CHAPTER 18

Nursing Management of the Newborn

KEY TERMS

acrocyanosis
Apgar score
caput succedaneum
cephalhematoma
circumcision
Epstein's pearls
erythema toxicum
gestational age
harlequin sign
infant abduction
immunizations
milia
molding
Mongolian spots
nevus flammeus
nevus vasculosus
ophthalmia neonatorum
phototherapy
pseudomenstruation
stork bites
vernix caseosa

LEARNING OBJECTIVES

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

1. Define the key terms.
2. Discuss the assessments performed during the immediate newborn period.
3. Select interventions that meet the immediate needs of the term newborn.
4. List the components of a typical physical examination of a newborn.
5. Identify common variations that can be noted during a newborn's physical examination.
6. List common concerns in the newborn and appropriate interventions.
7. Compare the importance of the newborn screening tests.
8. Explain common interventions that are appropriate during the early newborn period.
9. Discuss the nurse's role in meeting the newborn's nutritional needs.
10. Outline discharge planning content and education needed for the family with a newborn.

Kelly, a 16-year-old first-time mother, calls the hospital maternity unit 3 days after being discharged home. She tells the nurse that her newborn son "looks like a canary" and "isn't nursing well." She wonders what is wrong.

Wow

You can send a more powerful message with your actions and behavior than with words alone.

Immediately after the birth of a newborn, all parents are faced with the task of learning and understanding as much as possible about caring for this new family member, even if the parents already have other children. In their new or expanded role as parents, they will face many demands and challenges. For most, this is a wonderful, exciting time filled with many discoveries and much information.

Parents learn as they watch the nurse interacting with their newborn. Nurses play a major role in teaching parents about normal newborn characteristics and about ways to foster optimal growth and development. This role is even more important today because of limited hospital stays.

The newborn has come from a dark, small, enclosed space in the mother's uterus into the bright, cold extrauterine environment. Nurses can easily forget that they are caring for a small human being who is experiencing his or her first taste of human interaction outside the uterus. The newborn period is an extremely important one, and two National Health Goals have been developed to address this critical period.

HEALTHY PEOPLE 2010

Objective	Significance
Increase the proportion of mothers who breast-feed their babies during the early postpartum period from a baseline of 64% to 75%.	• Will emphasize the importance of breast milk as the most complete form of nutrition for infants • Will help to promote infant health, growth, immunity, and development throughout the newborn and infant periods • Will help to foster early detection and prompt treatment for conditions, thereby lessening the incidence of illness, disability, and death associated with these conditions and their overall effects on the newborn, infant, and family
Increase the proportion of mothers who breast-feed at 6 months from a baseline of 29% to 50%.	
Increase the proportion of mothers who breast-feed at 1 year from a baseline of 16% to 25%.	
Ensure appropriate newborn bloodspot screening, newborn hearing screening, follow-up testing, and referral services.	
Ensure that all newborns are screened at birth for conditions mandated by their state-sponsored newborn screening programs.	
Ensure that follow-up diagnostic testing for screening positives is performed within an appropriate time period.	

Source: U.S. DHHS, 2000.

It is also easy to overlook the intensity with which parents and visitors observe the actions of nurses as they care for the new family member. Nurses need to serve as a model for giving nurturing care to newborns.

This chapter provides information about assessment and interventions in the period immediately following the birth of a newborn and during the early newborn period.

Nursing Management During the Immediate Newborn Period

The period of transition from intrauterine to extrauterine life occurs during the first several hours after birth. During this time, the newborn is undergoing numerous adaptations, many of which are occurring simultaneously (see Chap. 17 for more information on the newborn's adaptation). The neonate's temperature, respiration, and cardiovascular dynamics stabilize during this period. Close observation of the newborn's status is essential. Careful examination of the newborn at birth can detect anomalies, birth injuries, and disorders that can compromise adaptation to extrauterine life. Problems that occur during this critical time can have a lifelong impact.

Assessment

The initial newborn assessment is completed in the birthing area to determine whether the newborn is stable enough to stay with the parents or whether resuscitation or immediate interventions are necessary. A second assessment is done within the first 2 to 4 hours, when the newborn is admitted to the nursery. A third assessment is completed before discharge. The purpose of these assessments is to determine whether the baby is normal, to provide information to the parents, and to identify apparent physical abnormalities (Arenson & Drake, 2007).

During the initial newborn assessment, look for signs that might indicate a problem, including:

- Nasal flaring
- Chest retractions
- Grunting on exhalation
- Labored breathing
- Generalized cyanosis
- Abnormal breath sounds: rhonchi, crackles (rales), wheezing, stridor
- Abnormal respiratory rates (tachypnea, more than 60 breaths/minute; bradypnea, less than 25 breaths/minute)
- Flaccid body posture
- Abnormal heart rates (tachycardia, more than 160 bpm; bradycardia, less than 100 bpm)
- Abnormal newborn size: small or large for gestational age

If any of these findings are noted, medical intervention may be necessary.

Apgar Scoring

The **Apgar score**, introduced in 1952 by Dr. Virginia Apgar, is used to evaluate newborns at 1 minute and 5 minutes after birth. An additional Apgar assessment is done at 10 minutes if the 5-minute score is less than 7 points (Keenan, 2006). Assessment of the newborn at 1 minute provides data about the newborn's initial adaptation to extrauterine life. Assessment at 5 minutes provides a clearer indication of the newborn's overall central nervous system status.

Five parameters are assessed with Apgar scoring. A quick way to remember the parameters of Apgar scoring is as follows:

- A = appearance (color)
- P = pulse (heart rate)
- G = grimace (reflex irritability)
- A = activity (muscle tone)
- R = respiratory (respiratory effort)

Each parameter is assigned a score ranging from 0 to 2 points. A score of 0 points indicates an absent or poor response; a score of 2 points indicates a normal response (Table 18.1). A normal newborn's score should be 8 to 10 points. The higher the score, the better the condition of the newborn. If the Apgar score is 8 points or higher, no intervention is needed other than supporting normal respiratory efforts and maintaining thermoregulation. Scores of 4 to 7 points signify moderate difficulty and scores of 0 to 3 points represent severe distress in adjusting to extrauterine life. The Apgar score is influenced by the presence of infection, congenital anomalies, physiologic immaturity, maternal sedation via medications, and neuromuscular disorders (Keenan, 2006).

When the newborn experiences physiologic depression, the Apgar score characteristics disappear in a predictable manner: first the pink coloration is lost, next the respiratory effort, and then the tone, followed by reflex irritability and finally heart rate (Kenner & Lott, 2007).

▶ *Take* NOTE!

Although Apgar scoring is done at 1 and 5 minutes, it also can be used as a guide during the immediate newborn period to evaluate the newborn's status for any changes because it focuses on critical parameters that must be assessed throughout the early transition period.

Length and Weight

Parents are eager to know their newborn's length and weight. These measurements are taken soon after birth. A disposable tape measure or a built-in measurement board located on the side of the scale can be used. Length is measured from the head of the newborn to the heel with the newborn unclothed (Fig. 18.1). Because of the flexed position of the newborn after birth, place the newborn in a supine position and extend the leg completely when measuring the length. The expected length of a full-term newborn is usually 48 to 53 cm (19 to 21 inches). Molding can affect measurement (Dillon, 2007).

TABLE 18.1 APGAR SCORING FOR NEWBORNS

Parameter (Assessment Technique)	0 Point	1 Point	2 Points
Heart rate (auscultation of apical heart rate for 1 full minute)	Absent	Slow (<100 bpm)	>100 bpm
Respiratory effort (observation of the volume and vigor of the newborn's cry; auscultation of depth and rate of respirations)	Apneic	Slow, irregular, shallow	Regular respirations (usually 30–60 breaths/minute), strong, good cry
Muscle tone (observation of extent of flexion in the newborn's extremities and newborn's resistance when the extremities are pulled away from the body)	Limp, flaccid	Some flexion, limited resistance to extension	Tight flexion, good resistance to extension with quick return to flexed position after extension
Reflex irritability (flicking of the soles of the feet or suctioning of the nose with a bulb syringe)	No response	Grimace or frown when irritated	Sneeze, cough, or vigorous cry
Skin color (inspection of trunk and extremities with the appropriate color for ethnicity appearing within minutes after birth)	Cyanotic or pale	Appropriate body color; blue extremities (acrocyanosis)	Completely appropriate color (pink on both trunk and extremities)

FIGURE 18.1 Measuring a newborn's length. (**A**) The nurse extends the newborn's leg and marks the pad at the heel. (**B**) The nurse measures from the newborn's head to the heel mark.

Most often, newborns are weighed using a digital scale that reads the weight in grams. Typically, the term newborn weighs 2,700 to 4,000 g (6 to 9 lb; Fig. 18.2). Birthweights less than 10% or more than 90% on a growth chart are outside the normal range and need further investigation. Weights taken at later times are compared with previous weights and are documented with regard to gain or loss on a nursing flow sheet. Newborns typically lose approximately 10% of their initial birth weight by 3 to 4 days of age secondary to loss of meconium, extracellular fluid, and limited food intake. This weight loss is usually regained by the 10th day of life (Kliegman et al., 2007).

FIGURE 18.2 Weighing a newborn. Note how the nurse guards the newborn from above to prevent injury.

Newborns can be classified by their birthweight regardless of their gestational age (AAP, 2007a) as follows:

- Low birthweight: <2,500 g (<5.5 lb)
- Very low birthweight: <1,500 g (<3.5 lb)
- Extremely low birthweight: <1,000 g (<2.5 lb)

Vital Signs

Heart rate and respiratory rate are assessed immediately after birth with Apgar scoring. Heart rate, obtained by taking an apical pulse for 1 full minute, typically is 120 to 160 bpm. Newborns' respirations are assessed when they are quiet or sleeping. Place a stethoscope on the right side of the chest and count the breaths for 1 full minute to identify any irregularities. The newborn respiratory rate is 30 to 60 breaths/minute with symmetric chest movement. Heart and respiratory rates are assessed every 30 minutes until stable for 2 hours after birth. Once stable, the heart rate and respiratory rates are checked every 8 hours (Kenner & Lott, 2007).

Axillary temperature is typically assessed not immediately after birth but on admission to the nursery or when the initial newborn assessment is carried out (e.g., the LDR room). The normal axillary temperature for a term newborn is 36.5° to 37.5°C (97.9° to 99.7°F). Rectal temperatures are no longer taken because of the risk of perforation (Blackburn, 2007). The thermometer or temperature probe is held in the midaxillary space according to manufacturer's directions and hospital protocol. Temperature is reassessed every 30 minutes until it has been stable for 2 hours, then every 8 hours until discharge (Kliegman et al., 2007).

Blood pressure is not usually assessed as part of a normal newborn examination unless there is a clinical indication or low Apgar scores. If assessed, an oscillometer (Dinamap) is used. The typical range is 50 to 75 mmHg

TABLE 18.2 NEWBORN VITAL SIGNS

Newborn Vital Signs	Ranges of values
Temperature	36.5° to 37.5°C (97.9° to 99.7°F)
Heart rate (pulse)	120 to 160 bpm; can increase to 180 during crying
Respirations	30 to 60 breaths/minute at rest; will increase with crying
Blood pressure	50 to 75 mmHg systolic, 30 to 45 mmHg diastolic

(systolic) and 30 to 45 mmHg (diastolic). Crying, moving, and late clamping of the umbilical cord will increase systolic pressure (Dillon, 2007).

Typical values for newborn vital signs are provided in Table 18.2.

Gestational Age Assessment

To determine a newborn's **gestational age** (the stage of maturity), physical signs and neurologic characteristics are assessed. Typically, gestational age is determined by using a tool such as the Dubowitz/Ballard or New Ballard Score system (Fig. 18.3). This scoring system provides an objective estimate of gestational age by scoring the specific parameters of physical and neuromuscular maturity. Points are given for each assessment parameter, with a low score of –1 point or –2 points for extreme immaturity to 4 or 5 points for postmaturity. The scores from each section are added together to correspond to a specific gestational age in weeks.

The physical maturity section of the examination is done during the first 2 hours after birth. The physical maturity assessment section of the Ballard examination evaluates physical characteristics that appear different at different stages depending on a newborn's gestational maturity. Newborns who are physically mature have higher scores than those who are not. The areas assessed on the physical maturity examination include:

- Skin texture—typically ranges from sticky and transparent to smooth, with varying degrees of peeling and cracking, to parchment-like or leathery with significant cracking and wrinkling
- Lanugo—soft downy hair on the newborn's body, which is absent in preterm newborns, appears with maturity, and then disappears again with postmaturity
- Plantar creases—creases on the soles of the feet, which range from absent to covering the entire foot, depending on maturity (the greater the number of creases, the greater the newborn's maturity)
- Breast tissue—the thickness and size of breast tissue and areola (the darkened ring around each nipple), which range from being imperceptible to full and budding
- Eyes and ears—eyelids can be fused or open and ear cartilage and stiffness determine the degree of maturity (the greater the amount of ear cartilage with stiffness, the greater the newborn's maturity)
- Genitals—in males, evidence of testicular descent and appearance of scrotum (which can range from smooth to covered with rugae) determine maturity; in females, appearance and size of clitoris and labia determine maturity (a prominent clitoris with flat labia suggests prematurity, whereas a clitoris covered by labia suggests greater maturity)

The neuromuscular maturity section typically is completed within 24 hours after birth. Six activities or maneuvers that the newborn performs with various body parts are evaluated to determine the newborn's degree of maturity:

1. Posture—How does the newborn hold his or her extremities in relation to the trunk? The greater the degree of flexion, the greater the maturity. For example, extension of arms and legs is scored as 0 point and full flexion of arms and legs is scored as 4 points.
2. Square window—How far can the newborn's hands be flexed toward the wrist? The angle is measured and scored from more than 90 degrees to 0 degrees to determine the maturity rating. As the angle decreases, the newborn's maturity increases. For example, an angle of more than 90 degrees is scored as –1 point and an angle of 0 degrees is scored as 4 points.
3. Arm recoil—How far do the newborn's arms "spring back" to a flexed position? This measure evaluates the degree of arm flexion and the strength of recoil. The reaction of the arm is then scored from 0 to 4 points based on the degree of flexion as the arms are returned to their normal flexed position. The higher the points assigned, the greater the neuromuscular maturity (for example, recoil less than a 90-degree angle is scored as 4 points).
4. Popliteal angle—How far will the newborn's knees extend? The angle created when the knee is extended is measured. An angle less than 90 degrees indicates greater maturity. For example, an angle of 180 degrees is scored as –1 point and an angle of less than 90 degrees is scored as 5 points.
5. Scarf sign—How far can the elbows be moved across the newborn's chest? An elbow that does not reach midline indicates greater maturity. For example, if the elbow reaches or nears the level of the opposite shoulder, this is scored as –1 point; if the elbow does not cross the proximate axillary line, it is scored as 4 points.
6. Heel to ear—How close can the newborn's feet be moved to the ears? This maneuver assesses hip flexibility: the lesser the flexibility, the greater the newborn's maturity. The heel-to-ear assessment is scored in the same manner as the scarf sign.

NEUROMUSCULAR MATURITY

NEUROMUSCULAR MATURITY SIGN	SCORE –1	0	1	2	3	4	5	RECORD SCORE HERE
POSTURE								
SQUARE WINDOW (Wrist)	>90°	90°	60°	45°	30°	0°		
ARM RECOIL		180°	140°–180°	110°–140°	90°–110°	<90°		
POPLITEAL ANGLE	180°	160°	140°	120°	100°	90°	<90°	
SCARF SIGN								
HEEL TO EAR								
							TOTAL NEUROMUSCULAR MATURITY SCORE	

SCORE
Neuromuscular ____
Physical ____
Total ____

MATURITY RATING

Score	Weeks
–10	20
–5	22
0	24
5	26
10	28
15	30
20	32
25	34
30	36
35	38
40	40
45	42
50	44

PHYSICAL MATURITY

PHYSICAL MATURITY SIGN	SCORE –1	0	1	2	3	4	5	RECORD SCORE HERE
SKIN	sticky, friable, transparent	gelatinous, red, translucent	smooth, pink, visible veins	superficial peeling and/or rash, few veins	cracking pale areas, rare veins	parchment, deep cracking, no vessels	leathery, cracked, wrinkled	
LANUGO	none	sparse	abundant	thinning	bald areas	mostly bald		
PLANTAR SURFACE	heel-toe 40–50 mm: –1 <40 mm: –2	>50 mm no crease	faint red marks	anterior transverse crease only	creases ant. 2/3	creases over entire sole		
BREAST	imperceptible	barely perceptible	flat areola no bud	stippled areola 1–2 mm bud	raised areola 3–4 mm bud	full areola 5–10 mm bud		
EYE-EAR	lids fused loosely: –1 tightly: –2	lids open pinna flat stays folded	sl. curved pinna; soft; slow recoil	well-curved pinna; soft but ready recoil	formed and firm instant recoil	thick cartilage, ear stiff		
GENITALS (Male)	scrotum flat, smooth	scrotum empty, faint rugae	testes in upper canal, rare rugae	testes descending, few rugae	testes down, good rugae	testes pendulous, deep rugae		
GENITALS (Female)	clitoris prominent and labia flat	prominent clitoris and small labia minora	prominent clitoris and enlarging minora	majora and minora equally prominent	majora large, minora small	majora cover clitoris and minora		
							TOTAL PHYSICAL MATURITY SCORE	

FIGURE 18.3 Gestational age assessment tool. (Ballard, J. L., Khoury, J. C., Wedig, K., et al. [1991]. New Ballard Score, expanded to include extremely premature infants. *Journal of Pediatrics, 119*[3], 417–423.)

After the scoring is completed, the 12 scores are totaled and then compared with standardized values to determine the appropriate gestational age in weeks. Scores range from very low in preterm newborns to very high for mature and postmature newborns.

Typically newborns are also classified according to gestational age as:

- Preterm or premature—born before 37 weeks' gestation, regardless of birthweight
- Term—born between 38 and 42 weeks' gestation
- Postterm or postdates—born after completion of week 42 of gestation
- Postmature—born after 42 weeks and demonstrating signs of placental aging

Using the information about gestational age and then considering birthweight, newborns can also be classified as follows:

- Small for gestational age (SGA)—weight less than the 10th percentile on standard growth charts (usually <5.5 lb)
- Appropriate for gestational age (AGA)—weight between 10th and 90th percentiles
- Large for gestational age (LGA)—weight more than the 90th percentile on standard growth charts (usually >9 lb)

Chapter 23 describes these variations in birthweight and gestational age in greater detail.

▶ *Take* NOTE!

Gestational age assessment is important because it allows the nurse to plot growth parameters and to anticipate problems related to prematurity, postmaturity, and growth abnormalities.

Nursing Interventions

During the immediate newborn period, care focuses on helping the newborn to make the transition to extrauterine life. The nursing interventions include maintaining airway patency, ensuring proper identification, administering prescribed medications, and maintaining thermoregulation.

Maintaining Airway Patency

Immediately after birth, a newborn is suctioned to remove fluids and mucus from the mouth and nose. Typically, the newborn's mouth is suctioned first with a bulb syringe to remove debris and then the nose is suctioned. Suctioning in this manner helps to prevent aspiration of fluid into the lungs by an unexpected gasp.

When suctioning a newborn with a bulb syringe, compress the bulb before placing it into the oral or nasal cavity. Release bulb compression slowly, making sure the tip is placed away from the mucous membranes to draw up the excess secretions. Remove the bulb syringe from the mouth or nose, and then, while holding the bulb syringe tip over an emesis basin lined with paper towel or tissue, compress the bulb to expel the secretions. Repeat the procedure several times until all secretions are removed.

▶ *Take* NOTE!

Always keep a bulb syringe near the newborn in case he or she develops sudden choking or a blockage in the nose.

Ensuring Proper Identification

Before the newborn and family leave the birthing area, be sure that agency policy about identification is followed. Typically, the mother and newborn, and possibly the father, receive matching identification bracelets. The newborn commonly receives two ID bracelets, one on a wrist and one on an ankle. The mother receives a matching one, usually on her wrist. The ID bands usually state name, gender, date and time of birth, and identification number. The same identification number is on the bracelets of all the family members.

These ID bracelets provide for the safety of the newborn and must be secured before the mother and newborn leave the birthing area. The ID bracelets are checked by all nurses to validate that the correct newborn is brought to the right mother if they are separated for any period of time (Fig. 18.4). They also serve as the official newborn identification and are checked before initiating any procedure on that newborn and on discharge from the unit (AAP, 2007). Taking the newborn's picture within 2 hours after birth with a color camera or color video/digital image also helps prevent mix-ups and abduction. Some facilities use electronic devices that sound an alarm if the newborn is removed from the area.

Newborns' footprints may also be taken, using a form that includes the mother's fingerprint, name, and date and time of the birth. Some states require footprints of the newborn, although many studies point out that birthing room staff members do not take consistently legible footprints suitable for identification purposes (Kenner & Lott, 2007). Many states have stopped requiring newborn footprints, and thus other means of identification are needed, such as collecting cord blood at the time of birth for DNA testing and live scans to capture digital forensic-quality prints that are suitable for identification purposes (Cohen, 2007).

Administering Prescribed Medications

During the immediate newborn period, two medications are commonly ordered: vitamin K and eye prophylaxis with

FIGURE 18.4 The nurse checks the newborn's identification band against the mother's.

either erythromycin or tetracycline ophthalmic ointment (Drug Guide 18.1).

Vitamin K

Vitamin K, a fat-soluble vitamin, promotes blood clotting by increasing the synthesis of prothrombin by the liver. A deficiency of this vitamin would delay clotting and might lead to hemorrhage.

