LEARNING OBJECTIVES

- Describe the purpose and components of the Apgar score.
- Describe the method for estimating the gestational age of a newborn.
- Explain the procedure for assessment of the newborn.
- Describe common deviations from normal physiologic findings during examination of the newborn.
- Discuss nursing care management of the newborn in transition to extrauterine life.
- Explain what is meant by a protective environment.
- Discuss phototherapy and the guidelines for teaching parents about this treatment.
- Explain purposes for and methods of circumcision, the postoperative care of the circumcised infant, and parent teaching regarding circumcision.
- Describe procedures for doing a heel stick, collecting urine specimens, assisting with venipuncture, and restraining the newborn.
- Evaluate pain in the newborn based on physiologic changes and behavioral observations.
- Discuss parent education related to caring for the infant during the first weeks at home.

KEY TERMS AND DEFINITIONS

Apgar score  Numeric expression of the condition of a newborn obtained by rapid assessment at 1 and 5 minutes of age, developed by Dr. Virginia Apgar

circumcision  Excision of the prepuce (foreskin) of the penis, exposing the glans

hypothermia  Temperature that falls below normal range, that is, below 35° C, usually caused by exposure to cold

ophthalmia neonatorum  Infection in the neonate’s eyes usually resulting from gonorrheal, chlamydial, or other infection contracted when the fetus passes through the birth canal (vagina)

phototherapy  Use of lights to reduce serum bilirubin levels by oxidation of bilirubin into water-soluble compounds that are processed in the liver and excreted in bile and urine

ELECTRONIC RESOURCES

Additional information related to the content in Chapter 19 can be found on the companion website at http://evolve.elsevier.com/Lowdermilk/Maternity/ or on the interactive companion CD

- NCLEX Review Questions
- Case Study—Normal Newborn
- WebLinks
- NCLEX Review Questions
- Critical Thinking Exercise—Circumcision
- Critical Thinking Exercise—Jaundice
- Plan of Care—Normal Newborn
- Skill—Changing a Diaper
- Skill—Infant Bathing
- Skill—Pain Assessment
- Video—Assessment of the Newborn
The numerous biologic changes the neonate makes during the transition to extra-uterine life are discussed in the preceding chapter. The first 24 hours are critical because respiratory distress and circulatory failure can occur rapidly and with little warning. Although most infants make the necessary biopsychosocial adjustment to extrauterine existence without undue difficulty, their well-being depends on the care they receive from others. This chapter describes assessment and care of the infant immediately after birth until discharge, as well as important parent education related to ongoing infant care. A discussion of pain in the neonate and its management is included.

Assessment and Nursing Diagnoses

The initial assessment of the neonate is done at birth by using the Apgar score (Table 19-1) and a brief physical examination (Box 19-1). A gestational age assessment is done within 2 hours of birth (Fig. 19-1). A more comprehensive physical assessment is completed within 24 hours of birth (Table 19-2).

**Box 19-1**

**Initial Physical Assessment by Body System**

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>FINDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNS</td>
<td>moves extremities, muscle tone good</td>
</tr>
<tr>
<td></td>
<td>symmetric features, movement</td>
</tr>
<tr>
<td></td>
<td>suck, rooting, Moro response, grasp reflexes good</td>
</tr>
<tr>
<td></td>
<td>anterior fontanel soft and flat</td>
</tr>
<tr>
<td>CV</td>
<td>heart rate strong and regular</td>
</tr>
<tr>
<td></td>
<td>no murmurs heard</td>
</tr>
<tr>
<td></td>
<td>pulsa strong and equal bilaterally</td>
</tr>
<tr>
<td></td>
<td>no retractions or nasal flaring</td>
</tr>
<tr>
<td></td>
<td>respiratory rate, 30-60 breaths/min</td>
</tr>
<tr>
<td></td>
<td>chest expansion symmetric</td>
</tr>
<tr>
<td></td>
<td>no upper airway congestion</td>
</tr>
<tr>
<td>RESP</td>
<td>lungs clear to auscultation bilaterally</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>GU</td>
<td>male: urethral opening at tip of penis; testes descended bilaterally</td>
</tr>
<tr>
<td></td>
<td>female: vaginal opening apparent</td>
</tr>
<tr>
<td>GI</td>
<td>abdomen soft, no distention</td>
</tr>
<tr>
<td></td>
<td>cord attached and clamped</td>
</tr>
<tr>
<td></td>
<td>anus appears patent</td>
</tr>
<tr>
<td>ENT</td>
<td>eyes clear</td>
</tr>
<tr>
<td></td>
<td>palate intact</td>
</tr>
<tr>
<td></td>
<td>nares patent</td>
</tr>
<tr>
<td>SKIN</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comments:**

Assessment and Nursing Diagnoses

The initial assessment of the neonate is done at birth by using the Apgar score (Table 19-1) and a brief physical examination (Box 19-1). A gestational age assessment is done within 2 hours of birth (Fig. 19-1). A more comprehensive physical assessment is completed within 24 hours of birth (Table 19-2).

**Table 19-1**

**Apgar Score**

<table>
<thead>
<tr>
<th>SIGN</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart rate</td>
<td>0</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>0</td>
</tr>
<tr>
<td>Reflex irritability</td>
<td>0</td>
</tr>
<tr>
<td>Color</td>
<td>0</td>
</tr>
</tbody>
</table>

**Apgar score**

The Apgar score permits a rapid assessment of the need for resuscitation based on five signs that indicate the physiologic state of the neonate: (1) heart rate, based on auscultation with a stethoscope; (2) respiratory rate, based on observed movement of the chest wall; (3) muscle tone, based on degree of flexion and movement of the extremities;
(4) reflex irritability, based on response to gentle slaps on the soles of the feet; and (5) generalized skin color, described as pallid, cyanotic, or pink. Each item is scored as a 0, 1, or 2. Evaluations are made 1 and 5 minutes after birth. Scores of 0 to 3 indicate severe distress; scores of 4 to 6 indicate moderate difficulty; and scores of 7 to 10 indicate that the infant is having no difficulty adjusting to extrauterine life. Apgar scores do not predict future neurologic outcome but are useful for describing the newborn’s transition to extrauterine environment (Box 19-2). Should resuscitation be required, it should be initiated before the 1-minute Apgar score (American Academy of Pediatrics [AAP] and American College of Obstetricians and Gynecologists [ACOG], 2002).

Initial Physical Assessment

The initial physical assessment includes a brief review of systems (see Box 19-1):

1. **External:** Note skin color, general activity, position; assess nasal patency by covering one nostril at a time while observing respirations; skin: peeling, or lack of subcutaneous fat (dysmaturity or postterm); note meconium staining of cord, skin, fingernails, or amniotic fluid (staining may indicate fetal release of meconium, often related to hypoxia; offensive odor may indicate intrauterine infection); note length of nails and creases on soles of feet.

2. **Chest:** Auscultate apical heart for rate and rhythm, heart tones and presence of abnormal sounds; note character of respirations and presence of crackles or stridor.
other adventitious sounds; note equality of breath sounds by auscultation.
3. **Abdomen:** Observe characteristics of abdomen (rounded, flat, concave) and absence of anomalies; auscultate bowel sounds; note number of vessels in cord.
4. **Neurologic:** Check muscle tone; assess Moro and suck reflexes; palpate anterior fontanel; note by palpation the presence and size of the fontanels and sutures.
5. **Genitourinary:** Note external sex characteristics and any abnormality of genitalia; check anal patency, presence of meconium; note passage of urine.
6. **Other observations:** Note gross structural malformations obvious at birth that may require immediate medical attention.

The nurse responsible for the care of the newborn immediately after birth verifies that respirations have been normal.
### TABLE 19-2
Physical Assessment of Newborn

<table>
<thead>
<tr>
<th>AREA ASSESSED</th>
<th>NORMAL FINDINGS</th>
<th>DEVIATIONS FROM NORMAL RANGE</th>
<th>ETIOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POSTURE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect newborn before disturbing Refer to maternal chart for fetal presentation, position, and type of birth (vaginal, surgical), because newborn readily assumes prenatal position</td>
<td>Vertebrae, arms, legs in moderate flexion; fists clenched Normal spontaneous movement bilaterally asynchronous but equal extension in all extremities Frank breech: legs straighter and stiff</td>
<td>Hypotonia</td>
<td>Prematurity or hypoxia in utero, maternal medications Drug dependence, central nervous system (CNS) disorder CNS disturbance</td>
</tr>
<tr>
<td><strong>VITAL SIGNS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Heart rate and pulses</strong></td>
<td>Visually palpations in left midclavicular line, fifth intercostal space Atrial pulse, fourth intercostal space 100-180 beats/min 80-100 beats/min (sleeping) to 180 beats/min (crying) Quality: first sound (closure of mitral and tricuspid valves) and second sound (closure of aortic and pulmonic valves) sharp and clear Possible murmur</td>
<td>Tachycardia: persistent, ≥180 beats/min Bradycardia: persistent, ≤80 beats/min Murmurs Arrhythmias: irregular rate Sounds distant, poor quality, extra Heart on right side of chest</td>
<td>Respiratory distress syndrome (RDS) Congenital heart block, maternal lupus Possibly functional Pneumomediastinum Dextrocardia, often accompanied by reversal of intestines</td>
</tr>
<tr>
<td><strong>Peripheral pulses</strong></td>
<td>Weak or absent peripheral pulses; unequal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Femoral, brachial, popliteal, posterior tibial</td>
<td>Peripheral pulses equal and strong Femoral pulses equal and strong</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>Subnormal</td>
<td>Increased</td>
<td></td>
</tr>
<tr>
<td>Axillary: 36.5° C to 37.2° C Temperature stabilized by 8-10 hr of age</td>
<td>Temperature not stabilized by 6-8 hr after birth</td>
<td>If mother received magnesium sulfate, maternal analgesics</td>
<td>Prematurity, infection, low environmental temperature, inadequate clothing, dehydration Infection, high environmental temperature, excessive clothing, proximity to heating unit or in direct sunshine, drug addiction, diencephalus and dehydration</td>
</tr>
<tr>
<td><strong>Check respiratory rate and effort when infant is at rest</strong></td>
<td>Apneic episodes: ≥15 sec Bradypnea: ≤25/min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count respirations for full minute</td>
<td>30-60 breaths/min Shallow and irregular in rate, rhythm, and depth when infant is awake Crackles may be heard after birth</td>
<td></td>
<td>Preterm infant: “periodic breathing,” rapid warming or cooling of infant Maternal narcosis from analgesics or anesthesias, birth trauma</td>
</tr>
</tbody>
</table>
### Physical Assessment of Newborn—cont’d

