanelle of the fetal head is formed by the intersection of which suture(s)? (*Select all that apply.*)
 1. Sagittal
 2. Frontal
 3. Coronal
 4. Lambdoid
8. Put the following mechanisms of labor in sequential order by numbering 1 (*first*) to 6 (*last*).
 - ___ Flexion
 - ___ Engagement and descent
 - ___ Expulsion
 - ___ External rotation
 - ___ Internal rotation
 - ___ Extension

Critical Thinking Questions

1. Why are the mechanisms of labor outlined in the chapter necessary for the fetus to negotiate through the maternal pelvis? How will labor be affected if one part of these mechanisms is altered?
2. How does a full bladder influence the progress of labor?

BIRTH SETTINGS

Birth settings can include traditional hospital birth settings, independent birthing centers, or home birth settings. They often are designed, in principle, to emphasize the naturalness of childbirth. The nurse-midwife in collaboration with the physician, assumes the overall management of the birth and prenatal and postpartum care. However, some alternative birth settings are

The primary goal of nursing care is to ensure the best possible outcome for the mother and the newborn. Nursing care focuses on establishing a meaningful relationship, determining the fetal status, encouraging the woman's self-direction and ability to cope, and supporting the woman and her family throughout the labor and birth process. Research-based goals for normal labor and delivery include

Objectives

1. Define key terms listed.
2. Describe three variations in cultural practices.
3. Compare alternative birth settings.
4. Outline three nursing assessments and interventions during each stage of labor.
5. Discuss the significance of psychological support during labor.
6. Review ways to protect the woman from infection.
7. Compare external and internal fetal monitoring during labor.
8. Compare the advantages and disadvantages of electronic fetal monitoring during labor.
9. Describe the cleansing of the woman's perineum in preparation for birth.
10. Compare reassuring and nonreassuring fetal heart rates.
11. Relate the nurse's role in fetal monitoring.
12. Describe the purpose of amnioinfusion.
13. Discuss the role of a doula in the delivery room.
14. Explain the common nursing responsibilities during birth.
15. Identify nursing priorities when assisting in an emergency (precip) delivery.
16. List four items that are important to record about the infant's birth.
17. Discuss the immediate care of the newborn.
18. Explain the reason the neonate requires administration of vitamin K at birth.
19. Describe the nursing assessments that are important in the woman's recovery period after birth.
20. Illustrate two ways to encourage maternal-newborn bonding after birth.
21. Discuss fetal pulse oximetry.

Key Terms

accelerations (äk-sël-ër-Ä-shünz, p. 123)
amnioinfusion (äm-në-ö-in-FÜ-zhän, p. 127)
Apgar score (p. 140)
decelerations (dë-sël-ër-Ä-shünz, p. 123)
doula (DOO-lä, p. 132)
Duncan mechanism (p. 136)
early decelerations (p. 125)
external fetal monitoring (p. 121)
ferning (p. 127)
fetal pulse oximetry (ök-SİM-ë-trë, p. 125)

internal fetal monitoring (p. 122)
late decelerations (p. 125)
Leopold's maneuvers (p. 127)
Nitrazine paper test (NĪ-trä-zën, p. 127)
nonreassuring heart rate pattern (p. 120)
precipitate delivery (p. 143)
reassuring heart rate pattern (p. 120)
Schultze mechanism (p. 136)
variable decelerations (p. 125)

The labor and birth process is an exciting, anxiety-provoking, but rewarding time for the woman and her family. They are about to undergo one of the most meaningful and stressful events in life. The adequacy of their preparation for childbirth will now be tested. Labor begins with regular uterine contractions, continues with hours of hard work, and ends as the woman and her family begin the attachment process with their newborn.

The primary goal of nursing care is to ensure the best possible outcome for the mother and the newborn. Nursing care focuses on establishing a meaningful, open relationship; determining the fetal status; encouraging the woman's self-direction and ability to cope; and supporting the woman and her family throughout the labor and birth process. Research-based goals for normal labor and delivery include

allowing labor to start on its own, allowing freedom of movement during labor, providing continuous labor support without routine interventions, allowing spontaneous pushing in a non-supine position, and keeping mother and infant together in skin-to-skin contact immediately after birth (AWHONN, 2007).

BIRTH SETTINGS

Birth settings can include traditional hospital birth settings, independent birthing centers, or home birth services. They often are designed, in principle, to emphasize the naturalness of childbirth. The nurse-midwife, in collaboration with the physician, assumes the overall management of the birth and prenatal and postpartum care. However, some alternative birth settings are