Generally, the bacteria of the intestine produce vitamin K in adequate quantities. However, the newborn's bowel is sterile, so vitamin K is not produced in the intestine until after microorganisms are introduced, such as with the first feeding. Usually it takes about a week for the newborn to produce enough vitamin K to prevent vitamin K deficiency bleeding (Wasee, 2006).

The efficacy of vitamin K in preventing early vitamin K deficiency bleeding is firmly established and has been the standard of care since the AAP recommended it in the early 1960s. They recommend that vitamin K be administered to all newborns soon after birth in a single intramuscular dose of 0.5 to 1 mg (AAP, 2007) (Fig. 18.5). They suggest that additional research is needed to validate the efficacy and safety of oral forms of vitamin K, which have been used in many parts of the world but currently are not recommended in the United States.

FIGURE 18.5 The nurse administers vitamin K IM to the newborn.

Eye Prophylaxis

All newborns in the United States, whether delivered vaginally or by cesarean birth, must receive an instillation of a prophylactic agent in their eyes within an hour or two of birth. This is mandated in all 50 states to prevent **ophthalmia neonatorum**, which can cause neonatal blindness (CDC, 2007). Ophthalmia neonatorum is a hyperacute purulent conjunctivitis occurring during the first 10 days of life. It is usually contracted during birth when the baby comes in contact with infected vaginal discharge of the mother (CDC, 2007). Most often both eyelids become swollen and red with purulent discharge.

Prophylactic agents that are currently recommended include erythromycin 0.5% ophthalmic ointment or tetracycline 1% ophthalmic ointment in a single application. Silver nitrate solution was formerly used but has little efficacy in preventing chlamydial eye disease (CDC, 2007).

Regardless of which agent is used, instillation should be done as soon as possible after birth (Fig. 18.6). If

DRUG GUIDE 18.1 DRUGS FOR THE NEWBORN

Drug	Action/Indication	Nursing Implications
Phytonadione (vitamin K [Aqua-MEPHYTON, Konakion, Mephyton])	Provides the newborn with vitamin K (necessary for production of adequate clotting factors II, VII, IX, and X by the liver) during the first week of birth until newborn can manufacture it Prevents vitamin K deficiency bleeding (VKDB) of the newborn	• Administer within 1 to 2 hours after birth. • Give as an IM injection at a 90-degree angle into the middle third of the vastus lateralis muscle. • Use a 25-gauge, 5/8-in needle for injection. • Hold the leg firmly and inject medication slowly after aspirating. • Adhere to standard precautions. • Assess for bleeding at injection site after administration.
Erythromycin ophthalmic ointment 0.5% or tetracycline ophthalmic ointment 1%	Provides bactericidal and bacteriostatic actions to prevent *Neisseria gonorrhoeae* and *Chlamydia trachomatis* conjunctivitis Prevents ophthalmia neonatorum	• Be alert for chemical conjunctivitis for 1–2 days. • Wear gloves, and open eyes by placing thumb and finger above and below the eye. • Gently squeeze the tube or ampoule to apply medication into the conjunctival sac from the inner canthus to the outer canthus of each eye. • Do not touch the tip to the eye. • Close the eye to make sure the medication permeates. • Wipe off excess ointment after 1 minute.

FIGURE 18.6 The nurse administers eye prophylaxis.

instillation is delayed to allow visualization and bonding, the nursery staff should make sure the agent is administered when the newborn reaches the nursery for observation and assessment.

Inform all parents about the eye treatment, including why it is recommended, what problems may arise if the treatment is not given, and possible adverse effects of the treatment.

▶ **Take** NOTE!

Parents have the right to refuse this treatment, but if they received adequate teaching about the treatment and understand its importance, they usually will consent to it.

Maintaining Thermoregulation

Newborns have trouble regulating their temperature, especially during the first few hours after birth (see Chap. 17 for a complete discussion). Therefore, maintaining body temperature is crucial.

Assess body temperature frequently during the immediate newborn period. The baby's temperature should be taken every 30 minutes for the first 2 hours or until the temperature has stabilized, and then every 8 hours until discharge (AAP, 2007).

Commonly a thermistor probe (automatic sensor) is attached to the newborn to record body temperature on a monitoring device. The probe is taped to the newborn's abdomen, usually in the right upper quadrant, which allows for position changes without having to readjust the probe. The other end of the thermistor probe is inserted into the radiant heat control panel. Temperature parameters are set on an alarm system connected to the heat panel that will sound if the newborn's temperature falls out of the set range. Check the probe connection periodically to make sure that it remains secure. Remember the potential for heat loss in newborns, and perform all nursing interventions in a way that minimizes heat loss and prevents hypothermia.

Axillary temperatures can also be used to assess the newborn's body temperature. At one time, rectal thermometers were routinely used to monitor body temperature, but their use is no longer recommended because of the risk of traumatizing the rectal lining (Blackburn, 2007). A newborn's temperature typically is maintained at 36.5° to 37.5°C (97.7° to 99.7°F) (Kenner & Lott, 2007).

Nursing interventions to help maintain body temperature include:

- Dry the newborn immediately after birth to prevent heat loss through evaporation.
- Wrap the baby in warmed blankets to reduce heat loss via convection.
- Use a warmed cover on the scale to weigh the unclothed newborn.
- Warm stethoscopes and hands before examining the baby or providing care.
- Avoid placing newborns in drafts or near air vents to prevent heat loss through convection.
- Delay the initial bath until the baby's temperature has stabilized to prevent heat loss through evaporation.
- Avoid placing cribs near cold outer walls to prevent heat loss through radiation.
- Put a cap on the newborn's head after it is thoroughly dried after birth.
- Place the newborn under a temperature-controlled radiant warmer (Fig. 18.7).

Nursing Management During the Early Newborn Period

The early newborn period is a time of great adjustment for both the mother and the newborn, both of whom are adapting to many physiologic and psychological changes. In the past, mothers and newborns remained in the health care facility while these dramatic changes were taking place, with nurses and doctors readily available. However, today shorter hospital stays are the norm, and new mothers can easily be overwhelmed by having to go through all of these changes in such a short time: the woman gives birth, experiences marked physiologic and psychological changes, and must adapt to her newborn and learn the skills needed to care for herself and the baby, all within 24 to 48 hours.

The nurse's role is to assist the mother and her newborn through this dramatic transition period. The newborn needs continued health assessment, and the mother needs to be taught to care for the new baby. At discharge, the new mother may panic and feel insecure about her role as primary caretaker. Nurses play a major role in promoting the newborn's transition by providing ongoing assessment and

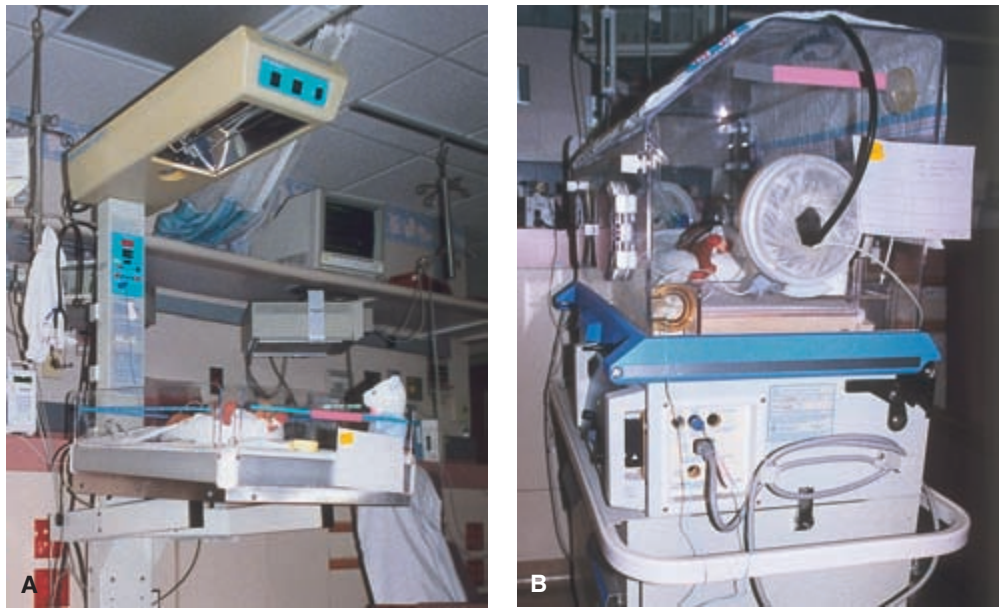

FIGURE 18.7 Maintaining thermoregulation. (**A**) Radiant warmer. (**B**) Isolette.

care and in promoting the woman's confidence by serving as a role model and teaching about proper newborn care.

Assessment

The newborn requires ongoing assessment after leaving the birthing area to ensure that his or her transition to extrauterine life is progressing without problems. The nurse uses the data gathered during the initial assessment as a baseline for comparison.

Perinatal History

Pertinent maternal and fetal data are vital to formulate a plan of care for the mother and her newborn. Historical information is obtained from the medical record and from interviewing the mother. Review the maternal history because it provides pertinent information, such as the presence of certain risk factors that could affect the newborn. Keep in mind that a comprehensive maternal history may not be available, especially if the mother has had limited or no prenatal care.

Historical information usually includes the following:

- Mother's name, medical record number, blood type, serology result, rubella and hepatitis status, and history of substance abuse
- Other maternal tests that are relevant to the newborn and care, such as HIV and group B streptococcus status
- Intrapartum maternal antibiotic therapy (type, dose, and duration)
- Maternal illness that can affect the pregnancy, evidence of chorioamnionitis, maternal use of medications such as steroids
- Prenatal care, including timing of first visit and subsequent visits
- Risk for blood group incompatibility, including Rh status and blood type
- Fetal distress or any nonreassuring fetal heart rate patterns during labor
- Known inherited conditions such as sickle cell anemia and phenylketonuria (PKU)
- Birthweights of previous live-born children, along with identification of any newborn problems
- Social history, including tobacco, alcohol, and recreational drug use
- History of depression or domestic violence
- Cultural factors, including primary language and educational level
- Pregnancy complications associated with abnormal fetal growth, fetal anomalies, or abnormal results from tests of fetal well-being
- Information on the progress of labor, birth, labor complications, duration of ruptured membranes, and presence of meconium in the amniotic fluid
- Medications given during labor, at birth, and immediately after birth
- Time and method of delivery, including presentation and the use of forceps or a vacuum extractor
- Status of the newborn at birth, including Apgar scores at 1 and 5 minutes, the need for suctioning, weight, gestational age, vital signs, and umbilical cord status
- Medications administered to the newborn
- Postbirth maternal information, including placental findings, positive cultures, and presence of fever

Newborn Physical Examination

The initial newborn physical examination, which may demonstrate subtle differences related to the newborn's age, is carried out within the first 24 hours after birth. For example, a newborn who is 30 minutes old has not yet

completed the normal transition from intrauterine to extrauterine life, and thus variability may exist in vital signs and in respiratory, neurologic, gastrointestinal, skin, and cardiovascular systems. Therefore, a comprehensive examination should be delayed until after the newborn has completed the transition.

In a quiet newborn, begin the examination with the least invasive and noxious elements of the examination (auscultation of heart and lungs). Then examine the areas most likely to irritate the newborn (e.g., examining the hips and eliciting the Moro reflex). A general visual assessment provides an enormous amount of information about the well-being of a newborn. Initial observation gives an impression of a healthy (stable) versus an ill newborn and a term versus a preterm newborn.

A typical physical examination of a newborn includes a general survey of skin color, posture, state of alertness, head size, overall behavioral state, respiratory status, gender, and any obvious congenital anomalies. Check the overall appearance for anything unusual. Then complete the examination in a systematic fashion.

Remember Kelly, who called the home health nurse and said her newborn son "looks like a canary"? What additional information is needed about the baby? What might be causing his yellow color?

Anthropometric Measurements

Shortly after birth, after the gender of the child is revealed, most parents want to know the "vital statistics" of their newborn—length and weight—to report to their family and friends. Additional measurements, including head and chest circumference, are also taken and recorded. Abdominal measurements are not routinely obtained unless there is a suspicion of pathology that causes abdominal distention. The newborn's progress from that point on will be validated based on these early measurements. These measurements will be compared with future serial measurements to determine growth patterns, which are plotted on growth charts to evaluate normalcy. Therefore, accuracy is key.

Length

The average length of most newborns is 50 cm (20 in), but it can range from 45 to 55 cm (18 to 22 in). Measure length with the unclothed newborn lying on a warmed blanket placed on a flat surface with the knees held in an extended position. Then run a tape measure down the length of the newborn—from the head to the soles of the feet—and record this measurement in the newborn's record (see Fig. 18.1).

Weight

At birth the average newborn weighs 3,400 g (7.5 lb), but normal birthweights can range from 2,500 to 4,000 g (5 lb, 8 oz to 8 lb, 14 oz). Newborns are weighed immediately after birth and then daily. Newborns usually lose up to 10% of their birthweight within the first few days of life, but regain it in approximately 10 days. Newborns are weighed on admission to the nursery or are taken to a digital scale to be weighed and returned to the mother's room.

First, balance the scale if it is not balanced. Place a warmed protective cloth or paper as a barrier on the scale to prevent heat loss by conduction; recalibrate the scale to zero after applying the barrier. Next, place the unclothed newborn in the center of the scale. Keep a hand above the newborn for safety (see Fig. 18.2).

Weight is affected by racial origin, maternal age, size of the parents, maternal nutrition, and placental perfusion (Lawrence, 2006). Weight should be correlated with gestational age. A newborn who weighs more than normal might be LGA or an infant of a diabetic mother (IDM); a newborn who weighs less than normal might be SGA or preterm or might have a genetic syndrome. It is important to identify the cause for the deviation in size and to monitor the newborn for complications common to that etiology.

Head Circumference

The average newborn head circumference is 32 to 38 cm (13 to 15 in). Measure the circumference at the head's widest diameter (the occipitofrontal circumference). Wrap a flexible or paper measuring tape snugly around the newborn's head and record the measurement (Fig. 18.8A).

▶ Take NOTE!

Head circumference may need to be remeasured at a later time if the shape of the head is altered from birth.

The head circumference should be approximately one fourth of the newborn's length (Lawrence, 2006). A small head might indicate microcephaly caused by rubella, toxoplasmosis, or SGA status; an enlarged head might indicate hydrocephalus or increased intracranial pressure. Both need to be documented and reported for further investigation.

Chest Circumference

The average chest circumference is 30 to 36 cm (12 to 14 in). It is generally equal to or about 2 to 3 cm less than the head circumference (Burns et al., 2009). Place a flexible or paper tape measure around the unclothed newborn's chest at the nipple line without pulling it taut (see Fig. 18.8B).

▶ Take NOTE!

The head and chest circumferences are usually equal by about 1 year of age.

FIGURE 18.8 (**A**) Measuring head circumference. (**B**) Measuring chest circumference.

Vital Signs

In the newborn, temperature, pulse, and respirations are monitored frequently and compared with baseline data obtained immediately after birth. Generally, vital signs (excluding blood pressure) are taken:

- On admission to the nursery or in the LDR room after the parents are allowed to hold and bond with the newborn
- Once every 30 minutes until the newborn has been stable for 2 hours
- Then once every 4 to 8 hours until discharge (AAP, 2007)

Blood pressure is not routinely assessed in a normal newborn unless the baby's clinical condition warrants it. This schedule can change depending on the baby's health status.

Obtain a newborn's temperature by placing an electronic temperature probe in the midaxillary area or by monitoring the electronic thermistor probe that has been taped to the abdominal skin (applied when the newborn was placed under a radiant heat source).

Monitor the newborn's temperature hourly for changes until it stabilizes. On average, a newborn's temperature is 36.5° to 37.5°C (97.9° to 99.7°F). If the temperature is higher, adjust the environment, such as removing some clothing or blankets. If the temperature is lower, check the radiant warmer setting or add a warmed blanket. Report any abnormalities to the primary health care provider if simple adjustments to the environment do not change the baby's temperature.

Obtain an apical pulse by placing the stethoscope over the fourth intercostal space on the chest. Listen for a full minute, noting rate, rhythm, and abnormal sounds such as murmurs. In the typical newborn, the heart rate is 120 to 160 bpm, with wide fluctuations with activity and sleep. Sinus arrhythmia is a normal finding. Murmurs detected during the newborn period do not necessarily indicate congenital heart disease, but they need to be assessed frequently over the next several months to see if they persist.

Also palpate the apical, femoral, and brachial pulses for presence and equality (Fig. 18.9). Report any abnormalities to the primary health care provider for evaluation.

Assess respirations by observing the rise and fall of the chest for 1 full minute. Respirations should be symmetric, slightly irregular, shallow, and unlabored at a rate of 30 to 60 breaths/minute. The newborn's respirations are predominantly diaphragmatic, but they are synchronous with abdominal movements. Also auscultate breath sounds. Note any abnormalities, such as tachypnea, bradypnea, grunting, gasping, periods of apnea lasting longer than 20 seconds, asymmetry or decreased chest expansion, abnormal breath sounds (rhonchi, crackles), or sternal retractions. Some variations might exist early after birth, but if the abnormal pattern persists, notify the primary health care provider.

Skin

Observe the overall appearance of the skin, including color, texture, turgor, and integrity. The newborn's skin should be smooth and flexible, and the color should be consistent with genetic background.

FIGURE 18.9 Assessing the newborn's vital signs. (**A**) Assessing the apical pulse. (**B**) Palpating the femoral pulse. (**C**) Palpating the brachial pulse.

Skin Condition and Color

Check skin turgor by pinching a small area of skin over the chest or abdomen and note how quickly it returns to its original position. In a well-hydrated newborn, the skin should return to its normal position immediately. Skin that remains "tented" after being pinched indicates dehydration. A small amount of lanugo (fine downy hair) may be observed over the shoulders and on the sides of the face and upper back. There may be some cracking and peeling of the skin. The skin should be warm to the touch and intact.

The newborn's skin often appears blotchy or mottled, especially in the extremities. Persistent cyanosis of fingers, hands, toes, and feet with mottled blue or red discoloration and coldness is called **acrocyanosis**. It may be seen in newborns during the first few weeks of life in response to exposure to cold. Acrocyanosis is normal and intermittent.

Newborn Skin Variations

While assessing the skin, note any rashes, ecchymoses or petechiae, nevi, or dark pigmentation. Skin lesions can be congenital or transient; they may be a result of infection or may result from the mode of birth. If any are present, observe the anatomic location, arrangement, type, and color. Bruising may result from the use of devices such as a vacuum extractor during delivery. Petechiae may be the result of pressure on the skin during the birth process. Forceps marks may be observed over the cheeks and ears. A small puncture mark may be seen if internal fetal scalp electrode monitoring was used during labor.

Common skin variations include vernix caseosa, stork bites or salmon patches, milia, Mongolian spots, erythema toxicum, harlequin sign, nevus flammeus, and nevus vasculosus (Fig. 18.10).

Vernix caseosa is a thick white substance that protects the skin of the fetus. It is formed by secretions from the fetus's oil glands and is found during the first 2 or 3 days after birth in body creases and the hair. It does not need to be removed because it will be absorbed into the skin.

Stork bites or salmon patches are superficial vascular areas found on the nape of the neck, on the eyelids, and between the eyes and upper lip (see Fig. 18.10A). The name comes from the marks on the back of the neck where, as myth goes, a stork may have picked up the baby. They are caused by a concentration of immature blood vessels and are most visible when the newborn is crying. They are considered a normal variant, and most fade and disappear completely within the first year.

Milia are unopened sebaceous glands frequently found on a newborn's nose. They may also appear on the chin and forehead (see Fig. 18.10B). They form from oil glands and disappear on their own within 2 to 4 weeks. When they occur in a newborn's mouth and gums, they are termed **Epstein's pearls**. They occur in approximately 60% of newborns (AAP, 2007b).

Mongolian spots are blue or purple splotches that appear on the lower back and buttocks of newborns (see Fig. 18.10C). They tend to occur in African-American, Asian, and Indian newborns but can occur in dark-skinned newborns of all races. The spots are caused by a concentration of pigmented cells and usually disappear within the first 4 years of life (Kliegman et al., 2007).

Erythema toxicum (newborn rash) is a benign, idiopathic, generalized, transient rash that occurs in up to 70% of all newborns during the first week of life. It consists of small papules or pustules on the skin resembling flea bites. The rash is common on the face, chest, and back (see Fig. 18.10D). One of the chief characteristics

FIGURE 18.10 Common skin variations. (**A**) Stork bite. (**B**) Milia. (**C**) Mongolian spots. (**D**) Erythema toxicum. (**E**) Nevus flammeus (port-wine stain). (**F**) Strawberry hemangioma.

of this rash is its lack of pattern. It is caused by the newborn's eosinophils reacting to the environment as the immune system matures (AAP, 2007b). It does not require any treatment and disappears in a few days.

Harlequin sign refers to the dilation of blood vessels on only one side of the body, giving the newborn the appearance of wearing a clown suit. It gives a distinct midline demarcation, which is described as pale on the nondependent side and red on the opposite, dependent side. It results from immature autoregulation of blood flow and is commonly seen in low-birthweight newborns when there is a positional change (Dillon, 2007). It is transient, lasting as long as 20 minutes, and no intervention is needed.

Nevus flammeus, also called a port wine stain, commonly appears on the newborn's face or other body areas (see Fig. 18.10E). It is a capillary angioma located directly below the dermis. It is flat with sharp demarcations

and is purple–red. This skin lesion is made up of mature capillaries that are congested and dilated. It ranges in size from a few millimeters to large, occasionally involving as much as half the body surface. Although it does not grow in area or size, it is permanent and will not fade. Port wine stains may be associated with structural malformations, bony or muscular overgrowth, and certain cancers. Recent studies have noted an association between port wine birthmarks and childhood cancer, so newborns with these lesions should be monitored with periodic eye examinations, neurologic imaging, and extremity measurements (Johnson et al., 2007). Pulsed dye laser surgery has been used to remove larger lesions with some success (AAP, 2007b).