<table>
<thead>
<tr>
<th>AREA ASSESSED</th>
<th>NORMAL FINDINGS</th>
<th>DEVIATIONS FROM NORMAL RANGE</th>
<th>ETIOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>VITAL SIGNS—cont’d</td>
<td>Breath sounds loud, clear, near</td>
<td>Tachypnea: &gt;60/min</td>
<td>RDS, congenital diaphragmatic hernia, transient tachypnea of the newborn fluid in lungs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crackles, rhonchi, wheezes</td>
<td>Narrowing of bronchi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Distress evidenced by nasal flaring, retractions, chin tug, labored breathing</td>
<td>RDS, fluid in lungs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Difference between upper and lower extremity pressures</td>
<td>Coarctation of aorta</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hypotension</td>
<td>Sepsis, hypovolemia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hypertension</td>
<td>Coarctation of aorta, renal involvement, thrombus</td>
</tr>
<tr>
<td>Measure blood pressure (BP) using oscillometric monitor BP cuff: palpate brachial, popliteal, or posterior tibial pulse (depending on measurement site) Check electronic monitor BP cuff: BP cuff width affects readings, use cuff 2.5 cm wide and palpate radial pulse</td>
<td>80-90s/40s-50s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEIGHT*</td>
<td>Weigh at same time each day</td>
<td>2500-4000 g Acceptable weight loss: ≤10%</td>
<td>Prematurity, small for gestational age, rubella syndrome</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Second baby weighs more than first Birth weight regained within first 2 weeks</td>
<td>Large for gestational age, maternal diabetes, heredity—normal for these parents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weight =2500 g</td>
<td>Dehydration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weight ≥4000 g</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weight loss &gt;10% to 15%</td>
<td></td>
</tr>
</tbody>
</table>

*Note: Weight, length, and head circumference all should be close to the same percentile for any newborn.*
**TABLE 19-2**

<table>
<thead>
<tr>
<th>AREA ASSESSED</th>
<th>NORMAL FINDINGS</th>
<th>DEVIATIONS FROM NORMAL RANGE</th>
<th>ETIOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH</td>
<td>Length from top of head to heel</td>
<td>46-55 cm</td>
<td>&lt;46 cm or &gt;55 cm</td>
</tr>
<tr>
<td>HEAD CIRCUMFERENCE</td>
<td>Measure head at greatest diameter: occipitofrontal circumference</td>
<td>32-36.8 cm</td>
<td>Small head ≤32 cm: microcephaly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hydrocephaly: sutures widely separated, circumference ≥4 cm more than chest circumference</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Increased intracranial pressure</td>
</tr>
</tbody>
</table>

Length, crown to rump. To determine total length, include length of legs. If measurements are taken before the infant’s initial bath, wear gloves. (Courtesy Marjorie Pyle, RNC, Life-circle, Costa Mesa, CA.)

Circumference of head. (Courtesy Marjorie Pyle, RNC, Life-circle, Costa Mesa, CA.)

Continued
### TABLE 19-2
Physical Assessment of Newborn—cont’d

<table>
<thead>
<tr>
<th>AREA ASSESSED</th>
<th>NORMAL FINDINGS</th>
<th>DEVIATIONS FROM NORMAL RANGE</th>
<th>ETIOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEST CIRCUMFERENCE</td>
<td>2.3 cm less than head circumference, averages between 30 and 33 cm</td>
<td>≤30 cm</td>
<td>Prematurity</td>
</tr>
<tr>
<td>Measure at nipple line</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABDOMINAL CIRCUMFERENCE</td>
<td>Same size as chest</td>
<td>Enlarging abdomen between feedings</td>
<td>Abdominal mass or blockage in intestinal tract</td>
</tr>
<tr>
<td>Measure above umbilicus</td>
<td>Not usually measured unless specific indication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SKIN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>Generally pink</td>
<td>Dark red</td>
<td>Prematurity, polycythemia</td>
</tr>
<tr>
<td></td>
<td>Varying with ethnic origin</td>
<td>Gray</td>
<td>Hypotension, poor perfusion</td>
</tr>
<tr>
<td></td>
<td>Acrocyanosis, especially if chilled</td>
<td>Pallor</td>
<td>Cardiovascular problem, CNS damage, blood dyscrasia, blood loss, twin-to-twin transfusion, nosocomial infection</td>
</tr>
<tr>
<td></td>
<td>Mottling</td>
<td></td>
<td>Hypothermia, infection, hypoglycemia, cardiopulmonary diseases, cardiac, neurologic, or respiratory malformations</td>
</tr>
<tr>
<td></td>
<td>Harlequin sign</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plathora</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Telangiectases (&quot;stork bites&quot; or capillary hemangiomas)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Erythema toxicum or neonatorum (&quot;newborn rash&quot;)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Milia</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Circumference of chest. (Courtesy Marjorie Pyle, RNC, Lifecircle, Costa Mesa, CA.)

Abdominal circumference. (Courtesy Marjorie Pyle, RNC, Lifecircle, Costa Mesa, CA.)
TABLE 19-2  
Physical Assessment of Newborn—cont'd

<table>
<thead>
<tr>
<th>AREA ASSESSED</th>
<th>NORMAL FINDINGS</th>
<th>DEVIATIONS FROM NORMAL RANGE</th>
<th>ETIOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKIN—cont’d</td>
<td>Petechiae over presenting part</td>
<td>Petechiae over any other area</td>
<td>Clotting factor deficiency, infection</td>
</tr>
<tr>
<td></td>
<td>Ecchymoses from forceps in vertex births or over buttocks, genitalia, and legs in breech births</td>
<td>Ecchymoses in any other area</td>
<td>Hemorrhagic disease, traumatic birth</td>
</tr>
<tr>
<td>Jaundice</td>
<td>None at birth</td>
<td>Jaundice within first 24 hr</td>
<td>Increased hemolysis, Rh isoimmunization, ABO incompatibility</td>
</tr>
<tr>
<td>Birthmarks</td>
<td>Mongolian spot (see Fig. 18-6)</td>
<td>Hemangiomas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infants of African-American, Asian, and Native American origin: 70%-85%</td>
<td>Nevus flammeus: port-wine stain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infants of Caucasian origin: 5%-13%</td>
<td>Nevus vasculosus: strawberry mark</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CHECK CONDITION</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No skin edema</td>
<td>Edema on hands, feet; pitting over tibia</td>
<td>Overhydration</td>
</tr>
<tr>
<td></td>
<td>Opacity: few large blood vessels visible indistinctly over abdomen</td>
<td>Texture thin, smooth, or of medium thickness; rash or superficial peeling visible</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Numerous vessels very visible over abdomen</td>
<td>Prematurity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Texture thick, parchment-like; cracking, peeling</td>
<td>Postmaturity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skin tags, webbing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pappules, pustules, vesicles, ulcers, maceration</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loose, wrinkled skin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gently pinch skin between thumb and forefinger over abdomen and inner thigh to check for turgor</td>
<td>Tense, tight, shiny skin</td>
<td>Impetigo, candidiasis, herpes, diaper rash</td>
</tr>
<tr>
<td></td>
<td>Dehydration: loss of weight best indicator</td>
<td>Lack of subcutaneous fat, prominence of clavicle or ribs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>After pinch released, skin returns to original state immediately</td>
<td></td>
<td>Edema, extreme cold, shock, infection</td>
</tr>
<tr>
<td></td>
<td>Normal weight loss after birth: ≤10% of birth weight</td>
<td></td>
<td>Prematurity, malnutrition</td>
</tr>
<tr>
<td>Vernix caseosa: Color and odor</td>
<td>Whitish, cheesy, odorless; usually more found in creases, folds</td>
<td>Absent or minimal</td>
<td>Postmaturity</td>
</tr>
<tr>
<td></td>
<td>Absent or minimal</td>
<td>Excessive</td>
<td>Prematurity</td>
</tr>
<tr>
<td></td>
<td>Odor</td>
<td>Green color</td>
<td>Possible intrauterine infection</td>
</tr>
<tr>
<td>Lanugo</td>
<td>Over shoulders, pinnas of ears, forehead</td>
<td>Absent</td>
<td>Possible intrauterine infection</td>
</tr>
<tr>
<td></td>
<td>Excessive</td>
<td></td>
<td>Prematurity, especially if lanugo abundant and long and thick over back</td>
</tr>
</tbody>
</table>
### TABLE 19-2

**Physical Assessment of Newborn—cont’d**

<table>
<thead>
<tr>
<th>AREA ASSESSED</th>
<th>NORMAL FINDINGS</th>
<th>DEVIATIONS FROM NORMAL RANGE</th>
<th>ETIOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HEAD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fontanels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open vs closed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anterior fontanel 5 cm diamond, increasing as molding resolves</td>
<td>Epicanthal folds</td>
<td>Full, bulging</td>
<td>Birth trauma, Tumor, hemorrhage, infection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Large, flat, soft</td>
<td>Dehydration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depressed</td>
<td>Malnutrition, hydrocephaly, retinal detachment, hypothyroidism</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sutures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palpable and unjointed sutures</td>
<td>Fine, wooly</td>
<td>Unusual swirls, patterns, hairline or coarse, brittle</td>
<td>Hydrocephaly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Craniostenosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Endocrine or genetic disorders</td>
</tr>
<tr>
<td><strong>EYES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyeballs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both present and of equal size, both round, firm</td>
<td>Agenesis or absence of one or both eyeballs</td>
<td>Small eyeball</td>
<td>Congenital cataracts, possibly from rubella infection</td>
</tr>
<tr>
<td>Eyes and space between eyes each one third the distance from outer-to-outter canthus</td>
<td>Epicantil folds when present with other signs</td>
<td>Lens opacity or absence of red reflex</td>
<td>Rubella syndrome</td>
</tr>
<tr>
<td>Epicantil folds: normal racial characteristic</td>
<td>Discharge: purulent</td>
<td>Discharge (purulent)</td>
<td>Infection</td>
</tr>
<tr>
<td>Symmetric in size, shape</td>
<td></td>
<td>Chemical conjunctivitis</td>
<td>Eye medication (requires no treatment)</td>
</tr>
<tr>
<td>Blink reflex</td>
<td></td>
<td></td>
<td>Congenital</td>
</tr>
<tr>
<td>No discharge</td>
<td></td>
<td></td>
<td>Albinism</td>
</tr>
<tr>
<td>No tears</td>
<td></td>
<td></td>
<td>Hyperbilirubinemia</td>
</tr>
<tr>
<td>Subconjunctival hemorrhage</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Eyes. In pseudostrabismus, inner epicantil folds cause the eyes to appear misaligned; however, corneal light reflexes are perfectly symmetric. Eyes are symmetric in size and shape and are well placed.
**TABLE 19-2**