Nevus vasculosus, also called a strawberry mark or strawberry hemangioma, is a benign capillary hemangioma in the dermal and subdermal layers. It is raised, rough, dark red, and sharply demarcated (see Fig. 18.10F). It is commonly found in the head region within a few weeks after birth and can increase in size or number. Commonly seen in premature infants weighing less than 1,500 g (Kenner & Lott, 2007), these hemangiomas tend to resolve by age 3 without any treatment.

Head

Head size varies with age, gender, and ethnicity and has a general correlation with body size. Inspect a newborn's head from all angles. The head should appear symmetric and round. As many as 90% of the congenital malformations present at birth are visible on the head and neck, so careful assessment is very important (AAP, 2007a).

The newborn has two fontanels at the juncture of the cranial bones. The anterior fontanel is diamond-shaped and closes by 18 to 24 months. Typically it measures 4 to 6 cm at the largest diameter (bone to bone). The posterior one is triangular, smaller than the anterior fontanel (usually fingertip size or 0.5 to 1 cm), and closes by 6 to 12 weeks. Palpate both fontanels, which should be soft, flat, and open. Then palpate the skull. It should feel smooth and fused, except at the area of the fontanels. Also assess the size of the head and the anterior and posterior fontanels, and compare them with appropriate standards.

Variations in Head Size and Appearance

During inspection and palpation, be alert for common variations that may cause asymmetry. These include caput succedaneum, cephalhematoma, and molding.

Molding is the elongated shaping of the fetal head to accommodate passage through the birth canal (Fig. 18.11). It occurs with a vaginal birth from a vertex position in which elongation of the fetal head occurs with prominence of the occiput and overriding sagittal suture line. It typically resolves within a week after birth without intervention.

Caput succedaneum describes localized edema on the scalp that occurs from the pressure of the birth process. It is commonly observed after prolonged labor. Clinically, it appears as a poorly demarcated soft tissue swelling that crosses suture lines. Pitting edema and overlying petechiae and ecchymosis are noted (Fig. 18.12A). The swelling will gradually dissipate in about 3 days without any treatment. Newborns who were delivered via vacuum extraction usually have a caput in the area where the cup was used.

FIGURE 18.11 Molding in a newborn's head.

Cephalhematoma is a localized effusion of blood beneath the periosteum of the skull. This condition is due to disruption of the vessels during birth. It occurs after prolonged labor and use of obstetric interventions such as low forceps or vacuum extraction. The clinical features include a well-demarcated, often fluctuant swelling with no overlying skin discoloration. The swelling does not cross suture lines and is firmer to the touch than an edematous area (see Fig. 18.12B). Cephalhematoma usually appears on the second or third day after birth and disappears within weeks or months (Simonson et al., 2007).

Common Abnormalities in Head or Fontanel Size

Common abnormalities in head or fontanel size that may indicate a problem include:

- Microcephaly—a head circumference more than 2 standard deviations below average or less than 10% of normal parameters for gestational age, caused by failure of brain development (Cohen, 2007). It can be familial, with autosomal dominant or recessive inheritance, and it may be associated with infections (cytomegalovirus) and syndromes such as trisomy 13 and 18, and fetal alcohol syndrome (Kenner & Lott, 2007).

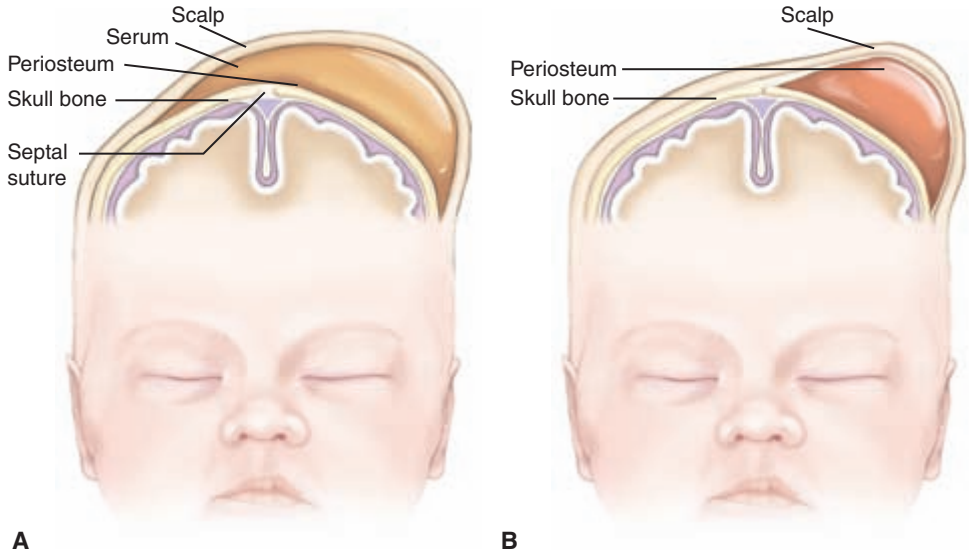

FIGURE 18.12 (**A**) Caput succedaneum involves the collection of serous fluid and often crosses the suture line. (**B**) Cephalhematoma involves the collection of blood and does not cross the suture line.

- Macrocephaly—a head circumference more than 90% of normal, typically related to hydrocephalus (Dillon, 2007). It is often familial (with autosomal dominant inheritance) and can be either an isolated anomaly or a manifestation of other anomalies, including hydrocephalus and skeletal disorders (achondroplasia).
- Large fontanels—more than 6 cm in the anterior diameter bone to bone or more than a 1-cm diameter in the posterior fontanel; possibly associated with malnutrition, hydrocephaly, congenital hypothyroidism, trisomies 13, 18, and 21, and various bone disorders such as osteogenesis imperfecta
- Small or closed fontanels—smaller-than-normal anterior and posterior diameters or fontanels that are closed at birth; associated with microcephaly or premature synostosis (union of two bones by osseous material) (Blackburn, 2007)

Face

Observe the newborn's face for fullness and symmetry. The face should have full cheeks and should be symmetric when the baby is resting and crying. If forceps were used during birth, the newborn may have bruising and reddened areas over both cheeks and parietal bones secondary to the pressure of the forceps blades. Reassure the parents that this resolves without treatment, and point out improvement each day.

Problems with the face can also involve facial nerve paralysis caused by trauma from the use of forceps. Paralysis is usually apparent on the first or second day of life. Typically, the newborn will demonstrate asymmetry of the face with the inability to close the eye and move the lips on the affected side. Newborns with facial nerve paralysis have difficulty making a seal around the nipple, and consequently milk or formula drools from the paralyzed side of the mouth. Most facial nerve palsies resolve spontaneously within days, although full recovery may require weeks to months. Attempt to determine the cause from the newborn's history.

Nose

Inspect the nose for size, symmetry, position, and lesions. The newborn's nose is small and narrow. The nose should have a midline placement, patent nares, and an intact septum. The nostrils should be of equal size and should be patent. A slight mucus discharge may be present, but there should be no actual drainage. The newborn is a preferential nose breather and will use sneezing to clear the nose if needed. The newborn can smell after the nasal passages are cleared of amniotic fluid and mucus (AAP, 2007a).

Mouth

Inspect the newborn's mouth, lips, and interior structures. The lips should be intact with symmetric movement and positioned in the midline; there should not be any lesions. Inspect the lips for pink color, moisture, and cracking. The lips should encircle the examiner's finger to form a vacuum. Variations involving the lip might include cleft upper lip (separation extending up to the nose) or thin upper lip associated with fetal alcohol syndrome.

Assess the inside of the mouth for alignment of the mandible, intact soft and hard palate, sucking pads inside the cheeks, a midline uvula, a free-moving tongue, and working gag, swallow, and sucking reflexes. The mucous membranes lining the oral cavity should be pink and moist, with minimal saliva present.

Normal variations might include Epstein's pearls (small, white epidermal cysts on the gums and hard palate

that disappear in weeks), erupted precocious teeth that may need to be removed to prevent aspiration, and thrush (white plaque inside the mouth caused by exposure to *Candida albicans* during birth), which cannot be wiped away with a cotton-tipped applicator.

Eyes

Inspect the external eye structures, including the eyelids, lashes, conjunctiva, sclera, iris, and pupils, for position, color, size, and movement. There may be marked edema of the eyelids and subconjunctival hemorrhages due to pressure during birth. The eyes should be clear and symmetrically placed. Test the blink reflex by bringing an object close to the eye; the newborn should respond quickly by blinking. Also test the newborn's pupillary reflex: pupils should be equal, round, and reactive to light bilaterally. Assess the newborn's gaze: he or she should be able to track objects to the midline. Movement may be uncoordinated during the first few weeks of life. Many newborns have transient strabismus (deviation or wandering of eyes independently) and searching nystagmus (involuntary repetitive eye movement), which is caused by immature muscular control. These are normal for the first 3 to 6 months of age.

Examine the internal eye structures. A red reflex (luminous red appearance seen on the retina) should be seen bilaterally on retinoscopy. The red reflex normally shows no dullness or irregularities.

Chemical conjunctivitis commonly occurs within 24 hours of instillation of eye prophylaxis after birth. There is lid edema with sterile discharge from both eyes. Usually it resolves within 48 hours without treatment.

Ears

Inspect the ears for size, shape, skin condition, placement, amount of cartilage, and patency of the auditory canal. The ears should be soft and pliable and should recoil quickly and easily when folded and released. Ears should be aligned with the outer canthi of the eyes. Low-set ears are characteristic of many syndromes and genetic abnormalities, such as trisomy 13 and 18, and internal organ abnormalities involving the renal system.

An otoscopic examination is not typically done because the newborn's ear canals are filled with amniotic fluid and vernix caseosa, which would make visualization of the tympanic membrane difficult.

Newborn hearing screening is required by law in most states (discussed later in the chapter). Hearing loss is the most common birth defect in the United States: One in 1,000 newborns is profoundly deaf and 2 to 3 in 1,000 have partial hearing loss (Wrightson, 2007). Delays in identification and intervention may affect the child's cognitive, verbal, behavioral, and emotional development. Screening at birth has reduced the age at which newborns with hearing loss are identified and has improved early intervention rates dramatically (AAP, 2007b). Prior to universal newborn screening, children were usually older than 2 years before significant congenital hearing loss was detected; by this time it had already affected their speech and language skills (USPSTF, 2006).

Causes of hearing loss can be conductive, sensorineural, or central. Risk factors for congenital hearing loss include cytomegalovirus infection and preterm birth necessitating a stay in the neonatal intensive care unit.

To assess for hearing ability generally, observe the newborn's response to noises and conversations. The newborn typically turns toward these noises and startles with loud ones.

Neck

Inspect the newborn's neck for movement and ability to support the head. The newborn's neck will appear almost nonexistent because it is so short. Creases are usually noted. The neck should move freely in all directions and should be capable of holding the head in a midline position. The newborn should have enough head control to be able to hold it up briefly without support. Report any deviations such as restricted neck movement or absence of head control.

Also inspect the clavicles, which should be straight and intact. The clavicles are the bones mostly commonly broken in infants, especially large ones. In most cases, the fractured clavicle is asymptomatic, but decreased or absent movement and pain or tenderness on movement of the arm on the affected side may be noted (Kenner & Lott, 2007). Treatment involves immobilization and minimizing pain.

Chest

Inspect the newborn's chest for size, shape, and symmetry. The newborn's chest should be round, symmetric, and 2 to 3 cm smaller than the head circumference. The xiphoid process may be prominent at birth, but it usually becomes less apparent when adipose tissue accumulates. Nipples may be engorged and may secrete a white discharge. This discharge, which occurs in both boys and girls, is a result of exposure to high levels of maternal estrogen while in utero. This enlargement and milky discharge usually dissipates within a few weeks. Some newborns may have extra nipples, called supernumerary nipples. They are typically small, raised, pigmented areas vertical to the main nipple line, 5 to 6 cm below the normal nipple (AAP, 2007a). They tend to be familial and do not contain glandular tissue. Reassure parents that these extra small nipples are harmless.

The newborn chest is usually barrel-shaped with equal anteroposterior and lateral diameters, and symmetric. Auscultate the lungs bilaterally for equal breath sounds. Normal breath sounds should be heard, with little difference between inspiration and expiration. Fine crackles can be heard on inspiration soon after birth as a result of clearing amniotic fluid from the lungs. Diminished breath sounds might indicate atelectasis, effusion, or poor respiratory effort (Dillon, 2007).

Listen to the heart when the newborn is quiet or sleeping. S1 and S2 heart sounds are accentuated at birth. The point of maximal impulse (PMI) is a lateral to midclavicular line located at the fourth intercostal space. A displaced PMI may indicate tension pneumothorax or cardiomegaly. Murmurs are often heard and are usually benign, but if present after the first 12 hours of life should be evaluated to rule out a cardiac disorder (Kliegman et al., 2007).

Abdomen

Inspect the abdomen for shape and movement. Typically the newborn's abdomen is protuberant but not distended. This contour is a result of the immaturity of the abdominal muscles. Abdominal movements are synchronous with respirations because newborns are, at times, abdominal breathers.

Auscultate bowel sounds in all four quadrants and then palpate the abdomen for consistency, masses, and tenderness. Perform auscultation and palpation systematically in a clockwise fashion until all four quadrants have been assessed. Palpate gently to feel the liver, the kidneys, and any masses. The liver is normally palpable 1 to 3 cm below the costal margin in the midclavicular line. The kidneys are 1 to 2 cm above and to both sides of the umbilicus. Normal findings would include bowel sounds in all four quadrants and no masses or tenderness on palpation. Absent or hyperactive bowel sounds might indicate an intestinal obstruction. Abdominal distention might indicate ascites, obstruction, infection, masses, or an enlarged abdominal organ (Cohen, 2007).

Inspect the umbilical cord area for the correct amount of blood vessels (two arteries and one vein). The umbilical vein is larger than the two umbilical arteries. Evidence of only a single umbilical artery is associated with renal and gastrointestinal anomalies. Also inspect the umbilical area for signs of bleeding, infection, granuloma, or abnormal communication with the intra-abdominal organs (Walsh, 2007).

Genitalia

Inspect the penis and scrotum in the male. In the circumcised male newborn, the glans should be smooth, with the meatus centered at the tip of the penis. It will appear reddened until it heals. For the uncircumcised male, the foreskin should cover the glans. Check the position of the urinary meatus: it should be in the midline at the glans tip. If it is on the ventral surface of the penis, hypospadias is present; if it is on the dorsal surface of the penis, it is termed epispadias. In either case, circumcision should be avoided until further evaluation.

Inspect the scrotum for size, symmetry, color, presence of rugae, and location of testes. The scrotum usually appears relatively large and should be pink in white neonates and dark brown in neonates of color. Rugae should be well formed and should cover the scrotal sac. There should not be bulging, edema, or discoloration (Fig. 18.13A).

FIGURE 18.13 Newborn genitalia. (**A**) Male genitalia. Note the darkened color of the scrotum. (**B**) Female genitalia.

Palpate the scrotum for evidence of the testes, which should be in the scrotal sac. The testes should feel firm and smooth and should be of equal size on both sides of the scrotal sac in the term newborn. Undescended testes (cryptorchidism) might be palpated in the inguinal canal in preterm infants; they can be unilateral or bilateral. If the testes are not palpable within the scrotal sac, further investigation is needed.

In the female newborn, inspect the external genitalia. The urethral meatus is located below the clitoris in the midline (Dillon, 2007). In contrast to the male genitalia, the female genitalia will be engorged: the labia majora and minora may both be edematous. The labia majora is large and covers the labia minora. The clitoris is large and the hymen is thick. These findings are due to the maternal hormones estrogen and progesterone (see Fig. 18.13B). A vaginal discharge composed of mucus mixed with blood may also be present during the first few weeks of life. This discharge, called **pseudomenstruation**, requires no treatment. Explain this phenomenon to the parents.

Variations in female newborns may include a labial bulge, which might indicate an inguinal hernia; ambiguous genitalia; a rectovaginal fistula with feces present in the vagina; and an imperforate hymen.

Inspect the anus in both male and female newborns for position and patency. Passage of meconium indicates patency. If meconium is not passed, a lubricated rectal thermometer can be inserted or a digital examination can be performed to determine patency. Abnormal findings would include anal fissures or fistulas and no meconium passed within 24 hours after birth.

Extremities and Back

Inspect the newborn's upper extremities for appearance and movement. Inspect the hands for shape, number, and position of fingers and presence of palmar creases. The newborn's arms and hands should be symmetric and should move through range of motion without hesitation. Observe for spontaneous movement of the extremities. Each hand should have five digits. Note any extra digits (polydactyly) or fusing of two or more digits (syndactyly). Most newborns have three palmar creases on the hand. A single palmar crease, called a simian line, is frequently associated with Down syndrome.

A brachial plexus injury can occur during a difficult birth involving shoulder dystocia. Erb's palsy is an injury resulting from damage to the upper plexus during labor and birth. The affected arm hangs limp alongside the body, and the affected shoulder and arm are adducted, extended, and internally rotated with a pronated wrist. The Moro reflex is absent on the affected side in brachial palsy. Complete recovery may take 3 to 6 months (Adegbehingbe et al., 2007).

Assess the lower extremities in the same manner. They should of equal length, with symmetric skin folds. Inspect the feet for clubfoot (a turning-inward position), which is secondary to intrauterine positioning. This may be positional or structural. Perform the Ortolani and Barlow maneuvers to identify congenital hip dislocation, commonly termed developmental dysplasia of the hip (DDH). Nursing Procedure 18.1 highlights the steps for performing these maneuvers.

Inspect the back. The spine should appear straight and flat and should be easily flexed when the baby is held in a prone position. Observe for the presence of a tuft of

Nursing Procedure 18.1

Performing Ortolani and Barlow Maneuvers

Purpose: To Detect Congenital Developmental Dysplasia of the Hip

Ortolani Maneuver

1. Place the newborn in the supine position and flex the hips and knees to 90 degrees at the hip.
2. Grasp the inner aspect of the thighs and abduct the hips (usually to approximately 180 degrees) while applying upward pressure.


A

3. Listen for any sounds during the maneuver. There should be no "cluck" or "click" heard when the legs are abducted. Such a sound indicates the femoral head hitting the acetabulum as the head re-enters the area. This suggests developmental hip dysplasia.

Barlow Maneuver

1. With the newborn still lying supine and grasping the inner aspect of the thighs (as just mentioned), adduct the thighs while applying outward and downward pressure to the thighs.


B

2. Feel for the femoral head slipping out of the acetabulum; also listen for a click (Dillon, 2007).

hair, a pilonidal dimple in the midline, a cyst, or a mass along the spine. These abnormal findings should be documented and reported to the primary health care provider.

Table 18.3 summarizes the newborn assessment.

Neurologic Status

Assess the newborn's state of alertness, posture, muscle tone, and reflexes.

Newborn Alertness, Posture, and Muscle Tone

The newborn should be alert and not persistently lethargic. The normal posture is hips abducted and partially flexed, with knees flexed. Arms are adducted and flexed at the elbow. Fists are often clenched, with fingers covering the thumb.

To assess for muscle tone, support the newborn with one hand under the chest. Observe how the neck muscles hold the head. The neck extensors should be able to hold the head in line briefly. There should be only slight head lag when pulling the newborn from a supine position to a sitting one.

Newborn Reflexes

Assess the newborn's reflexes to evaluate neurologic function and development. Absent or abnormal reflexes in a newborn, persistence of a reflex past the age when the reflex is normally lost, or return of an infantile reflex in an older child or adult may indicate neurologic pathology (Table 18.4). Reflexes commonly assessed in the newborn include sucking, Moro, stepping, tonic neck, root-

TABLE 18.3 NEWBORN ASSESSMENT SUMMARY

Assessment	Usual Findings	Variations and Common Problems
Anthropometric measurements	Head circumference: 33–37 cm (13–14 in) Chest circumference: 30–33 cm (12–13 in) Weight: 2,500–4,000 g (5.5–8.5 lb) Length: 45–55 cm (19–21 in)	SGA, LGA, preterm, postterm
Vital signs	Temperature: 36.5°–37.5°C (97°–99°F) Apical pulse: 120–160 bpm Respirations: 30–60 breaths/minute	
Skin	Normal: smooth, flexible, good skin turgor, warm	Jaundice, acrocyanosis, milia, Mongolian spots, stork bites
Head	Normal: varies with age, gender, ethnicity	Microcephaly, macrocephaly, enlarged fontanels
Face	Normal: full cheeks, facial features symmetric	Facial nerve paralysis, nevus flammeus, nevus vasculosus
Nose	Normal: small, placement in the midline and narrow, ability to smell	Malformation or blockage
Mouth	Normal: aligned in midline, symmetric, intact soft and hard palate	Epstein's pearls, erupted precocious teeth, thrush
Neck	Normal: short, creased, moves freely, baby holds head in midline	Restricted movement, clavicular fractures
Eyes	Normal: clear and symmetrically placed on face	Chemical conjunctivitis, subconjunctival hemorrhages
Ears	Normal: soft and pliable with quick recoil when folded and released	Low-set ears, hearing loss
Chest	Normal: round, symmetric, smaller than head	Nipple engorgement, whitish discharge
Abdomen	Normal: protuberant contour, soft, three vessels in umbilical cord	Distended, only two vessels in umbilical cord
Genitals	Normal male: smooth glans, meatus centered at tip of penis Normal female: swollen female genitals as a result of maternal estrogen	Edematous scrotum in males, vaginal discharge in females
Extremities and spine	Normal: extremities symmetric with free movement	Congenital hip dislocation; tuft or dimple on spine

TABLE 18.4 NEWBORN REFLEXES: APPEARANCE AND DISAPPEARANCE

Reflex	Appearance	Disappearance
Blinking	Newborn	Persists into adulthood
Moro	Newborn	3–6 mo
Grasp	Newborn	3–4 mo
Stepping	Birth	1–2 mo
Tonic neck	Newborn	3–4 mo
Sneeze	Newborn	Persists into adulthood
Rooting	Birth	4–6 mo
Gag reflex	Newborn	Persists into adulthood
Cough reflex	Newborn	Persists into adulthood
Babinski sign	Newborn	12 mo

ing, Babinski, and palmar grasp reflex. Spinal reflexes tested include truncal incurvation (Galant reflex) and anocutaneous reflex (anal wink).

The sucking reflex is elicited by gently stimulating the newborn's lips by touching them. The newborn will typically open the mouth and begin a sucking motion. Placing a gloved finger in the newborn's mouth will also elicit a sucking motion (Fig. 18.14A).

The Moro reflex, also called the embrace reflex, occurs when the neonate is startled. To elicit this reflex, place the newborn on his or her back. Support the upper body weight of the supine newborn by the arms, using a lifting motion, without lifting the newborn off the surface. Then release the arms suddenly. The newborn will throw the arms outward and flex the knees; the arms then return to the chest. The fingers also spread to form a C. The newborn initially appears startled and then relaxes to a normal resting position (see Fig. 18.14B).

Assess the stepping reflex by holding the newborn upright and inclined forward with the soles of the feet touching a flat surface. The baby should make a stepping motion or walking, alternating flexion and extension with the soles of the feet (see Fig. 18.14C).

The tonic neck reflex resembles the stance of a fencer and is often called the fencing reflex. Test this reflex by having the newborn lie on the back. Turn the baby's head to one side. The arm toward which the baby is facing should extend straight away from the body with the hand partially open, whereas the arm on the side away from the face is flexed and the fist is clenched tightly. Reversing the direction to which the face is turned reverses the position (see Fig. 18.14D).

Elicit the rooting reflex by stroking the newborn's cheek. The newborn should turn toward the side that was stroked and should begin to make sucking movements (see Fig. 18.14E).

The Babinski reflex should be present at birth and disappears at approximately 1 year of age. It is elicited by stroking the lateral sole of the newborn's foot from the heel toward and across the ball of the foot. The toes should fan out. A diminished response indicates a neurologic problem and needs follow-up (see Fig. 18.14F).

The newborn exhibits two grasp reflexes: palmar grasp and plantar grasp. Elicit the palmar grasp reflex by placing a finger on the newborn's open palm. The baby's hand will close around the finger. Attempting to remove the finger causes the grip to tighten. Newborns have strong

FIGURE 18.14 Newborn reflexes. (**A**) Sucking reflex. (**B**) Moro reflex. *(continued)*

FIGURE 18.14 (continued) (**C**) Stepping reflex. (**D**) Tonic neck reflex. (**E**) Rooting reflex. (**F**) Babinski reflex. *(continued)*

FIGURE 18.14 (continued) (**G**) Palmar grasp. (**H**) Plantar grasp.

grasps and can almost be lifted from a flat surface if both hands are used. The grasp should be equal bilaterally (see Fig. 18.14G).

The plantar grasp is similar to the palmar grasp. Place a finger just below the newborn's toes. The toes typically curl over the finger (see Fig. 18.14H).

Blinking, sneezing, gagging, and coughing are all protective reflexes and are elicited when an object or light is brought close to the eye (blinking), something irritating is swallowed or a bulb syringe is used for suctioning (gagging and coughing), or an irritant is brought close to the nose (sneezing).

The truncal incurvation reflex (Galant reflex) is present at birth and disappears in a few days to 4 weeks. With the newborn in a prone position or held in ventral suspension, apply firm pressure and run a finger down either side of the spine. This stroking will cause the pelvis to flex toward the stimulated side. This indicates T2–S1 innervation. Lack of response indicates a neurologic or spinal cord problem.

The anocutaneous reflex (anal wink) is elicited by stimulating the perianal skin close to the anus. The external sphincter will constrict (wink) immediately with stimulation. This indicates S4–5 innervation (Kenner & Lott, 2007).

Nursing Interventions

Developing confidence to care for their newborn is challenging for most couples. It takes time and patience and a great deal of instruction provided by the nurse. "Showing and telling" parents about their newborn and all the procedures (e.g., feeding, bathing, changing, handling) involved in daily care are key nursing interventions.

Providing General Newborn Care

Generally, newborn care involves bathing and hygiene, diaper care, cord care, circumcision care, use of appropriate clothing, environmental safety measures, and prevention of infection. Nurses should teach these skills to parents and should serve as role models for appropriate and consistent interaction with newborns. Demonstrating respect for the newborn and family helps foster a positive atmosphere to promote the newborn's growth and development.

Bathing and Hygiene

Immediately after birth, drying the newborn and removing blood may minimize the risk of infection caused by hepatitis B, herpesvirus, and HIV, but the specific benefits of this practice remain unclear. Until the newborn has been thoroughly bathed, standard precautions should be used when handling the newborn.

Newborns are bathed primarily for aesthetic reasons, and bathing is postponed until thermal and cardiorespiratory stability is ensured. Traditional reasons why nurses bathe the newborn are so they can conduct a physical assessment, reduce the effect of hypothermia, and allow the mother to rest (Cohen, 2007). However, recent research suggests that nurses do not need to give the newborn an initial bath to reduce heat loss; rather, the parents could be given this opportunity, supported by nurses. A study found that the amount of heat loss was similar in newborns bathed by parents versus newborns who were bathed by nurses (Walsh, 2007).

Wear gloves, because of potential exposure to maternal blood on the newborn, and perform the bath quickly, drying the baby thoroughly to prevent heat loss by evaporation. Move from the "cleanest" area (the eyes) to the most soiled area (the diaper area) to prevent cross-contamination.

Use plain warm water on the face and eyes, adding a mild soap (e.g., Dove) to cleanse the remainder of the body. Instruct the parents to wash the face and neck gently after each feeding to prevent rashes and to prevent the odor that can develop when milk accumulates in the neck creases.

Wash the hair using running water so that the scalp can be thoroughly rinsed. A mild shampoo or soap can be used. Wash both fontanel areas. Frequently parents avoid these "soft spots" because they fear that they will "hurt the baby's brain" if they rub too hard. Reassure parents that there is a strong membrane providing protection. Urge the parents to clean and rinse these areas well. If the anterior fontanel is not rinsed well after shampooing, cradle cap (dry flakes on the scalp) can develop. In Figure 18.15, the nurse is showing the father how to bathe his newborn.

After bathing, place the newborn under the radiant warmer and wrap him or her securely in blankets to prevent chilling. Check the baby's temperature within an hour to make sure it is within normal limits. If it is low, place the newborn under a radiant heat source again.

The literature suggests that tub bathing for the first bath, as opposed to sponge bathing, can be done without significantly lowering the newborn's temperature or increasing rates of cord infection in healthy term newborns (AAP, 2007c).

After the initial bath, the newborn may not receive another full one during the stay in the birthing unit. The diaper area will be cleansed at each diaper change, and any milk spilled will be cleaned. Clear water and a mild soap are appropriate to cleanse the diaper area. The use of lotions, baby oil, and powders is not encouraged because oils and lotions can lead to skin irritation and can cause rashes. Powders should not be used because they can be inhaled, causing respiratory distress. If the parents want to use oils and lotions, have them apply a small amount onto their hand first, away from the newborn; this warms the lotion. Then the parents should apply the lotion or oil sparingly.

Instruct parents that a bath two or three times weekly is sufficient for the first year; more frequent bathing may dry the skin. Parents should not fully immerse the newborn into water until the umbilical cord area is healed—up to 2 weeks after birth. Encourage parents to give the infant a sponge bath until the umbilical cord falls off and the navel area is healed completely. If the newborn has been circumcised, advise parents to wait until that area has also healed (usually 1 to 2 weeks). Until then, clean the penis with mild soap and water and apply a small amount of Vaseline to the tip to prevent the diaper from adhering to the penis. Instruct parents to apply the diaper loosely and place the newly circumcised male infant on his side or back to prevent pressure and irritation on the penis.

Encourage the parents to gather all items needed before starting the bath: a soft, clean washcloth; two cotton balls to clean the eyes; mild, unscented soap and shampoo; towels or blankets; a tub or basin with warm water; a clean diaper; and a change of clothes. Other guidelines for bathing newborns are given in Teaching Guidelines 18.1.

FIGURE 18.15 The nurse demonstrates bathing a newborn while the father watches.

Elimination and Diaper Area Care

Newborn elimination patterns are highly individualized. Usually the urine is light amber in color. Soaking 6 to 12 diapers a day indicates adequate hydration. Stools can

TEACHING GUIDELINES 18.1

Bathing a Newborn

- Select a warm room with a flat surface at a comfortable working height.
- Before the bath, gather all supplies needed so they will be within reach.
- Never leave the newborn alone or unattended at any time during the bath.
- Undress the newborn down to shirt and diaper.
- Always support the newborn's head and neck when moving or positioning him or her.
- Place a blanket or towel underneath the newborn for warmth and comfort.
- In this order, progressing from the cleanest to the dirtiest areas:
  - Wipe eyes with plain water, using either cotton balls or a washcloth. Wipe from the inner corner of the eyes to the outer with separate wipes.
  - Wash the rest of the face, including ears, with plain water.
  - Using baby shampoo, gently wash the hair and rinse with water.
  - Pay special attention to body creases, and dry thoroughly.
  - Wash extremities, trunk, and back. Wash, rinse, dry, cover.
  - Wash diaper area last, using soap and water, and dry; observe for rash.
- Put on a clean diaper and clean clothes after the bath.

change in color, texture, and frequency without signaling a problem. Meconium is passed for the first 48 hours after birth; the stools appear thick, tarry, sticky, and dark green. Transitional stools (thin, brown to green, less sticky than meconium) typically appear by day 3 after initiation of feeding. The stool characteristics after transitional stool depend on whether the newborn is breast-fed or bottle-fed. Breast-fed newborns typically pass mustard-colored, soft stool with a seedy consistency; formula-fed newborns pass yellow to brown, formed stool with a pasty consistency. As long as the newborn seems content, is eating normally, and shows no signs of illness, minor changes in bowel movements should not be a concern.

The newborn needs to be checked frequently to see whether a diaper change is needed, especially after feeding. Adhere to standard precautions when providing diaper area care. Instruct parents to keep the top edge of the diaper below the umbilical cord area to prevent irritation and to allow air to help dry the cord.

Meconium can be difficult to remove from the skin. Use plain water or special cleansing wipes if necessary to clean the area. Teach parents how to clean the diaper area properly and how to prevent skin irritation. Encourage them to avoid products such as powder and fragranced items, which could be irritating.

Discuss the pros and cons of using cloth diapers versus disposable diapers so that the parents can make informed decisions. Regardless of the type of diapers used, up to 10 diapers a day, or about 70 a week, will be needed.

Additional information about diapering might include:

- Before diapering, make sure all supplies are within reach, including clean diaper, cleaning agent or wipes, and ointment.
- Lay the newborn on a changing table and remove the dirty diaper.
- Use water and mild soap or wipes to gently wipe the genital area clean; wipe from front to back for girls to avoid urinary tract infections.
- Wash your hands thoroughly before and after changing diapers.

While performing diaper area care, parents should observe the area closely for irritation or rash. Tips for preventing or healing a diaper rash include:

- Change diapers frequently, especially after bowel movements.
- Apply a "barrier" cream, such as A & D ointment, after cleaning with mild soap and water.
- Use dye- and fragrance-free detergents to wash cloth diapers.
- Avoid the use of plastic pants, because they tend to hold in moisture.
- Expose the newborn's bottom to air several times a day.
- Place the newborn's buttocks in warm water after he or she had a diaper on all night.

▶ *Take* NOTE!

Advise parents that a rash that persists for more than 3 days may be fungal in origin and may require additional treatment. Encourage the parents to notify the health care provider.

Cord Care

The umbilical cord begins drying within hours after birth and is shriveled and blackened by the second or third day. Within 7 to 10 days, it sloughs off and the umbilicus heals. During this transition, frequent assessments of the area are necessary to detect any bleeding or signs of infection. Cord bleeding is abnormal and may occur if the cord clamp is loosened. Any cord drainage is also abnormal and is generally caused by infection, which requires immediate treatment.

To protect the cord area during each diaper change, apply the appropriate agent (e.g., triple dye, alcohol, or an antimicrobial agent), according to facility policy, to the cord stump to prevent any ascending infections. Single-use agents for cleaning are recommended to prevent cross-contamination with other newborns. Expect to remove the cord clamp approximately 24 hours after birth by using a cord-cutting clamp. However, if the cord is still moist, keep the clamp in place and ensure a referral to home health care so that the home care nurse can remove it after discharge. Always adhere to agency policies regarding cord care; changes in policy may be necessary based on new research findings.

Many parents avoid contact with the cord site to make sure they don't "bother" it. Teach them how to care for the cord site when they go home to prevent complications (Teaching Guidelines 18.2).

Circumcision Care

Circumcision is the surgical removal of all or part of the foreskin (prepuce) of the penis (AAP, 2007c). This has been traditionally done for hygiene and medical reasons and is the oldest known religious rite. In the Jewish faith, circumcision is a ritual that is performed by a *mohel* (ordained circumciser) on the eighth day after birth if possible. The circumcision is followed by a religious ceremony during which the newborn is named.

There are three commonly used methods of circumcision: the Gomco clamp, the Plastibell device, and the Mogen clamp. During the circumcision procedure, part of the foreskin is removed by clamping and cutting with a scalpel (Gomco or Mogen clamp) or by using a Plastibell. The Plastibell is fitted over the glans, and the excess foreskin is pulled over the plastic ring. A suture is tied around the rim to apply pressure to the blood vessels, creating hemostasis. The excess foreskin is cut away. The plastic rim remains in place until healing occurs.

TEACHING GUIDELINES 18.2

Umbilical Cord Care

- Observe for bleeding, redness, drainage, or foul odor from the cord stump and report it to your newborn's primary care provider immediately.
- Avoid tub baths until the cord has fallen off and the area has healed.
- Expose the cord stump to the air as much as possible throughout the day.
- Fold diapers below the level of the cord to prevent contamination of the site and to promote air-drying of the cord.
- Observe the cord stump, which will change color from yellow to brown to black. This is normal.
- Never pull the cord or attempt to loosen it; it will fall off naturally.

The plastic ring typically loosens and falls off in approximately 1 week (Kenner & Lott, 2007) (Fig. 18.16).

The debate over routine newborn circumcision continues in the United States. For many years, the purported benefits and harms of circumcision have been debated in the medical literature and society at large, with no clear consensus to date. Despite the controversy, circumcision is the most common surgical procedure performed on newborns, and almost two thirds of American male newborns are circumcised (Cunningham et al., 2005).

A policy statement by the AAP indicates that newborn circumcision has potential disadvantages and risks as well as medical benefits and advantages. Risks to the newborn include infection, hemorrhage, skin dehiscence, adhesions, urethral fistula, and pain. Benefits to the newborn include the following:

- Urinary tract infections are slightly less common in circumcised boys; however, rates are low in both circumcised and uncircumcised boys and are easily treated without long-term sequelae.
- Sexually transmitted infections are less common in circumcised males, but the risk is believed to be related more to behavioral factors than to circumcision status. However, circumcised males have a 50% lower risk of acquiring HIV infection (Ridings & Amaya, 2007).
- There appears to be a slightly lower rate of penile cancer in circumcised males; however, penile cancer is rare and risk factors such as genital warts, infection with human papillomavirus (HPV), multiple sex partners, and cigarette smoking seem to play a much larger role in causing penile cancer than circumcision status (Kliegman et al., 2007).

The new AAP recommendations state that if parents decide to circumcise their newborn, pain relief must be provided. Research has found that newborns circumcised without analgesia experience pain and stress, indicated by changes in heart rate, blood pressure, oxygen saturation, and cortisol levels (Ridings & Amaya, 2007). Analgesic methods may include EMLA cream (a topical mixture of local anesthetics), a dorsal penile nerve block with buffered lidocaine, acetaminophen, a sucrose pacifier, and swaddling (Cunningham et al., 2005).

The AAP recommends that parents be given accurate and unbiased information about the risks and benefits of circumcision. As with other newborn procedures, research continues. Nurses must keep informed about current medical research to allow parents to make informed decisions. The absence of compelling medical evidence in favor of or against newborn circumcision makes informed consent of parents of paramount importance. The circumcision discussion involves cultural, religious, medical, and emotional considerations. Nurses may have difficulty remaining unbiased and unemotional as they present the facts to parents. Circumcision is a very personal decision for parents, and the nurse's major responsibility is to inform the parents of the risks and benefits of the pro-

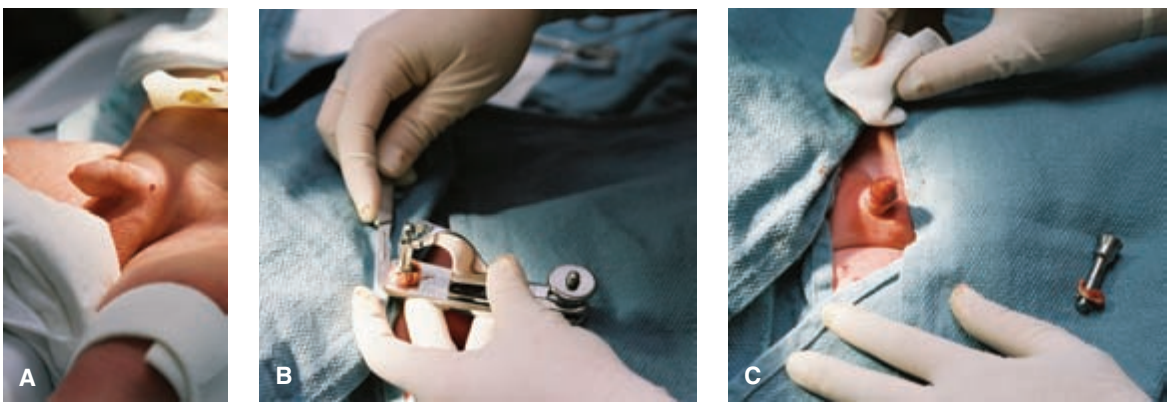

FIGURE 18.16 Circumcision. (**A**) Before the procedure. (**B**) Clamp applied and foreskin removed. (**C**) Appearance after circumcision.

cedure and to address concerns so that the parents can reach a fully informed decision.

▶ *Take* NOTE!

The decision to circumcise the male newborn is often a social one, with the strongest factor being whether the newborn's father is himself circumcised (AAP, 2007).

Immediately after circumcision, the tip of the penis is usually covered with petroleum jelly-coated gauze to keep the wound from sticking to the diaper. Continued care of this site includes:

- Assess for bleeding every 30 minutes for at least 2 hours.
- Document the first voiding to evaluate for urinary obstruction or edema.
- Squeeze soapy water over the area daily and then rinse with warm water. Pat dry.
- Apply a small amount of petroleum jelly with every diaper change if the Plastibell was used; clean with mild soap and water if other techniques were used.
- Fasten the diaper loosely over the penis and avoiding placing the newborn on his abdomen to prevent friction.

If a Plastibell has been used, it will fall off by itself in about a week. Inform parents of this and advise them not to pull it off sooner. Also instruct the parents to check daily for any foul-smelling drainage, bleeding, or unusual swelling.

If the newborn is uncircumcised, wash the penis with mild soap and water after each diaper change and do not force the foreskin back; it will retract normally over time.

Safety

Newborns are completely dependent on those around them to ensure their safety. Their safety must be ensured while in the health care facility and after they are discharged. Parental education is key, especially as the newborn grows and develops and begins to respond to and explore his or her surroundings (Teaching Guidelines 18.3).

Environmental Safety

People who enter a health care facility for treatment expect to be safe there until they return home, but ensuring a safe environment can be a daunting challenge to a health care facility.

Consider this scenario: A woman dressed in nurse's clothing entered the hospital room of a new mother soon after she had given birth. This "nurse" told the mother she needed to take her newborn to the nursery to have him weighed. Sometime later, a staff nurse making her routine rounds realized something was wrong when she saw that the newborn's bassinet in the mother's room was empty and the mother was sound asleep in her bed. The staff nurse called security immediately because she suspected that a newborn abduction had taken place.

This is a typical abduction scenario that is repeated many times throughout the United States each year. In **infant abduction**, someone who is not a family member takes a child less than 1 year old (Cohen, 2007). Infant abductions are traumatic for the parents, the community, and the health care facility. The facility may also face huge financial liability if a lawsuit is filed by the parents.

Abductions typically occur during the day and are usually carried out by women who are not criminally sophisticated. Many of these women experienced a pregnancy loss in the past; they are often emotionally immature and compulsive, with low self-esteem. Most female abductors can play the role of a hospital employee convincingly (Healthcare Risk Management, 2007).