Physical Assessment of Newborn—cont’d

<table>
<thead>
<tr>
<th>AREA ASSESSED</th>
<th>NORMAL FINDINGS</th>
<th>DEVIATIONS FROM NORMAL RANGE</th>
<th>ETIOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>EYES—cont’d</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pupils</td>
<td>Present, equal in size, reactive to light</td>
<td>Pupils: unequal, constricted, dilated, fixed</td>
<td>Intracranial pressure, medications, tumors</td>
</tr>
<tr>
<td></td>
<td>Random, jerky, uneven, focus possible briefly, following to midline</td>
<td>Persistent strabismus, Doll’s eyes</td>
<td>Increased intracranial pressure</td>
</tr>
<tr>
<td></td>
<td>Transient strabismus or nystagmus until third or fourth month</td>
<td>Sunset</td>
<td>Increased intracranial pressure</td>
</tr>
<tr>
<td>Eyeball movement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Midline</td>
<td>Copious drainage, with or without regular periods of cyanosis at rest and return of pink color with crying</td>
<td>Choanal atresia, congenital syphilis</td>
</tr>
<tr>
<td></td>
<td>Some mucus but no drainage</td>
<td>Malformed</td>
<td>Congenital syphilis, chromosomal disorder</td>
</tr>
<tr>
<td></td>
<td>Preferential nose breather Sneeze to clear nose</td>
<td>Flaring of nares</td>
<td>Respiratory distress</td>
</tr>
<tr>
<td></td>
<td>Slight deformity (flat or deviated to one side) from passage through birth canal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyebrows</td>
<td>Distinct (not connected in midline)</td>
<td>Connection in midline</td>
<td>Cornelia de Lange syndrome</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOSE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Midline</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Some mucus but no drainage</td>
<td>Copious drainage, with or without regular periods of cyanosis at rest and return of pink color with crying</td>
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<tr>
<td></td>
<td>Preferential nose breather Sneeze to clear nose</td>
<td>Malformed</td>
<td>Congenital syphilis, chromosomal disorder</td>
</tr>
<tr>
<td></td>
<td>Slight deformity (flat or deviated to one side) from passage through birth canal</td>
<td>Flaring of nares</td>
<td>Respiratory distress</td>
</tr>
<tr>
<td></td>
<td>Correct placement: line drawn through inner and outer canthi of eyes reaching to top notch of ears (at junction with scalp) Well-formed, firm cartilage</td>
<td>Agenesis, Lack of cartilage Low placement</td>
<td>Prematurity, Chromosomal disorder, mental retardation, kidney disorder</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preauricular tags</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Size: possibly overly prominent or protruding ears</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No response to sound</td>
<td>Deaf, rubella syndrome</td>
</tr>
<tr>
<td>EARS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinna</td>
<td>Correct placement: line drawn through inner and outer canthi of eyes reaching to top notch of ears (at junction with scalp) Well-formed, firm cartilage</td>
<td>Agenesis, Lack of cartilage Low placement</td>
<td>Prematurity, Chromosomal disorder, mental retardation, kidney disorder</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preauricular tags</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Size: possibly overly prominent or protruding ears</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No response to sound</td>
<td>Deaf, rubella syndrome</td>
</tr>
<tr>
<td>Hearing</td>
<td>Responds to voice and other sounds State (e.g., alert, asleep) influences response</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Placement of ears on the head in relation to a line drawn from the inner to the outer canthus of the eye. **A,** Normal position. **B,** Abnormally angled ear. **C,** True low-set ear. (Courtesy Mead Johnson Nutritional, Evansville, IN.)
TABLE 19-2
Physical Assessment of Newborn—cont’d

<table>
<thead>
<tr>
<th>AREA ASSESSED</th>
<th>NORMAL FINDINGS</th>
<th>DEVIATIONS FROM NORMAL RANGE</th>
<th>ETIOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FACIES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Normal” appearance, well-placed, proportionate,</td>
<td>Infant appearance “odd” or “funny”</td>
<td>Hereditary, chromosomal aberration</td>
</tr>
<tr>
<td></td>
<td>symmetric features Positional deformities</td>
<td>Usually accompanied by other features such as</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>low-set ears, other structural disorders</td>
<td></td>
</tr>
<tr>
<td><strong>MOUTH</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lips</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buccal mucosa</td>
<td>Symmetry of lip movement Dry or moist Pink</td>
<td>Gross anomalies in placement, size, shape</td>
<td>Cleft lip and/or palate, gums</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cyanosis, circumoral pallor</td>
<td>Respiratory distress, hypothermia</td>
</tr>
<tr>
<td></td>
<td>Transient circumoral cyanosis</td>
<td>Asymmetry in movement of lips</td>
<td>Cranial nerve VII paralysis</td>
</tr>
<tr>
<td></td>
<td>Pink gums Inclusion cysts (Epstein pearls—Bohn</td>
<td>Teeth: predeciduous or deciduous</td>
<td>Hereditary</td>
</tr>
<tr>
<td></td>
<td>nodule, whitish, hard nodules on gums or roof of</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>mouth)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tongue</td>
<td>Tongue not protruding, freely movable, symmetric</td>
<td>Macroglossia</td>
<td>Prematurity, chromosomal disorder</td>
</tr>
<tr>
<td></td>
<td>in shape, movement Sucking pads inside cheeks</td>
<td>Short lingual frenulum Thrus: white plaques on</td>
<td>Candida albicans</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cheeks or tongue that bled if touched</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cleft hard or soft palate</td>
<td></td>
</tr>
<tr>
<td>Palate (soft, hard):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arch</td>
<td>Soft and hard palates intact</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uvula</td>
<td>Uvula in midline Epstein pearls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chin</td>
<td>Distinct chin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saliva</td>
<td>Mouth moist</td>
<td>Micronothithia</td>
<td>Pierre Robin or other syndrome</td>
</tr>
<tr>
<td>Reflexes:</td>
<td>Reflexes present Reflex response dependent</td>
<td>Excessive saliva</td>
<td>Esophageal atresia, tracheoesophageal fistula</td>
</tr>
<tr>
<td>Rooting</td>
<td>on state of wakefulness and hunger</td>
<td>Absent</td>
<td>Prematurity</td>
</tr>
<tr>
<td>Sucking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extrusion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NECK</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sternoclavicular</td>
<td>Short, thick, surrounded by skin folds; no webbing</td>
<td>Webbing Restricted movement, holding of head at</td>
<td>Turner syndrome Torticollis (wryneck),</td>
</tr>
<tr>
<td>muscles</td>
<td>Head held in midline (sternocleidomastoid muscles</td>
<td>Absence of head control</td>
<td>opisthokonos</td>
</tr>
<tr>
<td></td>
<td>equal), no masses Transient positional deformity</td>
<td></td>
<td>Prematurity, Down syndrome</td>
</tr>
<tr>
<td></td>
<td>Freedom of movement from side to side and flexion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>and extension, no movement of chin past shoulder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thyroid gland</td>
<td>Thyroid not palpable</td>
<td></td>
<td>Enlarged thyroid</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cardiopulmonary disorder</td>
</tr>
<tr>
<td><strong>CHEST</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thorax</td>
<td>Almost circular, barrel shaped Tip of sternum</td>
<td>Bulging of chest, unequal movement Malformation</td>
<td>Pneumothorax, pneumo-</td>
</tr>
<tr>
<td></td>
<td>possibly prominent</td>
<td></td>
<td>mediastinum</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Funnel chest—pectus excavatum</td>
</tr>
<tr>
<td>AREA ASSESSED</td>
<td>NORMAL FINDINGS</td>
<td>DEVIATIONS FROM NORMAL RANGE</td>
<td>ETIOLOGY</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------</td>
<td>-----------------------------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>CHEST—cont’d</strong></td>
<td>Symmetric chest movements, chest and abdominal movements synchronized during respirations; Occasional retractions, especially when crying</td>
<td>Retractions with or without respiratory distress</td>
<td>Prematurity, RDS</td>
</tr>
<tr>
<td>Respiratory movements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clavicles</td>
<td>Clavicles intact</td>
<td>Fracture of clavicle; crepitus</td>
<td>Trauma</td>
</tr>
<tr>
<td>Ribs</td>
<td>Rib cage symmetric, intact; moves with respirations Prominent, well formed; symmetrically placed</td>
<td>Poor development of rib cage and musculature Supernumerary, along nipple line Malpositioned or widely spaced</td>
<td>Prematurity</td>
</tr>
<tr>
<td>Nipples</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast tissue</td>
<td>Breast nodule: approximately 3-10 mm in term infant Maternal hormones Secretion of witch’s milk</td>
<td>Lack of breast tissue</td>
<td>Prematurity</td>
</tr>
<tr>
<td><strong>ABDOMEN</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Umbilical cord</td>
<td>Two arteries, one vein Whitish gray</td>
<td>One artery Meconium stained Bleeding or oozing around cord Redness or drainage around cord Herniation of abdominal contents into area of cord (e.g., omphalocele); defect covered with thin, friable membrane, possibly extensive</td>
<td>Renal anomalies Intrauterine distress Hemorrhagic disease Infection, possible persistence of urachus</td>
</tr>
<tr>
<td></td>
<td>Definite demarcation between cord and skin, no intestinal structures within cord Dry around base, drying Odorous Cord clamp in place for 24 hr Reducible umbilical hernia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdomen</td>
<td>Rounded, prominent, dome shaped because abdominal musculature not fully developed Some diastasis of abdominal musculature Liver possibly palpable 1-2 cm below right costal margin No other masses palpable No distention</td>
<td>Distention at birth</td>
<td>Ruptured viscus, genitourinary masses or malformations: hydronephrosis, teratomas, abdominal tumors Overfeeding, high gastrointestinal tract obstruction</td>
</tr>
<tr>
<td></td>
<td>Mild</td>
<td></td>
<td>Overfeeding</td>
</tr>
<tr>
<td></td>
<td>Marked</td>
<td></td>
<td>Lower gastrointestinal tract obstruction, imperforate anus</td>
</tr>
<tr>
<td></td>
<td>Intermittent or transient Partial intestinal obstruction Visible peristalsis Malrotation of bowel or adhesions Sepsis</td>
<td></td>
<td>Overfeeding</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stenosis of bowel</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Obstruction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Infection</td>
</tr>
<tr>
<td>AREA ASSESSED</td>
<td>NORMAL FINDINGS</td>
<td>DEVIATIONS FROM NORMAL RANGE</td>
<td>ETIOLOGY</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------------------------------</td>
<td>------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>ABDOMEN—cont’d</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowel sounds</td>
<td>Sounds present within minutes after birth in healthy term infants</td>
<td>Scaphoid, with bowel sounds in chest and respiratory distress</td>
<td>Diaphragmatic hernia</td>
</tr>
<tr>
<td>Stools</td>
<td>Meconium stool passing within 24-48 hr after birth</td>
<td>No stool</td>
<td>Imperforate anus</td>
</tr>
<tr>
<td>Color</td>
<td>Linea nigra possibly apparent</td>
<td></td>
<td>Hormone influence during pregnancy</td>
</tr>
<tr>
<td>Movement with respiration</td>
<td>Respirations primarily diaphragmatic, abdominal and chest movement synchronous</td>
<td>Decreased abdominal breathing “Seesaw”</td>
<td>Intrathoracic disease, diaphragmatic hernia Respiratory distress</td>
</tr>
<tr>
<td>GENITALIA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clitoris</td>
<td>Usually edematous</td>
<td>Virilized female; extremely large clitoris</td>
<td>Congenital adrenal hyperplasia</td>
</tr>
<tr>
<td>Labia majora</td>
<td>Usually edematous, covering labia minora in term newborns</td>
<td></td>
<td>Pregnant hormones Breech birth</td>
</tr>
<tr>
<td></td>
<td>Increased pigmentation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labia minora</td>
<td>Possible protrusion over labia majora</td>
<td>Labia majora widely separated and labia minora prominent</td>
<td>Prematurity</td>
</tr>
<tr>
<td>Discharge Vagina</td>
<td>Smegma</td>
<td>Absence of vaginal orifice</td>
<td>Fistula</td>
</tr>
<tr>
<td></td>
<td>Open orifice</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Some vernix caseosa between labia possible</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blood-tined discharge from pseudomenstrualization caused by pregnancy hormones</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Muclid discharge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urinary meatus</td>
<td>Hymenal or vaginal tag beneath clitoris, difficult to see (to watch for voiding)</td>
<td>Stenosed meatus Bladder extrophy</td>
<td>Ambiguous genitils Hypospadias epispadias Round meatal opening</td>
</tr>
<tr>
<td>Male</td>
<td>Male genitals</td>
<td>Increased size and pigmentation caused by pregnancy hormones</td>
<td></td>
</tr>
<tr>
<td>Penis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urinary meatus as slit</td>
<td></td>
<td>Urinary meatus not on tip of glans penis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meatus at tip of penis</td>
<td>Prepuce removed if circumcised</td>
<td>Wide variation in size of genitals</td>
</tr>
</tbody>
</table>
### TABLE 19-2