Health care agencies are challenged to prevent infant abduction by instituting sound security practices and

TEACHING GUIDELINES 18.3

General Newborn Safety

- Have emergency telephone numbers readily available, such as those for emergency medical assistance and the poison control center.
- Keep small or sharp objects out of reach to prevent them from being aspirated.
- Put safety plugs in wall sockets within the child's reach to prevent electrocution.
- Do not leave the infant alone in any room without a portable intercom on.
- Always supervise the newborn in the tub: a newborn can drown in 2 inches of water.
- Make sure the crib or changing table is sturdy, without any loose hardware, and is painted with lead-free paint.
- Avoid placing the crib or changing table near blinds or curtain cords.
- Provide a smoke-free environment for all infants.
- Place all infants on their backs to sleep to prevent sudden infant death syndrome.
- To prevent falls, do not leave the newborn alone on any elevated surface.
- Use sun shields on strollers and hats to avoid overexposing the newborn to the sun.
- To prevent infection, thoroughly wash your hands before preparing formula.
- Thoroughly investigate any infant care facility before using it.

Source: AAP, 2007b.

systems (AWHONN Lifelines, 2007). Such measures include the following:

- All newborns must be transported in cribs and not carried.
- Nurses must respond immediately to any security alarm that sounds on the unit.
- Newborns must never be unattended at any time, especially in hallways.
- All staff must wear appropriate identification at all times.
- Scrubs should not be worn by nursing staff on the postpartum unit.
- Personnel should be wary of visitors who do not seem to be visiting a specific mother.
- The electronic security system should be checked to make sure it works.
- Proper functioning and placement of any electronic sensors used on newborns should be ensured.
- Parents should be taught what infant abduction is; why infant security is important; the schedule of nursery, feeding, and visiting hours; rules about visitor access; the facility's security policies and procedures; what parents can do to protect their infant in the hospital; which staff members are allowed to handle the newborn; and what a proper ID looks like.

Providing a safe and secure environment is a shared responsibility of the facility, staff, and parents. Preventing abductions requires everyone to learn and follow the rules and policies.

Car Safety

Every state requires the use of car seats for infants and children, because motor vehicle accidents are still the leading cause of unintentional injury and death in children under age 5 (AAP, 2007d). In more than half of these deaths, the child was unrestrained.

Despite evidence that the use of car seats can reduce the morbidity and mortality of motor vehicle crashes, parents who lack knowledge about them may underuse or misuse them (AAP, 2007d). Make sure that both parents understand the importance of safely transporting their newborn in a federally approved safety car seat every time the infant rides in a car. Do not release any newborn unless the parents have a car seat in place for their newborn's ride home (Fig. 18.17). If they cannot afford one, many community organizations will provide one for them. According to the AAP, no one car seat is considered to be the "safest" or the "best," but rather consistent and proper use is the key to preventing injuries and deaths. Instruct parents in the following:

- Select a car seat that is appropriate for the child's size and weight.
- Use the car seat correctly, every time the child is in the car.
- Use rear-facing car seats for infants until they are at least 1 year old and weigh 20 lb.

FIGURE 18.17 Newborn in a properly secured car seat.

- Make sure the harness (most seats have a three- to five-point harness) is in the slots at or below the shoulders.

Infection Prevention

The nurse plays a major role in preventing infection in the newborn environment. Ways to control infection are as follows:

- Minimize exposure of newborns to organisms.
- Wash your hands before and after providing care, and insist that all personnel wash their hands before handling any newborn.
- Do not allow ill staff or visitors to visit or handle newborns.
- Monitoring the umbilical cord stump and circumcision site for signs of infection.
- Providing eye prophylaxis by instilling prescribed medication soon after birth.
- Educate parents about appropriate home measures that will prevent infections, such as practicing good hand washing before and after diaper changes, keeping the newborn well hydrated, avoiding bringing the infant into crowds (which may expose him or her to colds and flu viruses), observing for early signs of infection (fever, vomiting, loss of appetite, lethargy, labored breathing, green watery stools, drainage from umbilical cord site or eyes), and keeping pediatrician appointments for routine immunizations.

Promoting Sleep

Although many parents feel their newborns need them every minute of the day, babies actually need to sleep much of the day initially. Usually newborns sleep up to 15 hours daily. They sleep for 2 to 4 hours at a time but do not sleep through the night because their stomach capacity is too small to go long periods without nourishment.

▶ *Take* NOTE!

All newborns develop their own sleep patterns and cycles, but it may take several months before the newborn sleeps through the night.

Parents should place the newborn on his or her back to sleep. To prevent suffocation, all fluffy bedding, quilts, sheepskins, stuffed animals, and pillows should be removed from the crib.

Parents should be informed that the practice of "co-sleeping" (sharing a bed) is not safe: for example, infants who sleep in adult beds are up to 40 times more likely to suffocate than those who sleep in cribs (Buswell & Spatz 2007). Suffocation can occur when the infant gets entangled in bedding or caught under pillows, or slips between the bed and the wall or the headboard and mattress. The parent may accidentally roll against or on top of the baby. The safest place for a newborn to sleep is in a crib, without any movable objects close by.

Teach parents to avoid other unsafe conditions, such as placing the newborn in the prone position, using a crib that does not meet federal safety guidelines, allowing window cords to hang loose and in close proximity to the crib, or setting the room temperature too high (can cause overheating) (Adler, Hyderi, & Hamilton, 2006).

Enhancing Bonding

Encourage and enhance parent–newborn interaction by involving both parents with the baby and demonstrating appropriate nurturing behaviors:

- Say "hello" and introduce yourself to the newborn.
- Ask the parents permission to care for and hold their newborn. This helps parents to realize that they are responsible for their child and reminds nurses of their role.
- Show parents the power of a soothing voice to calm the newborn.
- Provide care to the newborn in the least stressful way.
- Demonstrate ways to wake the newborn up gently to feed better.
- Tell parents what you are doing, why you are doing it, and how they can duplicate what you are doing at home.
- Offer the opportunity for parents to perform care while you observe them. Support their efforts to soothe the newborn throughout the care process.
- Help parents to interpret the communication cues the newborn uses.
- Point out the efforts the newborn is making to connect with the parents (e.g., alerting to the familiar voice, following the parents while they are speaking, quieting when held securely).

One of the most pleasurable aspects of newborn care is being close to them. Bonding begins soon after birth when parents cradle their newborn and gently stroke him or her with their fingers. Provide parents with opportunities for "skin-to-skin" contact with the newborn, holding the baby against their own skin when feeding or cradling. Many newborns respond very positively to gentle massage. If necessary, recommend books and videos that cover the subject.

For newborns, crying is their only way to communicate that something is wrong. Try to find out the reason why: Is the diaper wet? Is the room too hot or too cold? Is the baby uncomfortable (e.g., diaper rash or tight clothing)? Suggest the following ways in which parents can soothe an upset newborn:

- Try feeding or burping to relieve air or stomach gas.
- Lightly rub the newborn's back and speak softly to him or her.
- Gently sway side to side, or rock back and forth in a rocking chair.
- Talk with the newborn while making eye contact.
- Take the newborn for a walk in a stroller or carriage to get fresh air.
- Change the baby's position from back to side or vice versa.
- Try singing, reciting poetry and nursery rhymes, or reading to the baby.
- Turn on a musical mobile above the newborn's head.
- Give more physical contact by walking, rocking, or patting the newborn.
- Swaddle the newborn to provide a sense of security and comfort. To do this:
  - Spread out a receiving blanket, with one corner folded slightly.
  - Lay the newborn face up with head at the folded corner.
  - Wrap the left corner over the baby's body and tuck it beneath the baby.
  - Bring the bottom corner over the baby's feet.
  - Wrap the right corner around the baby, leaving only the head exposed.

Assisting With Screening Tests

Screening newborns for problems is important because some potentially life-threatening metabolic diseases may not be obvious at birth. Newborn screening tests that are required in most states before discharge are used to check for certain genetic and inborn errors of metabolism and hearing. Early identification and initiation of treatment can prevent significant complications and can minimize the negative effects of untreated disease.

Genetic and Inborn Errors of Metabolism Screening

Although each state mandates which conditions must be tested, the most common screening tests are for PKU, hypothyroidism, galactosemia, and sickle cell disease (Table 18.5).

TABLE 18.5 SELECTED CONDITIONS SCREENED FOR IN THE NEWBORN

Condition	Description	Clinical Picture/ Effect If Not Treated	Treatment	Timing of Screening
PKU	Autosomal recessive inherited deficiency in one of the enzymes necessary for the metabolism of phenylalanine to tyrosine—essential amino acids found in most foods	Irritability, vomiting of protein feedings, and a musty odor to the skin or body secretions of the newborn; if not treated, mental and motor retardation, seizures, microcephaly, and poor growth and development	Lifetime diet of foods low in phenylalanine (low protein) and monitoring of blood levels (Lawson, 2007); special newborn formulas available: Phenex and Lofenalac	Universally screened for in the United States; testing is done 24–48 hours after protein feeding (PKU)
Congenital hypothyroidism	Deficiency of thyroid hormone necessary for normal brain growth, calorie metabolism, and development; may result from maternal hypothyroidism	Increased risk in newborns with birthweight <2,000 g or >4,500 g, and those of Hispanic and Asian ethnic groups; feeding problems, growth and breathing problems; if not treated, irreversible brain damage and mental retardation	Lifelong thyroid replacement therapy (Dudek, 2006)	Testing (measures thyroxin [T4] and TSH) is done between days 4 and 6 of life.
Galactosemia	Absence of the enzyme needed for the conversion of the milk sugar galactose to glucose	Poor weight gain, vomiting, jaundice, mood changes, loss of eyesight, seizures, and mental retardation; if untreated, galactose buildup causing permanent damage to the brain, eyes, and liver, and eventually death	Eliminate milk from diet; substitute soy milk	First test done on discharge from the hospital with a follow-up test within 1 month
Sickle cell anemia	Recessively inherited abnormality in hemoglobin structure, most commonly found in African-American newborns	Anemia developing shortly after birth; increased risk for infection, growth restriction, vaso-occlusive crisis	Maintenance of hydration and hemodilution, rest, electrolyte replacement, pain management, blood replacement, and antibiotics	Bloodspot obtained at same time of other newborn screening tests or prior to 3 months of age

The trend toward early discharge of newborns can affect the timing of screening and the accuracy of some test results. For example, the newborn needs to ingest enough breast milk or formula to elevate phenylalanine levels for the screening test to identify PKU accurately, so newborn screening for PKU testing should not be performed before 24 hours of age.

Screening tests for genetic and inborn errors of metabolism require a few drops of blood taken from the newborn's heel (Fig. 18.18). These tests are usually per-

FIGURE 18.18 Screening for PKU. (**A**) Performing a heel stick. (**B**) Applying the blood specimen to the card for screening.

formed shortly before discharge. Newborns who are discharged before 24 hours of age need to have repeat tests done within a week in an outpatient facility.

Be aware of which conditions your state regularly screens for at birth to ensure that the parents are taught about the tests and the importance of early treatment. Also be familiar with the optimal time frame for screening and conditions that could affect the results. Ensure that a satisfactory specimen has been obtained at the appropriate time and that circumstances that could cause false results have been minimized. Send out specimens and completed forms within 24 hours of collection to the appropriate laboratory (Kenner & Lott, 2007).

Hearing Screening

Hearing loss is the most common birth disorder in the United States: approximately three to five newborns out of every 1,000 have some degree of hearing loss. Unlike a physical deformity, hearing loss is not clinically detectable at birth and thus remains difficult to assess (Wrightson, 2007). Factors associated with an increased risk of hearing loss include:

- Family history of childhood sensory hearing loss
- Congenital infections such as cytomegalovirus, rubella, toxoplasmosis, herpes
- Craniofacial anomalies involving the pinna or ear canal
- Low birthweight (less than 1,500 g)
- Postnatal infections such as bacterial meningitis
- Head trauma
- Hyperbilirubinemia requiring an exchange transfusion
- Exposure to ototoxic drugs, especially aminoglycosides
- Perinatal asphyxia (USPSTF, 2006)

Delays in identification and intervention may affect the child's language development, academic performance, and cognitive development. Detection before 3 months greatly improves outcomes. Because of this, auditory screening programs for all newborns are recommended by the AAP and are mandated by law in over 30 states. Screening only infants with risk factors is not enough, because as many as 50% of infants born with hearing loss have no known risk factors (AAP, 2007b). Early identification and intervention can prevent severe psychosocial, educational, and language development delays.

The current goals of *Healthy People 2010* (see the Healthy People 2010 display earlier in this chapter) are to screen all infants by 1 month of age, confirm hearing loss with an audiologic examination by 3 months of age, and treat with comprehensive early intervention services before 6 months of age (USDHHS, Volume II, Objective 16-20).

All newborns should be screened prior to discharge to ensure that any newborn with a hearing loss is not missed. Those with suspected hearing loss should be referred for follow-up assessment (Box 18.1 discusses screening methods). In addition, nurses should ensure that testing is accurate to facilitate early diagnosis and intervention services and to optimize the newborn's developmental potential.

BOX 18.1 Newborn Hearing Screening Methods

A newborn's hearing can be screened in one of two ways: otoacoustic emission (OAE) or automated auditory brain stem response (ABR). In OAE, an earphone is placed in the infant's ear canal and the sounds produced by the newborn's inner ear are measured in response to certain tones or clicks presented through the earphone. Preset parameters in the equipment decide whether the OAEs are sufficient for the newborn to pass or whether a referral is necessary for further evaluation.

In ABR, an earphone is placed in the ear canal or an earmuff is placed over the newborn's ear, and a soft, rapid tapping noise is presented. Electrodes placed around the newborn's head, neck, and shoulders record neural activity from the infant's brain stem in response to the tapping noises. The ABR tests how well the ear and the nerves leading to the brain work. Like OAEs, automated ABR screening is sensitive to more than mild degrees of hearing loss, but a "pass" does not guarantee normal hearing.

Source: AAP, 2007a.

EVIDENCE-BASED PRACTICE 18.1
Universal Neonatal Hearing Screening Versus Selective Screening as Part of the Management of Childhood Deafness

● Study
The principal factors that determine how deafness affects a child's development are the degree of hearing impairment and the age at which it is diagnosed. A number of factors are thought to increase the risk of hearing impairment, such as low birthweight, prematurity, and perinatal hypoxia and jaundice. The high incidence of deafness in children without risk factors and the introduction of simple new screening tests with high sensitivity and specificity have led many prestigious bodies to recommend universal early detection programs for deafness rather than screening that targets high-risk groups. A study was performed to compare the long-term effectiveness of a universal neonatal screening and early treatment program for hearing impairment versus screening and treatment of high-risk neonates only.

▲ Findings
This review found no randomized trials that compared the long-term results of these screening programs. Controlled trials and before-and-after studies are needed to address this issue.

■ Nursing Implications
Although additional research is needed, nurses should encourage all parents to have their newborns screened. The AAP recommends hearing screening for all newborns so that early interventions can be provided to prevent speech, language, and cognitive development impairments. This information should be stressed during discharge planning activities and follow-up tests if warranted.

Puig, T., Municio, A., & Medà, C. (2006). Universal neonatal hearing screening versus selective screening as part of the management of childhood deafness. *Cochrane Database of Systematic Reviews* 2006, Issue 2. Art. No.: CD003731. DOI: 10.1002/14651858.CD003731.pub2

Dealing With Common Concerns
During the newborn period of transition, certain conditions can develop that require intervention. These conditions, although not typically life-threatening, can be a source of anxiety for the parents. Common concerns include transient tachypnea of the newborn, physiologic jaundice, and hypoglycemia.

Transient Tachypnea of the Newborn
Transient tachypnea of the newborn appears soon after birth. It is accompanied by retractions, expiratory grunting, or cyanosis and is relieved by low-dose oxygen therapy. Mild or moderate respiratory distress typically is present at birth or within 6 hours of birth. This condition usually resolves within 3 days.

Transient tachypnea of the newborn occurs when the fetal liquid in the lungs is removed slowly or incompletely. This can be due to the lack of thoracic squeezing that occurs during a cesarean birth, or diminished respiratory effort if the mother received central nervous system depressant medication. Prolonged labor, macrosomia of the fetus, and maternal asthma also have been associated with this condition (Asenjo, 2007).

Nursing interventions include providing supportive care (giving oxygen, ensuring warmth, observing respiratory status frequently, and allowing time for the pulmonary capillaries and the lymphatics to remove the remaining fluid). The clinical course is relatively benign, but any newborn respiratory issue can be very frightening to the parents. Provide a thorough explanation and reassure them that the condition will resolve over time.

Physiologic Jaundice
Physiologic jaundice is very common in newborns, with the majority demonstrating yellowish skin, mucous membranes, and sclera within the first 3 days of life. In any given year, approximately 60% of the newborns in the United States will experience clinical jaundice (Deshpande & Ramer, 2007). Jaundice is the visible manifestation of hyperbilirubinemia. It typically results from the deposition of unconjugated bilirubin pigment in the skin and mucous membranes.

Factors that contribute to the development of physiologic jaundice in the newborn include an increased bilirubin load because of relative polycythemia, a shortened erythrocyte life span (80 days compared with the adult 120 days), and immature hepatic uptake and conjugation processes (Deshpande & Ramer, 2007). Normally the liver removes bilirubin from the blood and changes it to a form in which it can be excreted. As the red blood cell breakdown continues at a fast pace, the newborn's liver cannot keep up with bilirubin removal. Thus, bilirubin accumulates in the blood, causing a yellowish discoloration on the skin.

The AAP has recently released guidelines for the prevention and management of hyperbilirubinemia in newborns. These include:

- Promotion and support of successful breast-feeding practices to make sure the newborn is well hydrated and stooling frequently to promote elimination of bilirubin
- Completion of a systematic assessment before discharge for the risk of severe hyperbilirubinemia

- Early and focused follow-up based on the risk assessment
- When indicated, treatment of newborns with phototherapy or exchange transfusion to prevent kernicterus (AAP, 2006b)

Assess for jaundice in all newborns by pressing gently with a fingertip on the bridge of the nose, sternum, or forehead. If jaundice is present, the blanched area will appear yellow before the capillary refill (Kenner & Lott, 2007).

Measures that parents can take to reduce the risk of jaundice include exposing the newborn to natural sunlight for short periods of time throughout the day to help oxidize the bilirubin deposits on the skin, provide breastfeeding on demand to promote elimination of bilirubin through urine and stooling, and avoiding glucose water supplementation, which hinders elimination.

If or when the levels of unconjugated serum bilirubin increase and do not return to normal levels with increased hydration, phototherapy is used. The serum level of bilirubin at which phototherapy is initiated is a matter of clinical judgment by the physician, but it is often begun when bilirubin levels reach 12 to 15 mg/dL in the first 48 hours of life in a term newborn (Arenson & Drake, 2007). **Phototherapy** involves exposing the newborn to ultraviolet light, which converts unconjugated bilirubin into products that can be excreted through feces and urine.

▶ *Take* NOTE!

Exposure of newborns to sunlight represents the first documented use of phototherapy in the medical literature. Sister J. Ward, a charge nurse in Essex, England, in 1956 recognized that when jaundiced newborns were exposed to the sun they became less yellow. This observation changed the entire treatment of jaundice in newborns (Maisels, 2006).

Phototherapy reduces bilirubin levels in the blood by breaking down unconjugated bilirubin into colorless compounds. These compounds can then be excreted in the bile. Phototherapy aims to curtail the increase in bilirubin blood levels, thereby preventing kernicterus, a condition in which unconjugated bilirubin enters the brain. If not treated, kernicterus can lead to brain damage and death.

During the past several decades, phototherapy has generally been administered with either banks of fluorescent lights or spotlights. Factors that determine the dose of phototherapy include spectrum of light emitted, irradiance of light source, design of light unit, surface area of newborn exposed to the light, and distance of the newborn from the light source (Cohen, 2006). For phototherapy to be effective, the rays must penetrate as much of the skin as possible. Thus, the newborn must be naked and turned frequently to ensure maximum exposure of the skin. Several side effects of standard phototherapy have been identified: frequent loose stools, increased insensible water loss, transient rash, and potential retinal damage if the newborn's eyes are not covered sufficiently.

Recently, fiberoptic pads (Biliblanket or Bilivest) have been developed that can be wrapped around the newborn or on which the newborn can lie. The light is delivered from a tungsten–halogen bulb through a fiberoptic cable and is emitted from the sides and ends of the fibers inside a plastic pad (Cohen, 2006). These products work on the premise that phototherapy can be improved by delivering higher-intensity therapeutic light to decrease bilirubin levels. The pads do not produce appreciable heat like the banks of lights or spotlights do, so insensible water loss is not increased. Eye patches also are not needed; thus, parents can feed and hold their newborns continuously to promote bonding.

When caring for newborns receiving phototherapy for jaundice, nurses must do the following:

- Closely monitor body temperature and fluid and electrolyte balance.
- Observe skin integrity (as a result of exposure to diarrhea and phototherapy lights).
- Provide eye protection to prevent corneal injury related to phototherapy exposure.
- Encourage parents to participate in their newborn's care to prevent parent–infant separation.

See Chapter 24 for a more detailed discussion of hyperbilirubinemia.

The home health nurse made a postpartum visit to Kelly to assess the situation. Kelly's son was slightly jaundiced when the home health nurse pressed gently over his sternum, but Kelly said he was nursing better compared with the previous 2 days. What home suggestions can the nurse make to Kelly to reduce the jaundice? What specific education about physiologic jaundice is needed?

Hypoglycemia

Hypoglycemia affects as many as 40% of all full-term newborns (Kenner & Lott, 2007). It is defined as a blood glucose level of less than 35 mg/dL or a plasma concentration of less than 40 mg/dL (Kenner & Lott, 2007). In newborns, blood glucose levels fall to a low point during the first few hours of life because the source of maternal glucose is removed when the placenta is expelled. This period of transition is usually smooth, but certain newborns are at greater risk for hypoglycemia: infants of diabetic mothers, preterm newborns, and newborns with IUGR, inadequate caloric intake, sepsis, asphyxia, hypothermia, polycythemia, glycogen storage disorders, and endocrine deficiencies (Kliegman et al., 2007).

Most newborns experience transient hypoglycemia and are asymptomatic. The symptoms, when present, are nonspecific and include jitteriness, lethargy, cyanosis, apnea, seizures, high-pitched or weak cry, and poor feeding. If hypoglycemia is prolonged or is left untreated, serious, long-term adverse neurologic sequelae such as learning disabilities and mental retardation can occur (Cohen, 2007). Subsequently, early diagnosis and appropriate intervention are essential for all newborns.

Nursing care of the hypoglycemic newborn includes monitoring for signs of hypoglycemia or identifying high-risk newborns prone to this disorder based on their perinatal history, physical examination, body measurements, and gestational age. Check the blood glucose level of all newborns within the first few hours after birth and every 4 hours thereafter. More frequent monitoring and early feeding may be necessary for newborns considered to be high risk. Prevent hypoglycemia in newborns at risk by initiating early feedings with breast milk or formula. If hypoglycemia persists despite feeding, notify the primary health care provider for orders such as intravenous therapy with dextrose solutions. Anticipate hypoglycemia in certain high-risk newborns and begin assessments immediately on nursery admission.

Promoting Nutrition

Several physiologic changes dictate the type and method of feeding throughout the newborn's first year. Some of these changes include the following:

- Stomach capacity is limited to about 90 mL at birth. The emptying time is short (2 to 3 hours) and peristalsis is rapid. Therefore, small, frequent feedings are needed at first, with amounts progressively increasing with maturity.
- The immune system is immature at birth, so the baby is at a high risk for food allergies during the first 4 to 6 months of life. Introducing solid foods prior to this time increases the risk of developing food allergies.
- Pancreatic enzymes and bile to assist in digestion of fat and starch are in limited supply until about 3 to 6 months of age. Infants cannot digest cereal prior to this time.
- The kidneys are immature and unable to concentrate urine until about 4 to 6 weeks of age. Excess protein and mineral intake can place a strain on kidney function and can lead to dehydration. Infants need to consume more water per unit of body weight than adults do as a result of their high body weight from water.
- Immature muscular control at birth changes over time to assist in the feeding process by improving head and neck control, hand–eye coordination, swallowing, and ability to sit, grasp, and chew. At about 4 to 6 months, inborn reflexes disappear, head control develops, and the infant can sit to be fed, making spoon-feeding possible (Dudek, 2006).

Newborn Nutritional Needs

As newborns grow, their energy and nutrient requirements change to meet their body's changing needs. During infancy, energy, protein, vitamin, and mineral requirements per pound of body weight are higher than at any other time of life. These high levels are needed to fuel the rapid growth and development during this stage of life. Generally, an infant's birthweight doubles in the first 4 to 6 months of life and triples within the first year (Dillon, 2007).

A newborn's caloric needs range from 80 to 120 cal/kg body weight. For the first 3 months, the infant needs 110 cal/kg/day; this decreases to 100 cal/kg/day from 3 to 6 months (Begany & Mascarenhas, 2007). Breast milk and formulas contain approximately 20 cal/oz, so the caloric needs of young infants can be met if several feedings are given throughout the day.

Fluid requirements for the newborn and infant range from 100 to 150 mL/kg daily. This requirement can be met through breast or bottle feedings. Additional water supplementation is not necessary. Adequate carbohydrates, fats, protein, and vitamins are achieved through consumption of breast milk or formula. The AAP recommends that bottle-fed infants be given iron supplementation, because iron levels are low in all types of formula milk. This can be achieved by giving iron-fortified formula from birth. The breast-fed infant draws on iron reserves for the first 6 months and then needs iron-rich foods or supplementation added at 6 months of age. The AAP (2007c) also has recommended that all infants (breast- and bottle-fed) receive a daily supplement of vitamin D starting within the first 2 months of life to prevent rickets and vitamin D deficiency. It is also recommended that fluoride supplementation be given to infants not receiving fluoridated water after the age of 6 months (AAP, 2007c).

Supporting the Choice of Feeding Method

Parents typically decide about the method of feeding well before the infant is born. Prenatal and childbirth classes present information about breast-feeding versus bottle feeding and allow the parents to make up their minds about which method is best for them. Various factors can influence their decision, including socioeconomic status, culture, employment, social support available, level of education, range of care interventions provided during pregnancy, childbirth, and the early postpartum period, and especially partner support (Pryor & Huggins, 2007). Nurses can provide evidence-based information to assist the couple in making their decision. Regardless of which method is chosen, the nurse needs to respect and support the couple.

Feeding the Newborn

The newborn can be fed at any time during the transition period if assessments are normal and a desire is demonstrated. Before the newborn can be fed, determine his or her ability to suck and swallow. Clear any mucus in the

nares or mouth with a bulb syringe before initiating feeding. Auscultate bowel sounds, check for abdominal distention, and inspect the anus for patency. If these parameters are within normal limits, newborn feeding may be started. Most newborns are on demand feeding schedules and are allowed to feed when they awaken. When they go home, mothers are encouraged to feed their newborns every 2 to 4 hours during the day and only when the newborn awakens during the night for the first few days after birth.

Parents often have many questions about feeding. Generally, newborns should be fed on demand whenever they seem hungry. Most newborns will give clues about their hunger status by crying, placing their fingers or fist in their mouth, rooting around, and sucking.

Newborns differ in their feeding needs and preferences, but most breast-fed ones need to be fed every 2 to 3 hours, nursing for 10 to 20 minutes on each breast. The length of feedings is up to the mother and newborn. Encourage the mother to respond to cues from her infant and not feed according to a standard or preset schedule.

Formula-fed newborns usually feed every 3 to 4 hours, finishing a bottle in 30 minutes or less. Bottle-fed infants consume about 2 to 4 fluid ounces at first and double their intake within a few weeks of age (Begany & Mascarenhas, 2007). If the newborn seems satisfied, wets 6 to 10 diapers daily, produces several stools a day, sleeps well, and is gaining weight regularly, then he or she is probably receiving sufficient breast milk or formula.

Newborns swallow air during feedings, which causes discomfort and fussiness. Parents can prevent this by burping them frequently throughout the feeding. Tips about burping include:

- Hold the newborn upright with his or her head on the parent's shoulder (Fig. 18.19A).
- Support the head and neck while the parent gently pats or rubs the newborn's back (Fig.18.19B).
- Have the newborn sit on the parent's lap, while supporting the baby's chest and head. Gently rub the newborn's back with the other hand.
- Lay the newborn on the parent's lap with the baby's back facing up.
- Support the newborn's head in the crook of the parent's arm and gently pat or rub the back.

▶ *Take* NOTE!

It is the upright position, not the strength of the patting or rubbing, that allows the newborn to release air accumulated in the stomach.

Stress to parents that feeding time is more than an opportunity to get nutrients into their newborn; it is also a time for closeness and sharing. Feedings are as much for the baby's emotional pleasure as his or her physical well-being. Encourage parents to maintain eye contact with the newborn during the feeding, hold him or her comfortably close to them, and talk softly during the feeding to promote closeness and security.

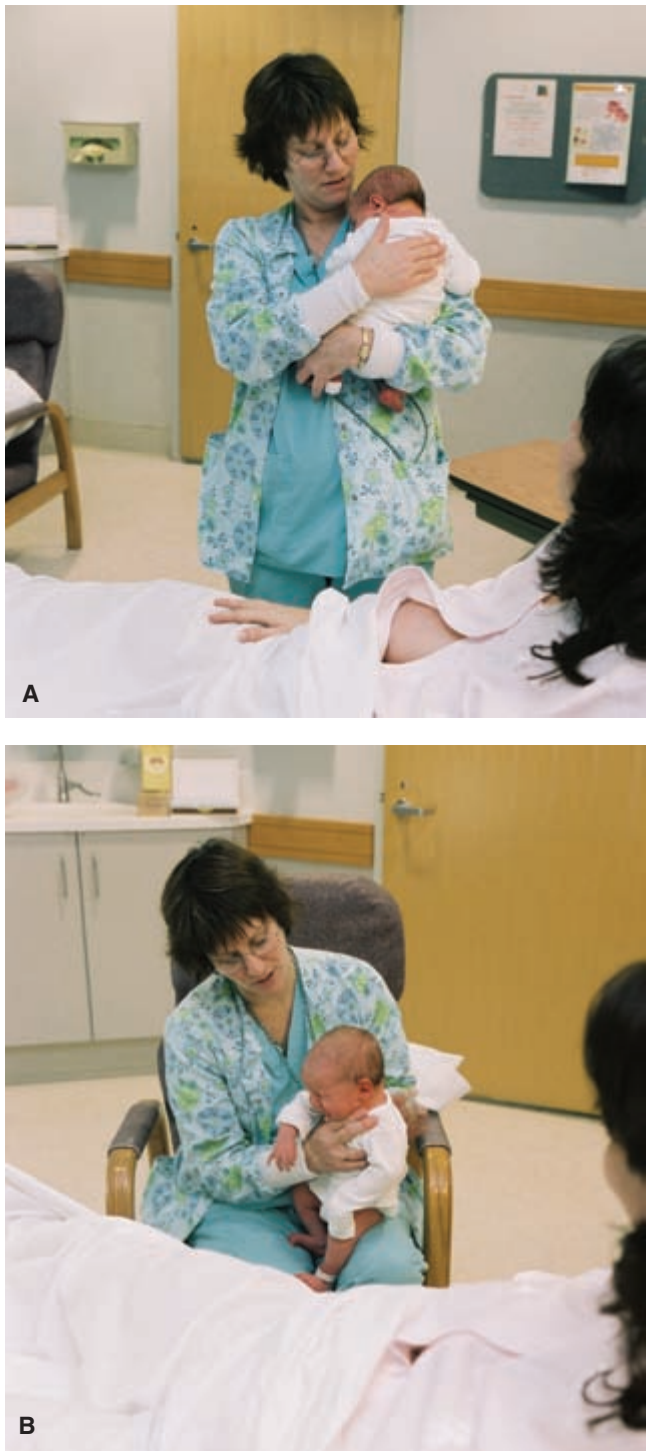

FIGURE 18.19 The nurse demonstrates holding the newborn upright over the shoulder (**A**) and sitting the newborn upright, supporting the neck and chin (**B**).

Breast-Feeding

There is consensus in the medical community that breast-feeding is optimal for all newborns. The AAP and the American Dietetic Association recommend breast-feeding exclusively for the first 6 months of life, continuing it in conjunction with other food at least until the newborn's first birthday (AAP, 2007c). Box 18.2 highlights the advantages of breast-feeding for the mother and newborn.

Mothers should continue to breast-feed during mild illnesses such as colds or the flu. However, in the United States mothers with HIV are advised not to breast-feed.

The composition of breast milk changes over time from colostrum, to transitional milk, and finally to mature milk. Colostrum is a thick, yellowish substance secreted during the first few days after birth. It is high in protein, minerals, and fat-soluble vitamins. It is rich in immunoglobulins (IgA), which help protect the newborn's gastrointestinal tract against infections. It is a natural laxative that helps rid the intestinal tract of meconium quickly (Pryor & Huggins, 2007).

BOX 18.2 Advantages of Breast-Feeding

Advantages for the Newborn

- Contributes to the development of a strong immune system
- Stimulates growth of positive bacteria in digestive tract
- Reduces incidence of stomach upset, diarrhea, and colic
- Begins the immunization process at birth by providing passive immunity
- Promotes optimal mother–infant bonding
- Reduces risk of newborn constipation
- Promotes greater developmental gains in preterm infants (AAP, 2006a, 2006b)
- Provides easily tolerated and digestible formula that is sterile, at proper temperature, and readily available with no artificial colorings, flavorings, or preservatives
- Is less likely to result in overfeeding, leading to obesity (AAP, 2006a, 2006b)
- Promotes better tooth and jaw development as a result of sucking hard
- Provides protection against food allergies
- Is associated with avoidance of type 1 diabetes and heart disease

Advantages for the Mother

- Can facilitate postpartum weight loss
- Stimulates uterine contractions to control bleeding
- Promotes uterine involution as a result of release of oxytocin
- Lowers risk of breast cancer and osteoporosis
- Affords some protection against conception, although it is not a reliable contraceptive method (Pryor & Huggins, 2007)

Transitional milk occurs between colostrum and mature milk and contains all the nutrients in colostrum, but it is thinner and less yellow than colostrum. This transitional milk is replaced by true or mature milk around day 10 after birth. Mature milk appears bluish and is not as thick as colostrum. It provides 20 cal/oz and contains:

- Protein—Although the content is lower than formula, it is ideal to support growth and development for the newborn. The majority of protein is whey, which is easy to digest.
- Fat—Approximately 58% of total calories are fat, but they are easy to digest. Essential fatty acid content is high, as is the level of cholesterol, which helps develop enzyme systems capable of handling cholesterol later in life.
- Carbohydrate—Approximately 35% to 40% of total calories are in the form of lactose, which stimulates the growth of natural defense bacteria in the gastrointestinal system and promotes calcium absorption.
- Water—Water, the major nutrient in breast milk, makes up 85% to 95% of the total volume. Total milk volume varies with the age of the infant and demand.
- Minerals—Breast milk contains calcium, phosphorus, chlorine, potassium, and sodium, with trace amounts of iron, copper, and manganese. Iron absorption is about 50%, compared with about 4% for iron-fortified formulas.
- Vitamins—All vitamins are present in breast milk; vitamin D is the lowest in amount. Debate about the need for vitamin D supplementation is ongoing.
- Enzymes—Lipase and amylase are found in breast milk to assist with digestion (Dudek, 2006).

Breast-Feeding Assistance

Breast-feeding can be initiated immediately after birth. If the newborn is healthy and stable, wipe the newborn from head to toe with a dry cloth and place him or her skin-to-skin on the mother's abdomen. Then cover the newborn and mother with another warmed blanket to hold in the warmth. Immediate mother–newborn contact takes advantage of the newborn's natural alertness after a vaginal birth and fosters bonding. This immediate contact also reduces maternal bleeding and stabilizes the newborn's temperature, blood glucose level, and respiratory rate (AAP, 2007c).

Left alone on the mother's abdomen, a healthy newborn scoots upward, pushing with the feet, pulling with the arms, and bobbing the head until finding and latching on to the mother's nipple. A newborn's sense of smell is highly developed, which also helps in finding the nipple. As the newborn moves to the nipple, the mother produces high levels of oxytocin, which contracts the uterus, thereby minimizing bleeding. Oxytocin also causes the breasts to release colostrum when the newborn sucks on the nipple. Colostrum is rich in antibodies and thus provides the newborn with her "first immunization" against infection.

Keys to successful breast-feeding include:

- Initiating breast-feeding within the first hour of life if the newborn is stable
- Following the newborn's feeding schedule—8 to 12 times in 24 hours
- Providing unrestricted periods of breast-feeding
- Offering no supplement unless medically indicated
- Having a lactation consultant observe a feeding session
- Avoiding artificial nipples and pacifiers except during a painful procedure
- Feeding from both breasts over each 24-hour period
- Watching for indicators of sufficient intake from infant:
  - Six to ten wet diapers daily
  - Waking up hungry 8 to 12 times in 24 hours
  - Acting content and falling asleep after feeding
- Keeping the newborn with the mother throughout the hospital stay

Help position the newborn so that latching-on is effective and is not painful for the mother. Placing pillows or a folded blanket under the mother's head may help, or rolling her to one side and tucking the newborn next to her. Assess both the mother and newborn during this initial session to determine needs for assistance and education. One tool used frequently in this assessment is the LATCH scoring tool (Table 18.6). The higher the score, the less nursing intervention is needed by the mother and baby.

Breast-Feeding Positioning

The mother and infant must be in comfortable positions to ensure breast-feeding success. The four most common positions for breast-feeding are the football, cradle, across-the-lap, and side-lying holds. Each mother, on experimentation, can decide which positions feel most comfortable for her (Fig. 18.20).

In the football hold, the mother holds the infant's back and shoulders in her palm and tucks the infant under her arm. Remind the mother to keep the infant's ear, shoulder, and hip in a straight line. The mother supports the breast with her hand and brings it to the infant's lips to latch on. She continues to support the breast until the infant begins to nurse. This position allows the mother to see the infant's mouth as she guides her infant to the nipple. This is a good choice for mothers who have had a cesarean birth because it avoids pressure on the incision.

The cradling position is the one most commonly used. The mother holds the baby in the crook of her arm, with the infant facing the mother. The mother supports the breast with her opposite hand.

In the across-the-lap position, the mother places a pillow across her lap, with the infant facing the mother. The mother supports the infant's back and shoulders with her palm and supports her breast from underneath. After the infant is in position, the infant is pulled forward to latch on.

In the side-lying position, the mother lies on her side with a pillow supporting her back and another pillow supporting the newborn in the front. To start, the mother props herself up on an elbow and supports the newborn with that arm, while holding her breast with the opposite hand. Once nursing is started, the mother lies down in a comfortable position.

To promote latching-on, instruct the mother to make a C or a V with her fingers. In the C hold, the mother places her thumb well above the areola and the other four fingers

TABLE 18.6 THE LATCH SCORING TOOL

Parameters	0 Point	1 Point	2 Points
L: Latch	Sleepy infant, no sustained latch achieved	Must hold nipple in infant's mouth to sustain latch and suck; must stimulate infant to continue to suck	Grasps nipple; tongue down; rhythmic sucking
A: Audible swallowing	None	A few observed with stimulation	Spontaneous and intermittent both <24 hours old and afterward
T: type of nipple	Inverted (drawn inward into breast tissue)	Flat (not protruding)	Everted or protruding out after stimulation
C: comfort of nipple	Engorged, cracked bleeding; severe discomfort	Filling; reddened, small blisters or bruises; mild to moderate discomfort	Soft, nontender
H: hold (positioning)	Nurse must hold infant to breast	Minimal assistance; help with positioning, then mother takes over	No assistance needed by nurse

Sources: AAP (2006a, 2006b, 2007); Pryor & Huggins (2007).

FIGURE 18.20 Breast-feeding positions.

below the areola and under the breast. In the V hold, the mother places her index finger above the areola and her other three fingers below the areola and under the breast. Either method can be used as long as the mother's hand is well away from the nipple so the infant can latch on.

Breast-Feeding Education

Breast-feeding is not an innate skill in human mothers. Almost all women have the potential to breast-feed successfully, but many fail because of inadequate knowledge. Nursing Care Plan 18.1 gives typical nursing diagnoses, outcomes, and interventions. For many mothers and newborns, breast-feeding goes smoothly from the start, but for others it is a struggle. Nurses can help throughout the experience by demonstrating techniques and offering encouragement and praise for success. Nurse should emphasize that the key to successful breast-feeding is correct positioning and latching-on.

Teaching by nurses has been shown to have a significant effect on both the ability to breast-feed successfully and the duration of lactation (Dudek, 2006). During the first few breast-feeding sessions, mothers want to know how often they should be nursing, whether breast-feeding is going well, if the newborn is getting enough nourishment, and what problems may ensue and how to cope with them. Education for the breast-feeding mother is highlighted in Teaching Guidelines 18.4.

Remember Kelly, who was concerned about jaundice in her newborn son? At her son's 2-week well-baby checkup at the clinic, his bilirubin level came back within normal limits. Kelly still felt he was not getting enough to eat and stated that she might switch to formula-feeding her son. What information can the nurse present to promote and reinforce breast-feeding? Should the nurse make a referral to the lactation consultant?

Breast Milk Storage and Expression

If the breast-feeding mother becomes separated from the newborn for any reason (e.g., work, travel, illness), she needs instruction on how to express and store milk safely. Expressing milk can be done manually (hand compression of breast) or by using a breast pump. Manual or hand pumps are inexpensive and can be used by mothers who occasionally need an extra bottle if they are going out. Electric breast pumps are used for mothers who experience a lengthy separation from their infants and need to pump their breasts regularly (Fig. 18.21).

To ensure the safety of expressed breast milk, instruct the mother in the following:

- Wash your hands before expressing milk or handling breast milk.
- Use clean containers to store expressed milk.
- Use sealed and chilled milk within 24 hours.
- Discard any milk that has been refrigerated more than 72 hours.
- Use any frozen expressed milk within 3 months.
- Do not use microwave ovens to warm chilled milk.
- Discard any used milk; never refreeze it.
- Store milk in quantities to be used for each feeding (2 to 4 oz).
- Thaw milk in warm water before using (AAP, 2007b).

Nursing Care Plan 18.1

OVERVIEW OF THE MOTHER AND NEWBORN HAVING DIFFICULTY WITH BREAST-FEEDING

Baby boy James, weight 7 lb, 4 oz, was born a few hours ago. His mother, Jane, is a 19-year-old gravida 1, para 1. His Apgar scores were 9 points at both 1 and 5 minutes. Labor and birth were unremarkable, and James was admitted to the nursery for assessment. After stabilization, James was brought to his mother, who had said she wished to breast-feed. The postpartum nurse assisted Jane with positioning and latching-on and left the room for a few minutes. On returning, Jane was upset, James was crying, and Jane stated she wanted a bottle of formula to feed him since she didn't have milk and her nipples hurt.

Assessment reveals a young, inexperienced mother placed in an uncomfortable situation with limited knowledge of breast-feeding. Anxiety from the mother transferred to James, resulting in crying. The mother, apprehensive about breast-feeding, needs additional help.

NURSING DIAGNOSIS: Knowledge deficit related to breast-feeding skills

Outcome Identification and Evaluation

Mother will demonstrate understanding of breast-feeding skills as evidenced by use of correct positioning and technique, and verbalization of appropriate information related to breast-feeding.