**Physical Assessment of Newborn—cont’d**

<table>
<thead>
<tr>
<th>AREA ASSESSED</th>
<th>NORMAL FINDINGS</th>
<th>DEVIATIONS FROM NORMAL RANGE</th>
<th>ETIOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENITALIA—cont’d</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrotum</td>
<td>Large, edematous, pendulous in term infant; covered with rugae</td>
<td>Scrotal edema and ecchymosis if breech birth</td>
<td>Prematurity, cryptorchidism</td>
</tr>
<tr>
<td>Testes</td>
<td>Palpable on each side Voiding within 24 hr, stream adequate, amount adequate</td>
<td>Undescended</td>
<td>Prematurity</td>
</tr>
<tr>
<td>Check reflex</td>
<td>Rust-stained urine</td>
<td>Unintact</td>
<td></td>
</tr>
<tr>
<td>Cremasteric</td>
<td>Testes retracted, especially when newborn is chilled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXTREMITIES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of flexion</td>
<td>Assuming of position maintained in utero Full range of motion, spontaneous movements</td>
<td>Limited motion</td>
<td>Malformations</td>
</tr>
<tr>
<td>Symmetry of motion</td>
<td>Attitude of general flexion Contours and movement symmetric</td>
<td>Poor muscle tone</td>
<td>Prematurity</td>
</tr>
<tr>
<td>Muscle tone</td>
<td>Slight tremors sometimes apparent</td>
<td>Positive scarf sign</td>
<td>Fracture or crepitus, brachial nerve trauma, malformations</td>
</tr>
<tr>
<td>Arms and hands</td>
<td>Longer than legs in newborn period</td>
<td>Asymmetry of contour</td>
<td>Malformations, fracture</td>
</tr>
<tr>
<td>Intactness</td>
<td>Contours and movement symmetric</td>
<td>Asymmetry of contour</td>
<td>Teratogens</td>
</tr>
<tr>
<td>Appropriate placement</td>
<td>Slight tremors sometimes apparent</td>
<td>Symmetric</td>
<td>Down syndrome</td>
</tr>
<tr>
<td>Color</td>
<td>Some acrocyanosis, especially when chilled</td>
<td>Symmetric</td>
<td></td>
</tr>
<tr>
<td>Fingers</td>
<td>Five on each hand Fist often clenched with thumb under fingers</td>
<td>Webbing of fingers: syndactyly</td>
<td>Familial trait</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Absence or excess of fingers</td>
<td>CNS disorder</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Strong, rigid flexion; persistent fists; positioning of fists in front of mouth constantly</td>
<td></td>
</tr>
<tr>
<td>Joints</td>
<td>Full range of motion, symmetric contour intact</td>
<td>Increased toxicity, clenous, prolonged tremors Fractured humerus</td>
<td>CNS disorder</td>
</tr>
<tr>
<td>Grasp (palmar and plantar)</td>
<td>Appearance of bowing because lateral muscles more developed than medid muscles</td>
<td>Amelia (absence of limbs), phocomelia (shortened limbs)</td>
<td>Trauma</td>
</tr>
<tr>
<td>Humerus</td>
<td>Fractured humerus</td>
<td>Amelia (absence of limbs), phocomelia (shortened limbs)</td>
<td>Chromosomal deficiency, teratogenic effect</td>
</tr>
<tr>
<td>Legs and feet</td>
<td>Feet appearing to turn in but can be easily rotated externally, positional defects tending to correct while infant is crying</td>
<td>Temperature of one leg different from that of the other</td>
<td>Circulatory deficiency</td>
</tr>
<tr>
<td></td>
<td>Arocyanosis</td>
<td></td>
<td>CNS disorder</td>
</tr>
</tbody>
</table>

*To determine whether rust color is caused by uric acid or blood, rinse diaper under running warm tap water; uric acid washes out, blood does not.
<table>
<thead>
<tr>
<th>AREA ASSESSED</th>
<th>NORMAL FINDINGS</th>
<th>DEVIATIONS FROM NORMAL RANGE</th>
<th>ETIOLOGY</th>
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</thead>
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<tr>
<td><strong>EXTREMITIES—cont’d</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toes</td>
<td>Five on each foot</td>
<td>Webbing, syndactyly Absence or excess of digits</td>
<td>Chromosomal defect Chromosomal defect, familial trait Difficult breech birth</td>
</tr>
<tr>
<td>Femur</td>
<td>Intact femur No click heard, femoral head not overriding acetabulum</td>
<td>Femoral fracture Developmental dysplasia or dislocation</td>
<td></td>
</tr>
<tr>
<td>Soles of feet</td>
<td>Major gluteal folds even Soles well lined (or wrinkled) over two thirds of foot in term infants Plantar fat pad giving flat-footed effect</td>
<td>Soles of feet Few lines Covered with lines Congenital clubfoot</td>
<td>Fusion or deformity of vertebra</td>
</tr>
<tr>
<td>Joints</td>
<td>Full range of motion, symmetric contour</td>
<td>Hypermobility of joints Asymmetric movement</td>
<td>Down syndrome Trauma, CNS disorder</td>
</tr>
<tr>
<td><strong>BACK</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spine</td>
<td>Spine straight and easily flexed Infant able to raise and support head momentarily when prone Temporary minor positional deformities, correction with passive manipulation Shoulders, scapulae, and iliac crests lining up in same plane</td>
<td>Limb length discrepancy</td>
<td>Fusion or deformity of vertebra</td>
</tr>
<tr>
<td><strong>ANUS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patency</td>
<td>One anus with good sphincter tone Passage of meconium within 24-48 hr after birth Good “wink” reflex of anal sphincter</td>
<td>Low obstruction: anal membrane High obstruction: anal or rectal atresia Absence of anal opening Drainage of fecal material from vagina in female or urinary meatus in male</td>
<td>Rectal fistula</td>
</tr>
<tr>
<td>Stools</td>
<td>Meconium followed by transitional and soft yellow stools</td>
<td>No stool Frequent watery stools</td>
<td>Obstruction Infection, phototherapy</td>
</tr>
<tr>
<td><strong>STOOLS</strong></td>
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</tr>
</tbody>
</table>
Significance of the Apgar Score

The Apgar score was developed to provide a systematic method of assessing an infant’s condition at birth. Researchers have attempted to attribute causality to the Apgar score, that is, to suggest that the low Apgar score caused or predicted later problems. This is an inappropriate use of the Apgar score. Instead the score should be used to ensure that infants are systematically observed at birth to ascertain the need for immediate care. Either a physician or a nurse may assign the score; however, to avoid the real or perceived appearance of bias, the person assisting in the assigned scores limits studies of the Apgar’s long-term predictive value. Prospective parents and the public need education on the significance of the Apgar score, as well as its limits. Because infants often do not receive the maximum score of 10, parents need to know that scores of 7 to 10 are within normal limits. Attorneys involved in litigation related to injury of an infant at birth or negative outcomes, either short term or long term, also need education about the Apgar score, its significance, and its limits. This useful tool needs to be used appropriately; health care providers, parents, and the public may need education to ensure appropriate use of the score.

State understanding of biologic and behavioral characteristics of the newborn

Begin to integrate the infant into the family

Plan of Care and Interventions

Changes can occur rapidly in newborns immediately after birth. Assessment must be followed quickly by the implementation of appropriate care.

Identification

Information on the matching identification bracelets applied immediately after birth to the newborn and mother (and in some institutions, the father or significant other) should include name, sex, date and time of birth, and identification number, according to hospital protocol. Infants also are footprinted by using a form that includes the mother’s fingerprints, name, and date and time of birth. These identification procedures must be performed before the mother and infant are separated after birth.

Stabilization

Generally, the normal term infant born vaginally has little difficulty clearing the airway. Most secretions are moved by gravity and brought to the oropharynx by the cough reflex. The infant is often maintained in a side-lying position (head stabilized, not in Trendelenburg) with a rolled blanket at the back to facilitate drainage.

If the infant has excess mucus in the respiratory tract, the mouth and nasal passages may be suctioned with the bulb syringe (Procedure box and Fig. 19-2). The nurse may perform gentle percussion over the chest wall using a soft circular mask or a percussion cup to aid in loosening secretions before suctioning (Fig. 19-3). Routine chest percussion is avoided, especially in preterm newborns, because this may cause more harm than good; the head should be kept steady during the procedure and the infant’s tolerance to the procedure carefully evaluated (Hagedorn, Gardner, & Abman, 2002). The infant who is choking on secretions should be supported with the head to the side. The mouth is suctioned first to prevent the infant from inhaling pharyngeal secretions by gasping as the nares are touched. The bulb is compressed (see Fig. 19-2) and inserted into one side of the mouth. The center of the infant’s mouth is avoided because this could stimulate the gag reflex. The nasal passages are suctioned one nostril at a time. The bulb syringe should always be kept in the infant’s crib. The parents should be given demonstrations on how to use the bulb syringe and asked to perform a return demonstration.

Use of nasopharyngeal catheter with mechanical suction apparatus. Deeper suctioning may be needed to remove mucus from the newborn’s nasopharynx or posterior oropharynx. Proper tube insertion and suctioning for 5 seconds or less per tube insertion helps prevent vagal stimulation and hypoxia (Niermeyer, 2005) (Procedure box).

Relieving airway obstruction. A choking infant needs immediate attention. Often, simply repositioning the infant and suctioning the mouth and nose with the bulb sy-
Maintenance of body temperature

Effective neonatal care includes maintenance of an optimal thermal environment. Cold stress increases the need for oxygen and may deplete glucose stores. The infant may react to exposure to cold by increasing the respiratory rate and may become cyanotic. Ways to stabilize the newborn’s body temperature include placing the infant directly on the mother’s abdomen and covering with a warm blanket (skin-to-skin contact); drying and wrapping the newborn in warmed blankets immediately after birth; keeping the head well covered; and keeping the ambient temperature of the nursery at 23.8° to 26.1°C (AAP & ACOG, 2002). If the infant does not remain with the mother during the first 1 to 2 hours after birth, the nurse places the thoroughly dried infant under a radiant warmer until the body temperature stabilizes. The infant’s skin temperature is used as the point of control in a warmer with a servocontrolled mechanism. The control panel usually is maintained between 36° and 37°C. This setting should maintain the healthy newborn’s skin temperature at approximately 36.5° to 37°C. A thermistor probe (automatic sensor) is taped to the right upper intercostal margin (never over a bone). A reflector adhesive patch may be used over the probe to provide adequate warming. This will ensure detection of minor changes resulting from external environmental factors or neonatal factors (peripheral vasoconstriction, vasodilation, or increased metabolism) before a dramatic change in core body temperature develops. The servocontroller adjusts the warmer temperature to maintain the infant’s skin temperature within the present range. The sensor must be checked periodically to make sure it is securely attached to the infant’s skin. The axillary temperature of the newborn is checked every hour (or more often as needed) until the newborn’s temperature stabilizes. The time to stabilize and maintain body temperature varies; each newborn should therefore be allowed to achieve thermal regulation as necessary, and care should be individualized.

During all procedures, heat loss must be avoided or minimized for the newborn; therefore examinations and activities are performed with the newborn under a heat panel. The initial bath is postponed until the newborn’s skin temperature is stable and can adjust to heat loss from a bath. The exact and optimal timing of the bath for each newborn remains unknown.

Even a normal term infant in good health can become hypothermic. Birth in a car on the way to the hospital, a cold birthing room, or inadequate drying and wrapping immediately after birth may cause the newborn’s temperature to fall below the normal range (hypothermia). Warming the hypothermic infant is accomplished with care. Rapid warming may cause apneic spells and acidosis in an infant. The
The warming process is monitored to progress slowly over a period of 2 to 4 hours.

**Therapeutic interventions**

It is the nurse’s responsibility to perform certain interventions immediately after birth to provide for the safety of the newborn.

**Eye prophylaxis.** The instillation of a prophylactic agent in the eyes of all neonates is mandatory in the United States as a precaution against *ophthalmia neonatorum* (Fig. 19-4). This is an inflammation of the eyes resulting from gonorrheal or chlamydial infection contracted by the newborn during passage through the mother’s birth canal. The agent used for prophylaxis varies according to hospital protocols, but the usual agent is erythromycin, tetracycline, or silver nitrate. In some institutions, eye prophylaxis is delayed until an hour or so after birth so that eye contact and parent-infant attachment and bonding are facilitated. The Centers for Disease Control and Prevention specifies that it should be given as soon as possible after birth; if instillation is delayed, there should be a monitoring process in place to ensure that all newborns are treated (Workowski & Levine, 2002) (Medication Guide). In the United States, if parents object to eye prophylaxis, they may be asked to sign an informed refusal form, and their refusal will be noted in the infant’s record.

Topical antibiotics such as tetracycline and erythromycin, silver nitrate, and a 2.5% povidone-iodine solution (currently unavailable in commercial form in the United States) have not proved to be effective in the treatment of chlamydial conjunctivitis.

A 14-day course of oral erythromycin or an oral sulfonamide may be given for chlamydial conjunctivitis (AAP & ACOG, 2002) (see Medication Guide).

**Vitamin K administration.** For the first few days after birth the newborn is at risk for prolonged clotting and bleeding because of vitamin K deficiency. Vitamin K is poorly transferred across the placenta or through breast milk, and the infant’s intestines are not yet colonized by microflora that synthesize vitamin K. Administering vitamin K intramuscularly is routine in the newborn period. For preterm infants who have no muscle mass, the medication should be diluted and given over 10 to 15 minutes, with the infant being closely monitored with a cardiorespiratory monitor. Rapid bolus administration of vitamin K may cause cardiac arrest.
Umbilical cord care. The cord is clamped immediately after birth. The goal of cord care is to prevent or decrease the risk of hemorrhage or infection. The umbilical cord stump is an excellent medium for bacterial growth and can easily become infected (Miller & Newman, 2005).

If bleeding from the blood vessels of the cord is noted, the nurse checks the clamp (or tie) and applies a second clamp next to the first one. If bleeding is not stopped immediately, the nurse calls for assistance.

Hospital protocol directs the time and technique for routine cord care. Many hospitals have subscribed to the practice of “dry care” consisting of cleaning the periumbilical area with soap and water and wiping it dry. Others apply an antiseptic solution such as triple O. Dye or alcohol to the cord (Janssen, Selwood, Dobson, Peacock, & Thiessen, 2003). Current recommendations for cord care by the Association of Women’s Health, Obstetric and Neonatal Nurses (AWHONN) include cleansing the cord with sterile water or a neutral pH cleanser. Subsequent care entails cleansing the cord with water (AWHONN, 2001). The stump and base of the cord should be assessed for edema, redness, and purulent drainage with each diaper change. The cord clamp is removed after 24 hours when the cord is dry (Fig. 19-5). Cord separation time is influenced by a number of factors, including type of cord care, type of birth, and other perinatal events. The average cord separation time is 10 to 14 days.

Promoting parent-infant interaction

Today’s childbirth practices strive to promote the family as the focus of care. Parents generally desire to share in the birth process and have early contact with their infants. Early contact between mother and newborn can be important in developing future relationships. It also has a positive effect on the duration of breastfeeding. The physiologic benefits of early mother-infant contact include increased oxytocin and prolactin levels in the mother and activation of sucking reflexes in the infant. The infant can be put to breast soon after birth. The process of developing active immunity begins as the infant ingests flora from the mother’s colostrum.

Evaluation

Evaluation of the effectiveness of immediate care of the newborn is based on the previously stated outcomes.

The infant’s admission to the nursery may be delayed, or it may never actually occur. Depending on the routine of the hospital, the infant frequently remains in the labor area and is then transferred to either the nursery or the postpartum unit with the mother. Many hospitals have adopted variations of single-room maternity care (SRMC) or mother-baby care in which one nurse provides care for the mother and newborn. SRMC allows the infant to remain with the parents after the birth. Many of the procedures, such as
EVIDENCE-BASED PRACTICE

Optimum Duration of Exclusive Breastfeeding: Systematic World Health Organization Review

BACKGROUND
- Breastfeeding provides many documented health benefits and can be lifesaving in developing countries. Breastfeeding has a protective effect against gastrointestinal and respiratory infection, sudden infant death syndrome (SIDS), atopic disease, obesity, diabetes, Crohn’s disease, and lymphoma. Breastfeeding may accelerate neuropsychological development and achievement. Maternal health benefits include possible protection against breast cancer, ovarian cancer, and osteoporosis.
- An observation of “growth faltering” at about 3 months of age in developing countries has led to questions about the nutritional and energy content of breast milk after 3 or 4 months, the nutritional quality of supplemental foods introduced at about 3 to 4 months, and the risk of infection-caused energy deficit in infants. A debate about the “weanling’s dilemma” stemmed from questions about inadequate breast milk nutrition versus nutritionally inadequate or contaminated weaning foods. WHO requested this review of available evidence regarding the optimum duration of breastfeeding.

OBJECTIVES
- All agreed that exclusive breastfeeding was best for 3 to 4 months. The reviewers compared health, growth, and development outcomes for those who continued exclusive breastfeeding until 6 months, versus those who gradually added supplemental liquid or food to breastfeeding. The participants could all be healthy, singleton, term infants (low birth weight accepted, as long as gestationally full term). Infant outcome measures could include weight, length, head circumference, infections, morbidity, mortality, micronutrient status, neuromotor and cognitive developmental milestones, atopic disease, type 1 diabetes, blood pressure, adult chronic illnesses, and inflammatory and autoimmune diseases. Maternal outcome measures include postpartum weight loss, lactational amenorrhea, breast and ovarian cancer, and osteoporosis.

METHODS
Search Strategy
- Twenty studies were reviewed, nine from developing countries (including the Philippines, Peru, Chile, Honduras, Bangladesh, Belarus, East India, and Senegal) and eleven from developed countries (the United States, Sweden, Finland, Australia, and Italy). The studies were published from 1980 to 2000. Two were controlled trials from Honduras, and the rest were observational studies.

Statistical Analyses
- Statistical analyses were possible in only the two controlled trials. The observational studies were too heterogeneous and limited by design to pool data.

FINDINGS
- The authors found no significant difference in weight, length, or atopic disease in the two groups. Exclusively breastfed infants had significantly decreased gastrointestinal infections. There was a marginally significant decrease in the iron stores of exclusively breastfed infants in developing countries at 6 months, unless they were receiving an iron supplement. Maternal weight loss was accelerated in exclusive breastfeeding, and lactational amenorrhea was prolonged.

LIMITATIONS
- Observational studies are subject to bias. Confounding by indication refers to statistical errors that occur because the reason for the treatment (i.e., food supplementation given to a growth-faltering breastfed infant) affects the outcome. Bias can also occur because of reverse causality. For example, an infant with an infection becomes anorectic and reduces milk intake to the point of loss of milk production. The infection might be blamed on the weaning, instead of the reverse.

CONCLUSIONS
- The researchers found no evidence of a “weanling’s dilemma,” and no benefits from adding supplemental food between 4 and 6 months. The iron deficit of exclusively breastfed babies in developing countries can be corrected with infant drops and does not warrant the loss of protection against gastrointestinal and respiratory infections that exclusive breastfeeding confers. Maternal lactational amenorrhea provides contraceptive benefit for child spacing. Rapid postpartum weight loss may not benefit women with marginal nutritional status. The policy statements of WHO and the World Health Assembly were modified to reflect the recommendation for exclusive breastfeeding for the first 6 months of life.

IMPLICATIONS FOR PRACTICE
- Exclusive breastfeeding should be recommended. Iron supplements for breastfeeding infants are beneficial. The contraceptive benefits of lactational amenorrhea are important.

IMPLICATIONS FOR FURTHER RESEARCH
- Public health policy demands information about breastfeeding beyond the observational stage. Large, randomized trials are needed, especially in developing countries, to confirm infection morbidity and infant nutritional status in exclusively breastfed infants of 6 months’ duration or longer. Costs are not addressed in these studies. More information on long-term outcomes is needed.

assessment of weight and measurement (i.e., circumference of head and chest, length), instillation of eye medications, intramuscular administration of vitamin K, and physical assessment, may be carried out in the labor and birth unit. Nurses who work in an SRMC unit, labor, delivery, and recovery (LDRR) room; or labor, delivery, recovery, and postpartum (LDRP) room must be knowledgeable and competent in intrapartal, neonatal, and postpartum nursing care. If an infant is transferred to the nursery, the infant’s identification is verified by the nurse receiving the infant, who places the baby in a warm environment and begins the admission process.

Regardless of the physical organization for care, many hospitals have a small holding nursery, which is available for procedures or on the request of the mother who wishes her infant to be placed there. This arrangement promotes parent-infant bonding while still allowing the new parents some time to be alone.

Assessment

Gestational age assessment

Assessment of gestational age is an important criterion because perinatal morbidity and mortality rates are related to gestation age and birth weight. The simplified Assessment of Gestational Age (Ballard, Novak, & Driver, 1979) is commonly used to assess gestational age of infants between 35 and 42 weeks. It assesses six external physical and six neuromuscular signs. Each sign has a number score, and the cumulative score correlates with a maturity rating of 26 to 44 weeks of gestation. The score is accurate to plus or minus 2 weeks and is accurate for infants of all races.

The New Ballard Score, a revision of the original scale, can be used with newborns as young as 20 weeks of gestation. The New Ballard Score has the same physical and neuromuscular sections but includes −1 to +2 scores that reflect signs of extremely premature infants, such as fused eyelids; imperceptible breast tissue; sticky, friable, transparent skin; no lanugo; and square-window (flexion of wrist) angle greater than 90 degrees (see Fig. 19-1, A). The examination of infants with a gestational age of 26 weeks or less should be performed at a postnatal age of less than 12 hours. For infants with a gestational age of at least 26 weeks, the examination can be performed up to 96 hours after birth. To ensure accuracy, it is recommended that the initial examination be performed within the first 48 hours of life. Neuromuscular adjustments after birth in extremely immature neonates require that a follow-up examination be performed to further validate neuromuscular criteria. The scale overestimates gestational age by 2 to 4 days in infants younger than 37 weeks of gestation, especially at gestational ages of 32 to 37 weeks (Ballard et al., 1991).