Interventions: Providing Education

- Instruct mother on proper positioning for breast-feeding; suggest use of football hold, side-lying position, modified cradle, and across-the-lap position to ensure comfort and *to promote ease in breast-feeding.*
- Review breast anatomy and milk letdown reflex *to enhance mother's understanding of lactation.*
- Observe newborn's ability to suck and latch on to the nipple *to assess whether newborn has adequate ability.*
- Monitor sucking and newborn swallowing for several minutes *to ensure adequate latching on and to assess intake.*
- Reinforce nipple care with water and exposure to air *to maintain nipple integrity.*

NURSING DIAGNOSIS: Anxiety related to breast-feeding ability and irritable, crying newborn

Outcome Identification and Evaluation

Mother will verbalize increased comfort with breast-feeding as evidenced by positive statements related to breast-feeding and verbalization of desire to continue to breast-feed newborn.

Interventions: Reducing Anxiety

- Ensure that the environment is calm and soothing without distractions *to promote maternal and newborn relaxation.*
- Show mother correct latching-on technique *to promote breast-feeding.*
- Assist in calming newborn by holding and talking *to ensure that the newborn is relaxed prior to latching on.*
- Reassure mother she can be successful at breast-feeding *to enhance her self-esteem and confidence.*
- Encourage frequent trials and attempts *to enhance confidence.*
- Encourage the mother to verbalize her anxiety/fears *to reduce anxiety.*

NURSING DIAGNOSIS: Pain related to breast-feeding and incorrect latching-on technique

Outcome Identification and Evaluation

Mother will experience a decrease in pain during breast-feeding as evidenced by statements of less nipple pain.

Interventions: Reducing Pain

- Suggest several alternate positions for breast-feeding *to increase comfort.*
- Demonstrate how to break suction before removing infant from breast *to minimize trauma to nipple.*
- Inspect nipple area *to promote early identification of trauma.*
- Reinforce correct latching-on technique *to prevent nipple trauma.*
- Administer pain medication if indicated *to relieve pain.*
- Instruct about nipple care between feedings *to maintain nipple integrity.*

TEACHING GUIDELINES 18.4

Breast-Feeding

- Set aside a quiet place where you can be relaxed and won't be disturbed. Relaxation promotes milk letdown.
- Sit in a comfortable chair or rocking chair or lie on a bed. Try to make each feeding calm, quiet, and leisurely. Avoid distractions.
- Listen to soothing music and sip a nutritious drink during feedings.
- Initially, nurse the newborn every few hours to stimulate milk production. Remember that the supply of milk is equal to the demand—the more sucking, the more milk.
- Watch for signals from the infant to indicate that he or she is hungry, such as:
  - Nuzzling against the mother's breasts
  - Demonstrating the rooting reflex by making sucking motions
  - Placing fist or hands in mouth to suck on
  - Crying and squirming
  - Smacking of the lips
- Stimulate the rooting reflex by touching the newborn's cheek to initiate sucking.
- Look for signs indicating that the newborn has latched on correctly: wide-open mouth with the nipple and much of the areola in the mouth, lips rolled outward, and tongue over lower gum, visible jaw movement drawing milk out, rhythmic sucking with an audible swallowing (soft "ka" or "ah" sound indicates the infant is swallowing milk).
- Hold the newborn closely, facing the breast, with the newborn's ear, shoulder, and hip in direct alignment.
- Nurse the infant on demand, not on a rigid schedule. Feed every 2 to 3 hours within a 24-hour period for a total of 8 to 12 feedings.
- Alternate the breast you offer first; identify with a safety pin on bra.
- Vary your position for each feeding to empty breasts and reduce soreness.
- Look for signs that the newborn is getting enough milk:
  - At least six wet diapers and two to five loose yellow stools daily
  - Steady weight gain after the first week of age
  - Pale-yellow urine, not deep yellow or orange
  - Sleeping well, yet looks alert and healthy when awake (AAP, 2007a)
- Wake up the newborn if he or she has nursed less than 5 minutes by unwrapping him or her.
- Before removing the baby from the breast, break the infant's suction by inserting a finger.
- Burp the infant to release air when changing breasts and at the end of the breast-feeding session.
- Avoid supplemental formula feedings to prevent "nipple confusion" (Pryor & Huggins, 2007)
- Do not take drugs or medications unless approved by the health care provider.
- Avoid drinking alcohol or caffeinated drinks because they pass through milk.
- Do not smoke while breast-feeding; it increases the risk of sudden infant death syndrome.
- Always wash your hands before expressing or handling milk to store.
- Wear nursing bras and clothes that are easy to undo.

Common Breast-Feeding Concerns

Breast-feeding women may experience problems such as cracked nipples, engorgement, or mastitis. Breast-feeding should not be painful for the mother. If she has sore, cracked nipples, the first step is to find the cause. Incorrect positioning or latching-on, removing the infant from the breast without first breaking the suction, or wearing a bra that is too tight can cause cracked or sore nipples. Cracked nipples can increase the risk of mastitis because a break in the skin may allow *Staphylococcus aureus* or other organisms to enter the body.

Sore nipples usually are caused by improper infant attachment, which traumatizes the tissue. The nurse should review techniques for proper positioning and latching-on. Recommend the following to the mother:

- Use only water, not soap, to clean the nipples to prevent dryness.
- Express some milk before feeding to stimulate the milk ejection reflex.
- Avoid using breast pads with plastic liners, and change pads when they are wet.
- Wear a comfortable bra that is not too tight.
- Apply a few drops of breast milk to the nipples after feeding.
- Rotate positions when feeding the infant to promote complete breast emptying.
- Leave the nursing bra flaps down after feeding to allow nipples to air-dry.
- Inspect the nipples daily for redness or cracks (Arenson & Drake, 2007).

To ease nipple pain and trauma, reinforce appropriate latching-on and remind the woman about the need to break the suction at the breast before removing the newborn from the breast. Additional measures may include

FIGURE 18.21 Hand-held breast pump.

applying cold compresses over the area and massaging breast milk onto the nipple after feeding.

Engorgement may occur as the milk comes in around day 3 or 4 after birth of the newborn. Explain to the mother that engorgement, though uncomfortable, is self-limited and will resolve as the newborn continues to nurse. The mother should continue to nurse during engorgement to avoid a plugged milk duct, which could lead to mastitis. Provide the following tips for relieving engorgement:

- Take warm to hot showers to encourage milk release.
- Express some milk manually before breast-feeding.
- Wear a supportive nursing bra 24 hours a day to provide support.
- Feed the newborn in a variety of positions—sitting up and then lying down.
- Massage the breasts from under the axillary area down toward the nipple.
- Increase the frequency of feedings.
- Apply warm compresses to the breasts prior to nursing.
- Stay relaxed while breast-feeding.
- Use a breast pump if nursing or manual expression is not effective.
- Remember that this condition is temporary and resolves quickly.

Mastitis, or inflammation of the breast, causes flu-like symptoms, chills, fever, and malaise. These symptoms may occur before the development of soreness, aching, swelling, and redness in the breast (usually the upper outer quadrant). This condition usually occurs in just one breast when a milk duct becomes blocked, causing inflammation, or through a cracked or damaged nipple, allowing bacteria to infect a portion of the breast. Treatment consists of rest, warm compresses, antibiotics, breast support, and continued breast-feeding (the infection will not pass into the breast milk). Explain to the mother that it is important to keep the milk flowing in the infected breast, whether it is through nursing or manual expression or with a breast pump.

Formula Feeding

Despite the general acknowledgment that breast-feeding is the most desirable means of feeding infants, about 40% of mothers choose formula feeding and need education about this procedure. Formula-fed infants grow more rapidly than breast-fed infants not only in weight but also in length (Begany & Mascarenhas, 2007).

Formula feeding requires more than just opening, pouring, and feeding. Parents need information about the types of formula available, preparation and storage of formula, equipment, feeding positions, and the amount to feed their newborn. The mother also needs to know how to prevent lactation (see Chap. 16 for more information).

Commercially prepared formulas are regulated by the Food and Drug Administration (FDA) and are manufactured by Meade Johnson (Enfamil) or Ross Laboratories (Similac) in the United States. Normal full-term infants usually receive conventional cow's milk-based formula, but this decision is made by the health care provider. If the infant shows signs of a reaction or lactose intolerance, a switch to another formula type is recommended. The general recommendation is for all infants to receive iron-fortified formula until the age of 1 year. The latest generation of infant formulas includes some fortification with docosahexaenoic acid (DHA) and arachidonic acid (ARA), two natural components of breast milk. Researchers have found that formulas with DHA and ARA can enhance visual and cognitive development in children (Lawson, 2007).

Commercial formulas come in three forms: powder, concentrate, and easy to feed or ready to use. All are similar in terms of nutritional content but differ in expense. Powdered formula is the least expensive, with concentrated formula the next most expensive. Both must be mixed with water before using. Ready-to-feed formula is the most expensive; it can be opened and poured into a bottle and fed directly to the infant.

Parents need information about the equipment needed for formula feeding. Basic supplies are 4 to 6 4-oz bottles, 8 to 10 8-oz bottles, 8 to 10 nipple units, a bottle brush, and a nipple brush. A key area of instruction is assessing for flow of formula through the nipple and checking for any nipple damage. When the bottle is filled and turned upside down, the flow from the nipple should be approximately one drop per second. If the parents are using bottles with disposable bags, instruct them to make sure they have a tight-fitting nipple to prevent leaks. Frequent observation of the flow rate from the nipple and the condition of the nipple will prevent choking and aspiration

associated with too fast a rate of delivery. Ask the parents to fill a bottle with formula and then turn it upside down and observe the rate at which the formula drips from the bottle. If it is too fast (more than one drop/second), then the nipple should be replaced.

Correct formula preparation is critical to the newborn's health and development. Mistakes in dilution may result if the parents do not understand how to prepare the formula or make measurement errors. The safety of the water supply should be considered. If well water is used, parents should sterilize the water by boiling it or should use bottled water. Many health care providers still recommend that all water used in formula preparation be brought to a rolling boil for 1 to 2 minutes and should be cooled to room temperature before use.

Opened cans of ready-made or concentrated formula should be covered and refrigerated after being prepared for the day (24 hours). Instruct parents to discard any unused portions after 48 hours.

▶ *Take* NOTE!

Any formula left in the bottle after feeding should also be discarded, because the infant's saliva has been mixed with it.

To warm refrigerated formula, advise the parents to place the bottle in a pan of hot water and test the temperature by letting a few drops fall on the inside of the wrist. If it is comfortably warm to the mother, it is the correct temperature.

Formula-Feeding Assistance

The process of feeding a newborn formula from a bottle should mirror breast-feeding as closely as possible. Although nutrition is important, so are the emotional and interactive components of feeding. Encourage parents to cuddle their newborn closely and position him or her so that the head is in a comfortable position, not too far back or turned, which makes swallowing difficult. Also urge parents to communicate with their newborn during the feedings by talking and singing to him or her.

Although it may seem that bottle feeding is not a difficult task, many new parents find it awkward. At first glance, holding an infant and a bottle appears simple enough, but both the position of the baby and the angle of the bottle must be correct.

Formula-Feeding Positions

Advise mothers to feed their newborns in a relaxed and quiet setting to create a sense of calm for themselves and the baby. Make sure that comfort is a priority for both mother and newborn. The mother can sit in a comfortable chair, using a pillow to support the arm in which she is holding the baby. The mother can cradle the newborn in a semi-upright position, supporting the newborn's head in the crook of her arm. Holding the newborn close during feeding provides stimulation and helps prevent choking. Holding the newborn's head raised slightly will help prevent formula from washing backward into the eustachian tubes in the ears, which can lead to an ear infection.

Formula-Feeding Education

Parents require teaching about the correct preparation and storage of formula as well as the techniques for feeding. See Teaching Guidelines 18.5.

Proper positioning makes bottle feeding easier and more enjoyable for both mother and newborn. As in breast-feeding, frequent burping is key. Advise the parents to hold the bottle so that formula fills the nipple, thus allowing less air to enter. Infants get fussy when they swallow air during feedings and need to be relieved of it every 2 to 3 oz.

TEACHING GUIDELINES 18.5

Formula-Feeding

- Wash your hands with soap and water before preparing formula.
- Mix the formula and water amounts exactly as the label specifies.
- Always hold the newborn and bottle during feedings; never prop the bottle.
- Never freeze formula or warm it in the microwave.
- Place refrigerated formula in a pan of hot water for a few minutes to warm.
- Test the temperature of the formula by shaking a few drops on the wrist.
- Hold the bottle like a pencil, keeping it tipped to prevent air from entering. Position the bottle so that the nipple remains filled with milk.
- Burp the infant after every few ounces to allow air swallowed to escape.
- Move the nipple around in the infant's mouth to stimulate sucking.
- Always keep a bulb syringe close by to use if choking occurs.
- Avoid putting the infant to bed with a bottle to prevent "baby bottle tooth decay."
- Feed the newborn approximately every 3 to 4 hours.
- Use an iron-fortified formula for the first year.
- Prepare enough formula for the next 24 hours.
- Check nipples regularly and discard any that are sticky, cracked, or leaking.
- Store unmixed, open liquid formula in the refrigerator for up to 48 hours.
- Throw away any formula left in the bottle after each feeding.

Emphasize to parents that an electrolyte imbalance can occur in infants who are fed formula that has been incorrectly mixed. Hypernatremia can result from formula that is mixed too thickly; the high concentration of sodium is too much for the baby's immature kidneys to handle. As a result, sodium is excreted along with water, leading to dehydration. Mixing the formula with too much water in an effort to save money can lead to failure to thrive and lack of weight gain (AAP, 2007b).

Weaning and Introduction of Solid Foods

Eventually, breast-feeding or formula feeding ends. Weaning involves the transition from breast to bottle, from breast or bottle to cup, or from liquids to solids. Weaning from breast-feeding to cup has several advantages over weaning to a bottle because it eliminates the step of weaning first to a bottle and then to a cup. Another advantage is that the bottle does not become a security object for the infant.

Weaning can be done because the mother is returning to work and cannot keep breast-feeding, or because the infant is losing interest in breast-feeding and showing signs of independence. There is no "right" time to wean; it depends on the desires of the mother and infant. Weaning represents a significant change in the way the mother and infant interact, and each mother must decide for herself when she and her infant are ready to take that step. Either one can start the weaning process, but usually it occurs between 6 months and 1 year of age.

To begin weaning from the breast, instruct mothers to substitute breast-feeding with a cup or bottle. Often the midday feeding is the easiest feeding to replace. A trainer cup with two handles and a snap-on lid with a spout is appropriate and minimizes spilling. Because weaning is a gradual process, it may take months. Instruct parents to proceed slowly and let the infant's willingness and interest guide them.

Weaning from the bottle to the cup also needs to be timed appropriately for mother and infant. Typically, the night bottle is the last to be given up, with cup drinking substituted throughout the day. Slowly diluting the formula with water over a week can help in this process; the final result is an all-water bottle. To prevent the baby from sucking on the bottle during the night, remove it from the crib after the infant falls asleep.

When infants double their birthweight and weigh at least 13 lb, it is time to consider introducing solid foods. Readiness cues include:

- Consumption of 32 oz of formula or breast milk daily (estimated)
- Ability to sit up with minimal support and turn head away to indicate fullness
- Reduction of protrusion reflex so cereal can be propelled to back of throat
- Demonstration of interest in food others around them are eating
- Ability to open mouth automatically when food approaches it

When introducing solid foods, certain principles apply:

- Only one new single-ingredient food (e.g., rice cereal or carrots) should be introduced at a time to watch for allergies.
- Infants should be allowed to set the pace regarding how much they wish to eat.
- New foods should not be introduced more frequently than every 3 to 5 days.
- Fruits are added after cereals; then vegetables and meats are introduced; eggs are introduced last.
- A relaxed, unhurried, calm atmosphere for meals is important.
- A variety of foods are provided to ensure a balanced diet.
- Infants should never be force-fed (Lawson, 2007).

Nurses can promote good feeding practices by actively listening to new mothers, helping them clarify their feelings and discussing solutions. A warm, sincere manner and tone of voice will put an anxious mother at ease. Giving accurate information, making suggestions, and presenting options will enable the mother to decide what is best for her and her infant. Nurses should be sensitive to the individual, family, and economic and cultural differences among mothers before offering suggestions for feeding practices that may not be appropriate.

Preparing for Discharge

Preparing the parents for discharge is an essential task for the nurse. Because of today's shorter hospital stays, the nurse must identify the major teaching topics that need to be covered. Nurses should assess the parents' baseline knowledge and learning needs and plan how to meet them. Using the following principles fosters a learner-centered approach:

- Make the environment conducive to learning. Encourage the parents to feel comfortable during this intense time by using support and praise.
- Allow the parents to provide input about the content and the process of learning. What do they want and need to learn?
- Build the parents' self-esteem by confirming that their responses to the entire birthing process and aftercare are legitimate, and others have felt the same way.
- Ensure that what the parents learn is relevant to their day-to-day home situation.
- Encourage responsibility by reinforcing that their emotional and physical responses are within the normal range.
- Respect cultural beliefs and practices that are important to the family by taking into account their heritage and health beliefs regarding newborn care. Examples include placing a bellyband over the newborn's navel

(Hispanics and African-Americans), delaying naming the newborn (Asian-Americans and Haitians), and delaying breast-feeding (Native Americans; they regard colostrum as "bad") (Bowers, 2007).

While in the hospital, women have ready access to support and hands-on instruction regarding feeding and newborn care. When the new mother is discharged, this close supervision and support by nurses should not end abruptly. Providing the new parents with the phone number of the mother–baby unit will help them through this stressful transitional period. Giving the new family information and offering backup support via the telephone will increase parenting success.

▸ *Consider* THIS!

I have always prided myself on being very organized and in control in most situations, but survival at home after childbirth wasn't one of them. I left the hospital 24 hours after giving birth to my son because my doctor said I could. The postpartum nurse encouraged me to stay longer, but wanting to be in control and sleeping in my own bed again won out. I thought my baby would be sleeping while I sent out birth announcements to my friends and family—wrong! What happened instead was my son didn't sleep as I imagined and my nipples became sore after breast-feeding every few hours. I was weary and tired and wanted to sleep, but I couldn't. Somehow I thought I would be getting a full night's sleep because I was up throughout the day, but that was a fantasy too. At 2 o'clock in the morning when you are up feeding your baby, you feel you are the only one in the world up at that time and feel very much alone. My feelings of being organized and in control all the time have changed dramatically since I left the hospital. I have learned to yield to the important needs of my son and derive satisfaction from being able to bring comfort to him and to let go of my control.

Thoughts: It is interesting to see how a newborn changed this woman's need to organize and control her environment. What "tips of survival" could the nurse offer this woman to help in her transition to home with her newborn? How can friends and family help when women arrive home from the hospital with their newborns?

Ensuring Follow-Up Care

Most newborns are scheduled for their first health follow-up appointment within 2 to 4 days after discharge so they can have additional laboratory work done as part of the newborn screening series, especially if they were discharged within 48 hours. After this first visit, the typical schedule of health care visits is as follows: 2 to 4 weeks of age; 2, 4, and 6 months of age for checkups and vaccines; 9 months of age for a checkup; 12 months for a checkup and tuberculosis testing; 15 and 18 months for checkups and vaccines; and 2 years of age for a checkup. These appointments provide an opportunity for parents to ask questions and receive anticipatory guidance as their newborn grows and develops.

In addition to encouraging parents to keep follow-up appointments, advise parents to call their health care provider if they notice signs of illness in their newborn. They should know which over-the-counter medicines should be kept on hand. Review the following warning signs of illness with parents:

- Temperature of 38.3°C (101°F) or higher
- Forceful, persistent vomiting, not just spitting up
- Refusal to take feedings
- Two or more green, watery diarrheal stools
- Infrequent wet diapers and change in bowel movements from normal pattern
- Lethargy or excessive sleepiness
- Inconsolable crying and extreme fussiness
- Abdominal distention
- Difficult or labored breathing

Providing Immunization Information

Parents also need instructions about immunizations for their newborn. **Immunization** is the process of rendering an individual immune or of becoming immune to certain communicable diseases (AAP, 2007). The purpose of the immune system is to identify unknown (non-self) substances in the body and develop a defense against these invaders. Disease prevention by immunization is a public health priority and is one of the leading health indicators as part of *Healthy People 2010.* Despite many advances in vaccine delivery, the goal of universal immunization has not been reached (AAP, 2007). Nurses can help to meet this national goal by educating new parents about the importance of disease prevention through immunizations.

Immunity can be provided either passively or actively. Passive immunity is protection transferred via already formed antibodies from one person to another. Passive immunity includes transplacental passage of antibodies from a mother to her newborn, immunity passed through breast milk, and immunity from immunoglobulins. Passive immunity provides limited protection and decreases over a period of weeks or months (Blackburn, 2007). Active immunity is protection produced by an individual's own immune system. It can be obtained by having the actual disease or by receiving a vaccine that produces an immunologic response by that person's body. Active immunity may be lifelong either way.