Classification of newborns by gestational age and birth weight

Classification of infants at birth by both birth weight and gestational age provides a more satisfactory method for predicting mortality risks and providing guidelines for management of the neonate than estimating gestational age or birth weight alone. The infant’s birth weight, length, and head circumference are plotted on standardized graphs that identify normal values for gestational age. A normal range of birth weights exists for each gestational week (see Fig. 19-1, B), but the birth weights of preterm, term, post-term, or postmature newborns also may be outside these normal ranges. Birth weights are classified in the following ways:

- **Low for gestational age (LGA)**—Weight is above the 90th percentile (or two or more standard deviations above the norm) at any week.
- **Appropriate for gestational age (AGA)**—Weight falls between the 10th and 90th percentile for infant’s age.
- **Small for gestational age (SGA)**—Weight is below the 10th percentile (or two or more standard deviations below the norm) at any week.
- **Low birth weight (LBW)**—Weight of 2500 g or less at birth. These newborns have had either less than the expected rate of intrauterine growth or a shortened gestation period. Preterm birth and LBW commonly occur together (e.g., less than 32 weeks of gestation and birth weight of less than 1200 g).
- **Very low birth weight (VLBW)**—Weight of 1500 g or less at birth.
- **Intrauterine growth restriction (IUGR)**—Term applied to the fetus whose rate of growth does not meet expected norms.

Newborns are classified according to their gestational ages in the following ways:

- **Preterm or premature**—Born before completion of 37 weeks of gestation, regardless of birth weight
- **Term**—Born between the beginning of week 38 and the end of week 42 of gestation
- **Postterm (postdate)**—Born after completion of week 42 of gestation
- **Postmature**—Born after completion of week 42 of gestation and showing the effects of progressive placental insufficiency

Maternal effects on gestational age assessment and birth weight. Some maternal conditions can affect the results of the gestational assessment. For instance, any infant who has had oxygen deprivation during labor will show poor muscle tone. Infants in respiratory distress tend to be flaccid and assume a “frogleg” posture. Even though an infant may look large, such as the infant of a diabetic mother, it may respond more like a premature infant. The infant of a mother who has been receiving magnesium sulfate will tend to be somewhat lethargic.

Physical assessment

A complete physical examination is performed within 24 hours after birth. The parents’ presence during this examination encourages discussion of parental concerns and actively involves the parents in the health care of their infant.
from birth. It also affords the nurse an opportunity to observe parental interactions with the infant.

The area used for the examination should be well lighted, warm, and free from drafts. The infant is undressed as needed and placed on a firm, warmed, flat surface or under a radiant warmer. The physical assessment should begin with a review of the maternal history and prenatal and intrapartal records. This provides a background for the recognition of any potential problems.

The assessment includes general appearance, behavior, vital signs measurement, and parent-infant interactions. The assessment should progress systematically from head to toe, with assessment and evaluation of each system (i.e., cardiovascular, respiratory, and so on). Descriptions of any variations from normal findings and all abnormal findings are included. The findings provide a database for implementing the nursing process with newborns and providing anticipatory guidance for the parents. (Table 19-2 summarizes the newborn assessment.) Ongoing assessments of the newborn are made throughout the hospital stay, and an evaluation is performed before discharge.

**Nursing considerations in assessment.** The neonate’s maturity level can be gauged by assessment of general appearance. Features to assess in the general survey include skin color, posture, state of alertness, cry, head size, lanugo, vernix caseosa, breast tissue, and sole creases. The normal resting posture of the neonate is one of general flexion. The neck is short, and the abdomen is prominent.

The temperature, heart rate, and respiratory rate are always assessed. Apical pulse rates should be obtained for all infants. Auscultation should be performed before discharge. This provides a background for the recognition of any potential problems.

Breast tissue is assessed through observation and palpation. To measure breast tissue, palpate the nipple gently with one finger or place the second and third fingers on either side of the nipple. The amount of breast tissue is measured between 4 and 6 days after birth. This measurement is usually equal to that of the immediate postbirth BP. BP may be measured in both arms and legs to detect any discrepancy between the two sides or between the upper and lower body. A discrepancy of 10 mm Hg or more between the arms and legs may signal a cardiac defect such as coarctation of the aorta.

Molding may give the neonate’s head an asymmetric appearance (see Fig. 18-9). Parents should be reassured that this will go away and that nothing need be done to the head. Facial asymmetry may occur from fetal positioning in utero; asymmetry usually disappears spontaneously over time. The hard and soft palates are assessed with the gloved little finger of the examiner. At the same time the suck reflex can be assessed.

A gross assessment of hearing can be done by watching the neonate’s response to voices or other sounds; a loud noise should elicit a startle reflex. Formal hearing screening of all infants is conducted in the newborn nursery.

The nose is examined for size, shape, mucous membrane integrity, and discharge. The nose should be midline on the face. The nares are checked for patency by occluding one nostril at a time and observing for respirations.

When palpating the clavicles, the examiner moves the fingers slowly over the anterior clavicular surface. If a mass or lump is detected, the examiner tries to move the neonate’s arm gently while palpating with the other hand. A crepitant, grating sensation and uneven movement of two juxtaposed bone fragments indicate a fracture. If a fractured clavicle is present, the infant will usually have limited movement of the arm on the affected side.

Breast tissue is assessed through observation and palpation. To measure breast tissue, palpate the nipple gently with one finger or place the second and third fingers on either side of the nipple. The amount of breast tissue is measured between the two fingers. Breast tissue and areola size increase with gestational age.

Movement of the arms should be assessed. Trauma to the brachial plexus during a difficult birth may result in brachial palsy. The most common type, Duchenne-Erb paralysis, in-
involves the fifth and sixth cervical nerve roots (see Fig. 27-2). The affected arm is held in a position of tight adduction and internal rotation at the shoulder. The grasp reflex on the affected side may be intact; however, the Moro reflex is absent on that side. With treatment, most neonates have complete recovery. Surgery may be necessary in some instances.

A neurologic assessment of the newborn’s reflexes (see Table 18-3) provides useful information about the infant’s nervous system and state of neurologic maturation. The assessment must be carried out as early as possible because abnormal signs present in the early neonatal period may disappear. They may reappear months or years later as abnormal functions.

**Common problems in the newborn**

**Physical injuries.** Birth trauma includes any physical injury sustained by a newborn during labor and birth. Although most injuries are minor and resolve during the neonatal period without treatment, some types of trauma require intervention. A few are serious enough to be fatal.

Factors that may predispose the neonate to birth trauma include prolonged or precipitous labor, preterm labor, fetal macrosomia, cephalopelvic disproportion, abnormal presentation, and congenital anomalies. Injury can be the result of obstetric birth techniques such as forceps-assisted birth, vacuum extraction, version and extraction, and cesarean birth (Efird & Hernandez, 2005).

**Soft tissue injuries.** Cephalhematoma is the most common type of cranial injury in newborns and can be associated with an underlying skull fracture. Caput succedaneum is diffuse swelling of the soft tissues of the scalp and is a result of pressure of the uterus or vaginal wall on the fetal head (Efird & Hernandez, 2005). Caput succedaneum and cephalhematoma are described in Chapter 18 (see Fig. 18-5).

Subconjunctival and retinal hemorrhages result from rupture of capillaries caused by increased pressure during birth (see Chapter 18). These hemorrhages usually clear within 5 days after birth and present no further problems. Parents need explanation and reassurance that these injuries will resolve without sequelae.

Erythema, ecchymoses, petechiae, abrasions, lacerations, or edema of buttocks and extremities may be present. Localized discoloration may appear over presenting parts and may result from the application of forceps or the vacuum extractor. Ecchymoses and edema may appear anywhere on the body.

Bruises over the face may be the result of face presentation (Fig. 19-6). In a breech presentation, bruising and swelling may be seen over the buttocks or genitalia (Fig. 19-7). The skin over the entire head may be ecchymotic and covered with petechiae caused by a tight nuchal cord. Petechiae (pinpoint hemorrhagic areas) acquired during birth may extend over the upper trunk and face. These lesions are benign if they disappear within 2 or 3 days of birth and no new lesions appear. Ecchymoses and petechiae may be signs of a more serious disorder, such as thrombocytopenic purpura.

**NURSE ALERT** To differentiate hemorrhagic areas from skin rashes and discolorations, try to blanch the skin with two fingers. Petechiae and ecchymoses do not blanch because extravasated blood remains within the tissues, whereas skin rashes and discolorations do.
Trauma resulting from dystocia occurs to the presenting fetal part. Forceps injury and bruising from the vacuum cup occur at the site where the instruments were applied. In a forceps injury, commonly a linear mark appears across both sides of the face in the shape of the forceps blades. The affected areas are kept clean to minimize the risk of infection. With the increased use of the vacuum extractor and the use of padded forceps blades, the incidence of these lesions may be significantly reduced (Mangurten, 2002).

Accidental lacerations may be inflicted with a scalpel during a cesarean birth. These cuts may occur on any part of the body but are most often found on the face, scalp, buttocks, and thighs. Usually they are superficial and only need to be kept clean. Liquid skin adhesive or butterfly adhesive strips can hold together the edges of more serious lacerations. Rarely are sutures needed.

**Skeletal injuries.** Fracture of the clavicle (collarbone) is the most common birth injury. This injury is often associated with macrosomia and is a result of compression of the shoulder or manipulation of the affected arm during birth.

A fractured clavicle usually heals without treatment, although the arm and shoulder may be immobilized for comfort (Efird & Hernandez, 2005). Fractures of the humerus and femur may occur during a difficult birth, but such fractures in newborns generally heal rapidly. Immobilization is accomplished with slings, splints, swaddling, and other devices.

The infant’s immature, flexible skull can withstand a great deal of molding before fracture results. Fractures may occur during difficult births and result from the head pressing on the bony pelvis or from the injudicious application of forceps (Fig. 19-8). The location of a skull fracture determines whether it is insignificant or fatal. Spontaneous or nonsurgical elevation of the indentation using a hand breast pump or vacuum extractor has been reported.

Nerve injuries may result in temporary or permanent paralysis. Brachial plexus injuries can affect movement of the shoulder, arm, wrist, or hand. Phrenic nerve palsy can occur because of hyperextension of the neck during difficult birth and can cause respiratory distress. Facial palsy affects one side of the face and is usually self-limiting (Efird & Hernandez, 2005).

Parents need emotional support when it comes to handling a newborn with birth injuries because they are often fearful of hurting their newborn. Parents are encouraged to practice handling, changing, and feeding the injured newborn under the guidance of the nursing staff. This increases the parents’ knowledge and confidence, in addition to facilitating attachment. A plan for follow-up therapy is developed with the parents so that the times and arrangements for therapy are convenient for them.

**Physiologic problems**

**Physiologic jaundice.** The majority of term newborns have some degree of physiologic jaundice (become yellowish) during the first 3 days of life (see Chapter 18). Jaundice is clinically visible when serum bilirubin levels reach 5 to 7 mg/dl.

Every newborn is assessed for jaundice. The blanch test helps differentiate cutaneous jaundice from skin color. To do the test, apply pressure with a finger over a bony area (e.g., the nose, forehead, sternum) for several seconds to empty all the capillaries in that spot. If jaundice is present, the blanched area will look yellow before the capillaries refill. The conjunctival sacs and buccal mucosa also are assessed, especially in darker-skinned infants. It is better to assess for jaundice in daylight, because artificial lighting and reflection from nursery walls can distort the actual skin color.

Jaundice is noticeable first in the head and then progresses gradually toward the abdomen and extremities because of the newborn infant’s circulatory pattern (cephalocaudal developmental progression). If jaundice is suspected, evaluation of serum bilirubin level is needed. Jaundice that appears before the infant is 24 hours old is likely to be pathologic instead of physiologic, and the primary health care provider should be notified.