Young infants and children are susceptible to various illnesses because their immune systems are not yet mature. Many of these illnesses can be prevented by following the recommended schedule of childhood immunizations; Figure 18.22 shows the 2008 Childhood Immunization

Recommended Immunization Schedule for Persons Aged 0–6 Years—UNITED STATES • 2008

For those who fall behind or start late, see the catch-up schedule

Vaccine ▼ Age ▶	Birth	1 month	2 months	4 months	6 months	12 months	15 months	18 months	19–23 months	2–3 years	4–6 years
Hepatitis B[1]	HepB	HepB		see footnote 1	HepB						
Rotavirus[2]			Rota	Rota	Rota						
Diphtheria, Tetanus, Pertussis[3]			DTaP	DTaP	DTaP	see footnote 3	DTaP				DTaP
Haemophilus influenzae type b[4]			Hib	Hib	*Hib*[4]	Hib					
Pneumococcal[5]			PCV	PCV	PCV	PCV				PPV	
Inactivated Poliovirus			IPV	IPV	IPV						IPV
Influenza[6]					Influenza (Yearly)						
Measles, Mumps, Rubella[7]						MMR					MMR
Varicella[8]						Varicella					Varicella
Hepatitis A[9]						HepA (2 doses)				HepA Series	
Meningococcal[10]										MCV4	

Range of recommended ages

Certain high-risk groups

This schedule indicates the recommended ages for routine administration of currently licensed childhood vaccines, as of December 1, 2007, for children aged 0 through 6 years. Additional information is available at **www.cdc.gov/vaccines/recs/schedules**. Any dose not administered at the recommended age should be administered at any subsequent visit, when indicated and feasible. Additional vaccines may be licensed and recommended during the year. Licensed combination vaccines may be used whenever any components of the combination are indicated and other components of the vaccine are not contraindicated and if approved by the Food and Drug Administration for that dose of the series. Providers should consult the respective Advisory Committee on Immunization Practices statement for detailed recommendations, including for **high-risk conditions: http://www.cdc.gov/vaccines/pubs/ACIP-list.htm**. Clinically significant adverse events that follow immunization should be reported to the Vaccine Adverse Event Reporting System (VAERS). Guidance about how to obtain and complete a VAERS form is available at **www.vaers.hhs.gov** or by telephone, **800-822-7967**.

1. Hepatitis B vaccine (HepB). *(Minimum age: birth)*

At birth:

- Administer monovalent HepB to all newborns prior to hospital discharge.
- If mother is hepatitis B surface antigen (HBsAg) positive, administer HepB and 0.5 mL of hepatitis B immune globulin (HBIG) within 12 hours of birth.
- If mother's HBsAg status is unknown, administer HepB within 12 hours of birth. Determine the HBsAg status as soon as possible and if HBsAg positive, administer HBIG (no later than age 1 week).
- If mother is HBsAg negative, the birth dose can be delayed, in rare cases, with a provider's order and a copy of the mother's negative HBsAg laboratory report in the infant's medical record.

After the birth dose:

- The HepB series should be completed with either monovalent HepB or a combination vaccine containing HepB. The second dose should be administered at age 1–2 months. The final dose should be administered no earlier than age 24 weeks. Infants born to HBsAg-positive mothers should be tested for HBsAg and antibody to HBsAg after completion of at least 3 doses of a licensed HepB series, at age 9–18 months (generally at the next well-child visit).

4-month dose:

- It is permissible to administer 4 doses of HepB when combination vaccines are administered after the birth dose. If monovalent HepB is used for doses after the birth dose, a dose at age 4 months is not needed.

2. Rotavirus vaccine (Rota). *(Minimum age: 6 weeks)*

- Administer the first dose at age 6–12 weeks.
- Do not start the series later than age 12 weeks.
- Administer the final dose in the series by age 32 weeks. Do not administer any dose later than age 32 weeks.
- Data on safety and efficacy outside of these age ranges are insufficient.

3. Diphtheria and tetanus toxoids and acellular pertussis vaccine (DTaP). *(Minimum age: 6 weeks)*

- The fourth dose of DTaP may be administered as early as age 12 months, provided 6 months have elapsed since the third dose.
- Administer the final dose in the series at age 4–6 years.

4. *Haemophilus influenzae* type b conjugate vaccine (Hib). *(Minimum age: 6 weeks)*

- If PRP-OMP (PedvaxHIB® or ComVax® [Merck]) is administered at ages 2 and 4 months, a dose at age 6 months is not required.
- TriHIBit® (DTaP/Hib) combination products should not be used for primary immunization but can be used as boosters following any Hib vaccine in children age 12 months or older.

5. Pneumococcal vaccine. *(Minimum age: 6 weeks for pneumococcal conjugate vaccine [PCV]; 2 years for pneumococcal polysaccharide vaccine [PPV])*

- Administer one dose of PCV to all healthy children aged 24–59 months having any incomplete schedule.
- Administer PPV to children aged 2 years and older with underlying medical conditions.

6. Influenza vaccine. *(Minimum age: 6 months for trivalent inactivated influenza vaccine [TIV]; 2 years for live, attenuated influenza vaccine [LAIV])*

- Administer annually to children aged 6–59 months and to all eligible close contacts of children aged 0–59 months.
- Administer annually to children 5 years of age and older with certain risk factors, to other persons (including household members) in close contact with persons in groups at higher risk, and to any child whose parents request vaccination.
- For healthy persons (those who do not have underlying medical conditions that predispose them to influenza complications) ages 2–49 years, either LAIV or TIV may be used.
- Children receiving TIV should receive 0.25 mL if age 6–35 months or 0.5 mL if age 3 years or older.
- Administer 2 doses (separated by 4 weeks or longer) to children younger than 9 years who are receiving influenza vaccine for the first time or who were vaccinated for the first time last season but only received one dose.

7. Measles, mumps, and rubella vaccine (MMR). *(Minimum age: 12 months)*

- Administer the second dose of MMR at age 4–6 years. MMR may be administered before age 4–6 years, provided 4 weeks or more have elapsed since the first dose.

8. Varicella vaccine. *(Minimum age: 12 months)*

- Administer second dose at age 4–6 years; may be administered 3 months or more after first dose.
- Do not repeat second dose if administered 28 days or more after first dose.

9. Hepatitis A vaccine (HepA). *(Minimum age: 12 months)*

- Administer to all children aged 1 year (i.e., aged 12–23 months). Administer the 2 doses in the series at least 6 months apart.
- Children not fully vaccinated by age 2 years can be vaccinated at subsequent visits.
- HepA is recommended for certain other groups of children, including in areas where vaccination programs target older children.

10. Meningococcal vaccine. *(Minimum age: 2 years for meningococcal conjugate vaccine (MCV4) and for meningococcal polysaccharide vaccine (MPSV4))*

- Administer MCV4 to children aged 2–10 years with terminal complement deficiencies or anatomic or functional asplenia and certain other high-risk groups. MPSV4 is also acceptable.
- Administer MCV4 to persons who received MPSV4 3 or more years previously and remain at increased risk for meningococcal disease.

FIGURE 18.22 Recommended childhood immunization schedule.

Schedule. Readers can view the latest CDC immunization schedule by visiting www.cdc.gov/nip. The schedule for immunizations should be reviewed with parents, stressing the importance of continued follow-up health care to preserve their infant's health.

The newborn's first immunization (hepatitis B) is received in the hospital soon after birth. The first dose can also be given by age 2 months if the mother is HbsAg negative. If the mother is HbsAg positive, then the newborn should receive hepatitis B vaccine and hepatitis B immunoglobulin within 12 hours of birth (Cunningham et al., 2005).

Education for the parents should include the risks and benefits for each vaccine and possible adverse effects. Federal law requires a consent form to be signed before administering a vaccine. Parents have the right to refuse immunizations based on their religious beliefs and can sign a waiver noting their decision. The nurse administering the vaccine must document the date and time it was given, name and manufacturer, lot number and expiration date of the vaccine given, site and route of administration, and the name and title of the nurse who administered the vaccine.

Key Concepts

- The period of transition from intrauterine to extrauterine life occurs during the first several hours after birth. It is a time of stabilization for the newborn's temperature, respiration, and cardiovascular dynamics.
- The newborn's bowel is sterile at birth. It usually takes about a week for the newborn to produce vitamin K in sufficient quantities to prevent VKDB.
- It is recommended that all newborns in the United States receive an instillation of a prophylactic agent (erythromycin or tetracycline ophthalmic ointment) in their eyes within an hour or two of being born.
- Nursing measures to maintain newborns' body temperature include drying them immediately after birth to prevent heat loss through evaporation, wrapping them in prewarmed blankets, putting a hat on their head, and placing them under a temperature-controlled radiant warmer.
- The specific components of a typical newborn examination include a general survey of skin color, posture, state of alertness, head size, overall behavioral state, respiratory status, gender, and any obvious congenital anomalies.
- Gestational age assessment is pertinent because it allows the nurse to plot growth parameters and to anticipate potential problems related to prematurity/postmaturity and growth abnormalities such as SGA/LGA.
- After the newborn has passed the transitional period and stabilized, the nurse needs to complete ongoing assessments, vital signs, weight and measurements, cord care, hygiene measures, newborn screening tests, and various other tasks until the newborn is discharged home from the birthing unit.
- Important topics about which to educate parents include environmental safety, newborn characteristics, feeding and bathing, circumcision and cord care, sleep and elimination patterns of newborns, safe infant car seats, holding/positioning, and follow-up care.
- Newborn screening tests consist of hearing and certain genetic and inborn errors of metabolism tests required in most states for newborns before discharge from the birth facility.
- The AAP and the American Dietetic Association recommend breast-feeding exclusively for the first 6 months of life and that it continue along with other food at least until the first birthday.
- Parents who choose not to breast-feed need to know what types of formula are available, preparation and storage of formula, equipment, feeding positions, and how much to feed their infant.
- Common problems associated with the newborn include transient tachypnea, physiologic jaundice, and hypoglycemia.
- Transient tachypnea of the newborn appears soon after birth; is accompanied by retractions, expiratory grunting, or cyanosis; and is relieved by low-dose oxygen.
- Physiologic jaundice is a very common condition in newborns, with the majority demonstrating yellowish skin, mucous membranes, and sclera within the first 3 days of life. Newborns undergoing phototherapy in the treatment of jaundice require close monitoring of their body temperature, fluid, and electrolyte balance; observation of skin integrity; eye protection; and parental participation in their care.
- The newborn with hypoglycemia requires close monitoring for signs and symptoms of hypoglycemia if present. In addition, newborns at high risk need to be identified based on their perinatal history, physical examination, body measurements, and gestational age. Blood glucose levels of all newborns are checked within the first few hours after birth and every 4 hours thereafter.
- The schedule for immunizations should be reviewed with parents, stressing the importance of continual follow-up health care to preserve their infant's health.

References

Adegbehingbe, O., Owa, J. A., Kuti, O., & Oginni, L. M. (2007). Orthopedic birth trauma: A reflection of current perinatal care. *Internet Journal of Gynecology and Obstetrics, 6*(2), 8–20.

Adler, M. R., Hyderi, A., & Hamilton, A. (2006). What are the safe sleeping arrangements for infants? *Journal of Family Practice, 55*(12), 1083–1087.

American Academy of Pediatrics (AAP). (2006a). *A woman's guide to breast-feeding.* Available at www.aap.org/family/brstguid.htm.

American Academy of Pediatrics (AAP). (2006b). Breast-feeding and the use of human milk. AAP policy statement. *Pediatrics, 115,* 496–506.

American Academy of Pediatrics (AAP). (2007a). *Bright futures guidelines for health supervision of infants, children, and adolescents.* Washington, DC: AAP.

American Academy of Pediatrics (AAP). (2007b). *Heading home with your newborn: From birth to reality.* Washington, DC: AAP.
American Academy of Pediatrics (AAP). (2007c). *Pediatric clinical practice guidelines and policies: A compendium of evidence-based research for pediatric practice* (7th ed.). Washington, DC: AAP.
American Academy of Pediatrics (AAP). (2007d). *Car safety seats: A guide for families 2007.* Available at www.aap.org/family/carseatguide.htm.
Arenson, J., & Drake, P. (2007). *Maternal and newborn health.* Sudbury, MA: Jones and Bartlett Publishers.
Asenjo, M. (2007). Transient tachypnea of the newborn. *eMedicine.* Available at www.emedicine.com/radio/topic710.htm.
AWHONN Lifelines. (2007). Preventing infant abduction: A parent's guide. *AWHONN Lifelines, 10*(6), 521–522.
Begany, M., & Mascarenhas, M. (2007). Normal infant feeding. In R. E. Rakel & E. T. Bope (Eds.), *Conn's current therapy 2007* (Section 16, pp. 1210–1214). Philadelphia: Saunders Elsevier.
Blackburn, S. T. (2007). *Maternal, fetal, and neonatal physiology: A clinical perspective* (3rd ed.). St. Louis: Saunders Elsevier.
Bowers, P. (2007). Cultural aspects of childbearing. *Nursing Spectrum.* Available at: http://www.nurse.com/ce/syllabus.html?CCID=3245.
Burns, C. E., Dunn, A. M., Brady, M. A., Starr, N. B., & Blosser, C. G. (2009). *Pediatric primary care* (4th ed.). St. Louis: Saunders Elsevier.
Buswell, S. D., & Spatz, D. L. (2007). Parent-infant co-sleeping and its relationship to breastfeeding. *Journal of Pediatric Health Care, 21*(1), 22–28.
Centers for Disease Control and Prevention (CDC). (2007). *Sexually transmitted diseases treatment guidelines.* Available at: www.cdc.gov/STD/treatment.
Cohen, S. (2007). *Critical thinking in the pediatric unit: Skills to assess, analyze and act.* Marblehead, MA: HCPro, Inc.
Cohen, S. M. (2006). Jaundice in the full-term newborn. *Pediatric Nursing, 32*(3), 202–208.
Cunningham, F. G., Leveno, K. J., Bloom, S. L., Hauth, J. C., Gilstrap, L. C., & Wenstrom, K. D. (2005). *Williams obstetrics* (22nd ed.). New York: McGraw-Hill Medical Publishing Division.
Deshpande, P. G., & Ramer, T. (2007). Breast milk jaundice. *eMedicine.* Available at: http://www.emedicine.com/ped/topic282.htm.
Dillon, P. M. (2007). *Nursing health assessment: A critical thinking, case studies approach.* Philadelphia: F. A. Davis.
Dudek, S. G. (2006). *Nutrition essentials for nursing practice* (5th ed.). Philadelphia: Lippincott Williams & Wilkins.
Healthcare Risk Management. (2007). Infant abduction raises questions about health care security and vigilance. *Healthcare Risk Management, 29*(5), 49–60.
Johnson, K. J., Spector, L. G., Klebanoff, M. A., & Ross, J. A. (2007). Childhood cancer and birthmarks in the collaborative perinatal project. *Pediatrics, 119*(5), 1088–1093.
Keenan, W. (2006). Apgar score—How consistent is it? *Pediatric Alert, 31*(19), 113–114.
Kenner, C., & Lott, J. W. (2007). *Comprehensive neonatal care: An interdisciplinary approach* (4th ed.). St. Louis: Saunders Elsevier.
Kliegman, R. M., Behrman, R. E., Jenson, H. B., & Stanton, B. F. (2007). *Nelson's textbook of pediatrics* (18th ed.). St. Louis: Saunders Elsevier.
Lawrence, E. J. (2006). Focus on the physical. Part 1: A matter of size. *Advances in Neonatal Care, 6*(6), 313–322.
Lawson, M. (2007). Contemporary aspects of infant feeding. *Pediatric Nursing, 19*(2), 39–45.
Maisels, M. J. (2006). What's in a name? Physiologic and pathologic jaundice: The conundrum of defining normal bilirubin levels in the newborn. *Pediatrics, 118*(2), 805–807.
Mukherjee, S. (2007). Hyperbilirubinemia, unconjugated. *eMedicine.* Available at: http://www.emedicine.com/med/topic1066.htm.
Pryor, G., & Huggins, K. (2007). *Nursing mother, working mother: The essential guide to breastfeeding your baby before and after you return to work* (2nd ed.). Harvard, MA: The Harvard Common Press.
Ridings, H., & Amaya, M. (2007). Male neonatal circumcision: An evidence-based review. *Journal of the American Academy of Physician Assistants, 20*(2), 32–36.
Simonson, C., Barlow, P., Dehennin, N., Sphel, M., Toppet, V., Murillo, D., & Rozenberg, S. (2007). Neonatal complications of vacuum-assisted delivery. *Obstetrics and Gynecology, 109*(3), 626–633.
U.S. Department of Health and Human Services (USDHHS). (2000). *Healthy people 2010: Understanding and improving health* (2nd ed.). DHHS publication 017-001-00550-9. Washington, DC: Author.
U.S. Prevention Services Task Force (USPSTF). (2006). *The guide to clinical prevention services.* Agency for Healthcare Research and Quality. Washington, DC: AHRQ Pub.No. 06-0588.
Walsh, D. (2007). *Evidence-based care for normal labor and birth: A guide for midwives.* London: Taylor and Francis, Inc.
Wasee, M. (2006). Vitamin K and hemorrhagic disease of newborns. *Southern Medical Journal, 99*(11), 1199–1200.
Wrightson, A. S. (2007) Universal newborn hearing screening. *American Family Physician, 75*(9), 1349–1352.

WEBSITES

American Academy of Pediatrics, Newborn Screening Facts Sheets: www.aap.org/policy/01565.html
American Academy of Pediatrics, Breast-feeding and use of human milk: www.aap.org/policy/re9729.html
American Social Health Association: www.vaccines.ashastd.org
Baby Trend: www.babytrend.com
Breast-feeding information: www.breastfeeding.com
Bright Future Lactation Resource Center: www.bflrc.com
CDC's National Immunization Program: www.cdc.gov/nip
Graco/Century: www.gracobaby.com
Immunization Action Coalition: www.immunize.org
La Leche League International: www.lalecheleague.org
March of Dimes, newborn screening tests: www.marchofdimes.com/professionals/681_1200.asp
National Center for Missing and Exploited Children: www.missingkids.com
National Healthy Mothers, Healthy Babies Coalition: www.hmhb.org
National Institute of Child Health and Human Development: www.nih.gov
National Newborn Screening and Genetics Resource Center: http://genes-r-us.uthscsa.edu/resources/newborn/screestatus.htm
Neonatal Network: www.neonatalnetwork.com
Safeline Corporation: www.safelinekids.com
Vaccine Education Center: www.vaccine.chop.edu

CHAPTER WORKSHEET

MULTIPLE CHOICE QUESTIONS

1. At birth, a newborn's assessment reveals the following: heart rate of 140 bpm, loud crying, some flexion of extremities, crying when bulb syringe is introduced into the nares, and a pink body with blue extremities. The nurse would document the newborn's Apgar score as:
   a. 5 points
   b. 6 points
   c. 7 points
   d. 8 points
2. The nurse is explaining phototherapy to the parents of a newborn. The nurse would include which of the following as the purpose?
   a. Increase surfactant levels
   b. Stabilize the newborn's temperature
   c. Destroy Rh-negative antibodies
   d. Oxidize bilirubin on the skin
3. The nurse administers a single dose of vitamin K intramuscularly to a newborn after birth to promote:
   a. Conjugation of bilirubin
   b. Blood clotting
   c. Foreman ovale closure
   d. Digestion of complex proteins
4. A prophylactic agent is instilled in both eyes of all newborns to prevent which of the following conditions?
   a. Gonorrhea and chlamydia
   b. Thrush and Enterobacter
   c. *Staphylococcus* and syphilis
   d. Hepatitis B and herpes
5. The AAP recommends that all newborns be placed on their backs to sleep to reduce the risk of:
   a. Respiratory distress syndrome
   b. Bottle mouth syndrome
   c. Sudden infant death syndrome
   d. GI regurgitation syndrome
6. Which of the following immunizations is received by newborns before hospital discharge?
   a. Pneumococcus
   b. Varicella
   c. Hepatitis A
   d. Hepatitis B
7. Which condition would be missed if newborns are screened before they have tolerated protein feedings for at least 48 hours?
   a. Hypothyroidism
   b. Cystic fibrosis
   c. Phenylketonuria
   d. Sickle cell disease

CRITICAL THINKING EXERCISES

1. Linda Scott, an African-American mother who delivered her first baby and is on the mother–baby unit, calls the nursery nurse into her room and expresses concern about how her daughter looks. Ms. Scott tells the nurse that her baby's head looks like a "banana" and is mushy to the touch, and she has "white spots" all over her nose. In addition, there appear to be "big bluish bruises" all over her baby's buttocks. She wants to know what is wrong with her baby and whether these problems will go away.
   a. How should the nurse respond to Ms. Scott's questions?
   b. What additional newborn instruction might be appropriate at this time?
   c. What reassurance can be given to Ms. Scott regarding her daughter's appearance?
2. At approximately 12:30 a.m. on a Friday, a woman enters a hospital through a busy emergency room. She is wearing a white uniform and a lab coat with a stethoscope around her neck. She identifies herself as a new nurse coming back to check on something she had left on the unit on an earlier shift. She enters a postpartum client's room containing the mother's newborn, pushes the open crib down a hallway, and escapes through an exit. The security cameras aren't working. The infant isn't discovered missing until the 2 a.m. check by the nurse.

a. What impact does an infant abduction have on the family and the hospital?

b. What security measure was the weak link in the chain of security?

c. What can hospitals do to prevent infant abduction?

STUDY ACTIVITIES

1. Interview a new mother on the postpartum unit on her second day about the changes she has noticed in her newborn's appearance and behavior within the past 24 hours. Discuss your interview findings at post conference.
2. Demonstrate a newborn bath to a new mother in her room, using the principle of bathing from the cleanest to the dirtiest body part. Discuss the questions asked by the mother and her reaction to the demonstration in post conference.
3. Go to the La Leche League website (www.lalecheleague.org). Review the information it provides on breast-feeding. How helpful would it be to a new mother?
4. Debate the risks and benefits of neonatal circumcision within your nursing group at post conference. Did either side present a stronger position? What is your opinion, and why?