**Hypoglycemia.** Hypoglycemia during the early newborn period of a term infant is defined as a blood glucose concentration of less than 35 mg/dl or as a plasma concentration of less than 40 mg/dl. When the neonate is born and abruptly disconnected from the continuous supply of maternal glucose, there is a period of adjustment as the newborn begins to regulate blood glucose concentration in accordance with intermittent feedings. Hypoglycemia can result if this metabolic adaptation is delayed, if early feedings result in limited intake, or if the neonate is stressed. The glucose level normally declines during the first hours after birth. Not all newborns are routinely screened for hypoglycemia. Instead, those who are symptomatic and those considered
to be at risk for hypoglycemia are tested. Risk factors for hypo-
glycemia include birth weight less than 2500 g or greater
than 4000 g, gestational age less than 37 weeks or greater
than 42 weeks, LGA infant, SGA infant, maternal diabetes, and
5-minute APGAR of 5 or less. Blood glucose levels should
be checked initially between 30 minutes and 2 hours of life,
and repeated every 30 minutes to 1 hour until the levels are
consistently within normal limits. Glucose levels may be
measured every 4 hours until the risk period has passed
(Townsend, 2005).

Signs of hypoglycemia include jitteriness; an irregular res-
piratory effort; cyanosis; apnea; a weak, high-pitched cry;
feeding difficulty; hunger; lethargy; twitching; eye rolling;
and seizures. The signs may be transient and recurrent.

Hypoglycemia in the low risk term infant is usually elim-
inated by feeding the infant. Occasionally the intravenous
administration of glucose is required for newborns with per-
sistently high insulin levels or those with depleted glycogen
stores.

Hypocalcemia. Hypocalcemia (serum calcium levels
of less than 7.8 to 8 mg/dl in term infants and 7 mg/dl in
preterm infants) may occur in newborns of diabetic moth-
ers or in those who had perinatal asphyxia or trauma, and
in LBW and preterm infants. Early-onset hypocalcemia oc-
curs within the first 72 hours after birth. Signs of hypocal-
cemia include jitteriness, high-pitched cry, irritability, apnea,
intermittent cyanosis, abdominal distention, and laryn-
gospasm, although some hypocalcemic infants are asymp-
tomatic (Blackburn, 2003).

In most instances, early-onset hypocalcemia is self-
limiting and resolves within 1 to 3 days. Treatment includes
early feeding and, occasionally, the administration of calcium
supplements. Preterm or asphyxiated infants may require in-
travenous elemental calcium.

Jitteriness is a symptom of both hypoglycemia and
hypocalcemia; therefore hypocalcemia must be considered
if the therapy for hypoglycemia proves ineffective. In many
newborns, jitteriness remains despite therapy and cannot be
explained by hypoglycemia or hypocalcemia (DeMarini &
Tsang, 2002).

Laboratory and diagnostic tests
Because newborns experience many transitional events in
the first 28 days of life, laboratory samples are often gath-
ered to determine adequate physiologic adaptation and to
identify disorders that may adversely affect the child’s life
beyond the neonatal period. Tests that are commonly per-
formed include blood glucose levels, bilirubin levels, com-
plete blood count (CBC), newborn screening tests, and drug
tests. Standard laboratory values for a term newborn are
given in Box 19-4.

Newborn genetic screening. Before hospital dis-
charge, a heel-stick blood sample is obtained to detect a va-
rity of congenital conditions. Mandated by U.S. law, new-
born genetic screening is an important public health program
that is aimed at early detection of genetic diseases that re-
sult in severe health problems if not treated early. All states
screen for phenylketonuria (PKU) and hypothyroidism, but
each state determines whether other tests are performed.
Other genetic defects that are included in some screening
programs include galactosemia, cystic fibrosis, maple syrup
urine disease, and sickle cell disease. It is recommended that
the screening test be repeated at age 1 to 2 weeks if the ini-
tial specimen was obtained when the infant was younger
than 24 hours (Albers & Levy, 2005; Zinn, 2002).

Newborn hearing screening. Universal newborn
hearing screening is required by law in over 30 states and is
performed routinely in other states. Infants in the neonatal
intensive care unit (NICU) and those with other risk factors
are screened in many settings where universal screening is
not routinely done. Newborn hearing screening is completed
before hospital discharge, and infants who do not pass are
referred for repeated testing within the next 2 to 8 weeks. The
practice of universal hearing screening reduces the age at
which infants with hearing loss are identified and treated
(Joint Committee on Infant Hearing, 2000) (Fig. 19-9).

Collection of specimens. Ongoing evaluation of
a newborn often requires obtaining blood by the heel-stick
or venipuncture method or the collection of a urine spec-
imen.

Heel stick. Most blood specimens are drawn by lab-
oratory technicians. Nurses, however, may be required to per-
form heel sticks to obtain blood for glucose monitoring and

Fig. 19-9 Hearing screening in the newborn nursery.
(Courtesy Dee Lowdermilk, Chapel Hill, NC.)
to measure hematocrit levels. The same technique is used to obtain a blood sample for newborn genetic screening tests. It may be helpful to warm the heel before the sample is taken, because the application of heat for 5 to 10 minutes helps dilate the vessels in the area. A cloth soaked with warm water and wrapped loosely around the foot can effectively warm the foot (Fig. 19-10, A). Disposable heel warmers also are available from a variety of companies but should be used with care to prevent burns. Nurses should wear gloves when collecting any specimen. The nurse first cleanses the area.

### Standard Laboratory Values in the Neonatal Period

#### 1. HEMATOLOGIC VALUES

<table>
<thead>
<tr>
<th>Clotting factors</th>
<th>TERM</th>
<th>0 to 24</th>
<th>0 to 64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activated clotting time (ACT)</td>
<td>2 min</td>
<td>2 to 7 min</td>
<td></td>
</tr>
<tr>
<td>Fibrinogen</td>
<td>125 to 300 mg/dl*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clotting factors</th>
<th>PRETERM</th>
<th>15 to 17</th>
<th>45 to 55</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activated clotting time (ACT)</td>
<td>2 min</td>
<td>2 to 7 min</td>
<td></td>
</tr>
<tr>
<td>Fibrinogen</td>
<td>125 to 300 mg/dl*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hemoglobin (g/dl)</th>
<th>TERM</th>
<th>14 to 24</th>
<th>15 to 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fetal hemoglobin (% of total)</td>
<td>40 to 70</td>
<td>80 to 90</td>
<td></td>
</tr>
<tr>
<td>Red blood cells (RBCs)/μl</td>
<td>4.8 × 10^12 to 7.1 × 10^12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White blood cells (WBCs)/μl</td>
<td>9000 to 30,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term</th>
<th>0 to 2 days</th>
<th>1 to 2 days</th>
<th>2 to 5 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin (g/dl)</td>
<td>6 mg/dl</td>
<td>8 mg/dl</td>
<td>12 mg/dl</td>
</tr>
<tr>
<td>Platelet count/mm³</td>
<td>150,000 to 300,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutrophils (%)</td>
<td>54 to 62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lymphocytes (%)</td>
<td>25 to 33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monocytes (%)</td>
<td>3 to 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>immature WBCs (%)</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protein</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose</td>
<td>Negative</td>
</tr>
<tr>
<td>Ketones</td>
<td>Negative</td>
</tr>
<tr>
<td>RBCs</td>
<td>0 to 2</td>
</tr>
<tr>
<td>WBCs</td>
<td>0 to 4</td>
</tr>
</tbody>
</table>

*dl refers to deciliter (1 dl = 100 ml); this conforms to the SI system (standardized international measurement). |
†mcl refers to microliter.

#### 2. BIOCHEMICAL VALUES

<table>
<thead>
<tr>
<th>Bilirubin, direct (mg/dl)</th>
<th>TERM</th>
<th>0 to 1 mg/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral blood:</td>
<td></td>
<td>&lt;2 mg/dl</td>
</tr>
<tr>
<td>0 to 1 day</td>
<td></td>
<td>6 mg/dl</td>
</tr>
<tr>
<td>1 to 2 days</td>
<td></td>
<td>8 mg/dl</td>
</tr>
<tr>
<td>2 to 5 days</td>
<td></td>
<td>12 mg/dl</td>
</tr>
<tr>
<td>Arterial: (paCO₂, PaO₂)</td>
<td></td>
<td>pH 7.31 to 7.49</td>
</tr>
<tr>
<td>venous:</td>
<td></td>
<td>PaCO₂ 26 to 41 mm Hg</td>
</tr>
<tr>
<td>Serum glucose (mg/dl)</td>
<td></td>
<td>PaO₂ 60 to 70 mm Hg</td>
</tr>
</tbody>
</table>

#### 3. URINALYSIS

<table>
<thead>
<tr>
<th>Color</th>
<th>Clear, straw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific gravity</td>
<td>1.001 to 1.020</td>
</tr>
<tr>
<td>pH</td>
<td>5 to 7</td>
</tr>
<tr>
<td>Protein</td>
<td>Negative</td>
</tr>
<tr>
<td>Glucose</td>
<td>Negative</td>
</tr>
</tbody>
</table>

with alcohol, restrains the infant’s foot with his or her free hand, and then punctures the site. A spring-loaded automatic puncture device causes less pain and requires fewer punctures than a manual lance blade.

The most serious complication of an infant heel stick is necrotizing osteochondritis resulting from lancet penetration of the bone. To prevent this, the stick should be made at the outer aspect of the heel and should penetrate no deeper than 2.4 mm (Hockenberry, 2003). To identify the appropriate puncture site, the nurse should draw an imaginary line from between the fourth and fifth toes that runs parallel to the lateral aspect of the heel, where the stick should be made; a line can also be drawn from the great toe that runs parallel to the medial aspect of the heel, another site for a stick (Fig. 19-10, B). Repeated trauma to the walking surface of the heel can cause fibrosis and scarring that may lead to problems with walking later in life.

After the specimen has been collected, pressure should be applied with a dry gauze square, but no further alcohol should be applied because this will cause the site to continue to bleed. The site is then covered with an adhesive bandage. The nurse ensures proper disposal of equipment used, reviews the laboratory slip for correct identification, and checks the specimen for accurate labeling and routing.

Venipuncture. A venipuncture may be less painful than a heel stick for blood sampling. Venous blood samples can be drawn from antecubital, saphenous, superficial wrist, and rarely, scalp veins. If an intravenous site is used to

Fig. 19-10 Heel stick. A, Newborn with foot wrapped for warmth to increase blood flow to extremity before heel stick. B, Heel-stick sites (shaded areas) on infant’s foot for obtaining samples of capillary blood. (A, Courtesy Marjorie Pyle, RNC, Lifecircle, Costa Mesa, CA.)
obtain a blood specimen, it is important to consider the type of infusion fluid, because mixing of the blood sample with the fluid can alter the results.

When venipuncture is required, positioning of the needle is extremely important. Although regular venipuncture needles may be used, some prefer butterfly needles. A 25-gauge needle is adequate for blood sampling in neonates, with minimal hemolysis occurring when the proper procedure is followed. It is necessary to be very patient during the procedure, because the blood return in small veins is slow,
and consequently the small needle must remain in place longer. The mummy restraint commonly is used to help secure the infant (Fig. 19-11).

For external jugular venipuncture, "mummy" the infant as necessary, and then lower the infant's head over a rolled towel, the edge of a table, or your knee, and stabilize. For femoral venipuncture, place your hands over the infant's knees, but avoid pressing your fingers over the inner aspect of the thigh (Fig. 19-12, A). Both of these positions ensure the safety of the infant and exposure of the puncture sites. If the radial vein is used, the infant's arm is exposed and held securely in place.

If venipuncture or arterial puncture is being performed for blood gas studies, crying, fear, and agitation will affect the values; therefore every effort must be made to keep the infant quiet during the procedure. For blood gas studies, the blood sample tubes are packed in ice (to reduce blood cell metabolism) and are taken immediately to the laboratory for analysis.

Pressure must be maintained over an arterial or femoral vein puncture with a dry gauze square for at least 3 to 5 minutes to prevent bleeding from the site. For an hour after any venipuncture, the nurse should then observe the infant frequently for evidence of bleeding or hematoma formation at the puncture site. The infant's tolerance of the procedure also should be recorded. The infant should be cuddled and comforted when the procedure is completed.

**Obtaining a urine specimen.** Examination of urine is a valuable laboratory tool for infant assessment; the way in which the urine specimen is collected may influence the results. The urine sample should be fresh and analyzed within 1 hour of collection.

A variety of urine collection bags are available, including the Hollister U-Bag (Fig. 19-13). These are clear plastic, single-use bags with an adhesive material around the opening at the point of attachment. To prepare the infant, the nurse removes the diaper and places the infant in a supine position. The genitalia, perineum, and surrounding skin are washed and thoroughly dried because the adhesive on the bag will not stick to moist, powdered, or oily skin surfaces. The protective paper is removed to expose the adhesive (Fig. 19-13, A). In female infants, the perineum is first stretched to flatten skin folds, and then the adhesive area on the bag is pressed firmly onto the skin all around the urinary meatus and vagina. (**NOTE:** Start with the narrow portion of the butterfly-shaped adhesive patch.) Starting the application at the bridge of skin separating the rectum from the vagina and working upward is most effective (Fig. 19-13, B). In male infants, the penis and scrotum are tucked through the opening into the collection bag before the protective paper is removed from the adhesive and it is pressed firmly onto the perineum, making sure the entire adhesive is firmly attached to skin and the edges of the opening do not pucker (Fig. 19-13, C). This helps ensure a leakproof seal and decreases the chance of contamination from stool. Cutting a slit in the diaper and pulling the bag through the slit also may help prevent leaking.

The diaper is carefully replaced, and the bag is checked frequently. When a sufficient amount of urine (this amount varies according to the test done) appears, the bag is removed. The infant's skin is observed for signs of irritation while the bag is in place. The specimen can be aspirated with a syringe or drained directly from the bag.

Collection of a 24-hour specimen can be a challenge; the infant may need to be restrained. The 24-hour urine bag is applied in the manner just described, and the urine is drained into a receptacle. During the collection, the infant's skin is observed closely for signs of irritation and for lack of a proper seal.

For some types of urine tests, urine can be aspirated directly from the diaper by means of a syringe without a needle. If the diaper has absorbent gelling material that traps urine, a small gauze dressing or some cotton balls can be placed inside the diaper and the urine aspirated from them (Hockenberry, 2003).

**Restraining the infant.** Infants may need to be restrained to (1) protect the infant from injury, (2) facilitate...
examinations, and (3) limit discomfort during tests, procedures, and specimen collections (see Figs. 19-11 and 19-12). The following special considerations must be kept in mind when restraining an infant:

- Apply restraints and check them to make sure they are not irritating the skin or impairing circulation.
- Maintain proper body alignment.
- Apply restraints without using knots or pins if possible. If knots are necessary, make the kind that can be released quickly. Use pins with care so that there is no danger of their puncturing or pressing against the infant’s skin.
- Check the infant hourly, or more frequently if indicated.

Restrain without appliance. The nurse may restrain the infant by using the hands and body. Figure 19-12, B illustrates ways to restrain an infant in this manner.

Possible nursing diagnoses for the newborn from 2 hours after birth until discharge include the following:

- Ineffective breathing pattern related to
  - obstructed airway
- Impaired gas exchange related to
  - ineffective breathing pattern
- Ineffective thermoregulation related to
  - excess heat loss to the environment
- Acute pain related to
  - circumcision
  - bled stick, venipuncture

Possible nursing diagnoses for the parents are as follows:

- Readiness for enhanced family coping related to
  - knowledge of newborn’s social capabilities
- Knowledge of newborn’s dependency needs
- Knowledge of newborn’s biologic characteristics
- Situational low self-esteem related to
  - misinterpretation of newborn’s behavioral cues

Examples of nursing diagnoses derived from specific assessment findings are listed in the Plan of Care.

**Expected Outcomes of Care**

The expected outcomes for newborn care relate to the infant and parents. The outcomes for the infant are that the infant will do the following:

- Maintain an effective breathing pattern
- Maintain effective thermoregulation
- Remain free from infection
- Establish adequate elimination patterns
- Experience minimal pain

For the parents, expected outcomes include the following:

- Attain knowledge, skill, and confidence relevant to infant care activities
- State understanding of biologic and behavioral characteristics of their newborn
- Have opportunities to intensify their relationship with the infant
- Begin to integrate the infant into the family

**Plan of Care and Interventions**

In the inpatient setting, priorities of care must be established and a systematic teaching plan devised for infant care. One way to accomplish this is to use critical path case management. A care path may be developed to cover the changes expected in the infant during the first several days of life (Care Path). When variations from the care path occur, further assessment and intervention may be necessary.
Proper environment

The provision of a protective environment is basic to the care of the newborn. The construction, maintenance, and operation of nurseries in accredited hospitals are monitored by national professional organizations such as the AAP, Joint Commission on Accreditation of Healthcare Organizations, Occupational Health and Safety Administration, and local or state governing bodies. In addition, hospital personnel develop their own policies and procedures for protecting the newborns under their care. Prescribed standards cover areas such as the following:

- Environmental factors: Provision of adequate lighting, elimination of potential fire hazards, safety of electrical appliances, adequate ventilation, and controlled temperature (i.e., warm and free of drafts) and humidity (lower than 50%).
- Measures to control infection: Adequate floor space to permit the positioning of bassinets at least 3 feet

PLANNED CARE: Normal Newborn

NURSING DIAGNOSIS Risk for ineffective airway clearance related to excess mucus production or improper positioning

Expected Outcomes Neonate’s airway remains patent; breath sounds are clear, and no respiratory distress is evident.

Nursing Interventions/Rationales
- Teach parents that gagging, coughing, and sneezing are normal neonatal responses that assist the neonate in clearing airways.
- Monitor vital signs.
- Review maternal record for evidence of any risk factors.
- Monitor neonate’s axillary temperature frequently.
- Maintain neutral thermal environment.

NURSING DIAGNOSIS Risk for infection related to improper handwashing techniques before handling newborn

Expected Outcomes: Neonate’s airway remains free of infection.

Nursing Interventions/Rationales
- Teach parents feeding techniques that prevent overfeeding.
- Monitor neonate’s axillary temperature frequently.
- Maintain neutral thermal environment.
- Teach parents to practice good handwashing techniques before handling newborn and prevent aspiration and airway obstruction.
- Assess neonate for signs of infection.
- Provide prescribed eye prophylaxis to prevent infection.
- Keep genital area clean and dry using proper cleansing techniques to prevent skin irritation, cross-infection, and infection.
- Keep unстерile stump clean and dry and keep exposed to air to allow drying and minimize chance of infection.
- If infant is circumcised, keep site clean and apply diaper loosely to prevent trauma and infection.
- Teach parents to keep neonate away from crowds and environmental irritants to reduce potential sources of infection.

NURSING DIAGNOSIS Risk for injury related to sole dependence on caregiver

Expected Outcomes: Neonate remains free of injury.

Nursing Interventions/Rationales
- Monitor environment for hazards such as sharp objects, long fingernails of caretaker and neonate, and jewelry of caretaker that may be sharp to prevent injury.
- Handle neonate gently and support head, ensure use of car seat by parents, teach parents never to place neonate on high surface unsupervised, and to supervise pet and sibling interactions to prevent injury.
- Assess neonate frequently for any evidence of jaundice to identify rising bilirubin levels, treat promptly, and prevent kernicterus.

NURSING DIAGNOSIS Readiness for enhanced family coping related to anticipatory guidance regarding responses to neonate’s crying

Expected Outcomes: Parent will verbalize understanding of methods of coping with neonate’s crying and describe increased success in interpreting neonate’s cries.

Nursing Interventions/Rationales
- Alert parents to crying as neonate’s form of communication and that cries can be differentiated to indicate hunger, wetness, pain, and loneliness to provide reassurance that crying is not indicative of neonate’s rejection of parents and that parents will learn to interpret the different cries of their child.
- Differentiate self-soothing behaviors from fussing or crying to give parents concrete examples of interventions.
- Discuss methods of consoling a neonate who has been crying that assist the neonate in clearing airway and prevent aspiration.
- To prevent regurgitation and aspiration.
- To assist the neonate in clearing airway and prevent aspiration.
- To prevent aspiration and airway obstruction.
- To prevent infection.
- To prevent infection.
- To prevent infection.
- To prevent infection.
- To prevent infection.
- To prevent infection.
### CARE PATH

#### Healthy Term Newborn

<table>
<thead>
<tr>
<th>CARE ASPECTS</th>
<th>FIRST HOUR</th>
<th>2-3 HR</th>
<th>6 HR</th>
<th>12 HR</th>
<th>18 HR</th>
<th>24 HR</th>
<th>36-48 HR TO DISCHARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>ID band on and verified matching parents; bulb syringe (for suction) at bedside; newborn safety alarm system activated. ¹</td>
<td>ID band on Parent teaching regarding bulb syringe; NB alarm system active</td>
<td>ID band on Bulb syringe in crib; NB alarm system active</td>
<td>ID band on Bulb syringe in crib; NB alarm system active</td>
<td>ID band on Bulb syringe in crib; NB alarm system active</td>
<td>ID band on T</td>
<td>Remove at discharge only Parents verbalize appropriate car seat in place Discuss and reinforce home safety, including abduction prevention, infection prevention, car seat safety, and falls prevention Reinforce teaching for use of bulb syringes Discuss sleep position—on back, always; sleep environment (mattress, crib rails) Reinforce smoke-free environment around infant Deactivate NB alarm system at discharge</td>
</tr>
<tr>
<td>Temperature (axillary)</td>
<td>36.5° - 37.2° C</td>
<td>36.5° - 37.2° C</td>
<td>36.5° - 37.2° C</td>
<td>36.5° - 37.2° C</td>
<td>36.5° - 37.2° C</td>
<td>36.5° - 37.2° C</td>
<td>36.5° - 37.2° C</td>
</tr>
<tr>
<td>Vital signs</td>
<td>Blood pressure on admission per protocol (not usual unless indicated)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart rate</td>
<td>100-180 beats/min</td>
<td>80-180 beats/min</td>
<td>120-140 beats/min</td>
<td>120-140 beats/min</td>
<td>VS stable</td>
<td>VS stable: 120-140 beats/min</td>
<td>VS stable and documented If murmur present, document Monitor blood pressure per protocol</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>30-50 breaths/min (may be less if asleep)</td>
<td>30-50 breaths/min</td>
<td>30-50 breaths/min</td>
<td>30-50 breaths/min</td>
<td>30-50 breaths/min</td>
<td>30-50 breaths/min</td>
<td>30-50 breaths/min</td>
</tr>
<tr>
<td>Feeding</td>
<td>Breast Initiated—latch-on</td>
<td>1 latch-on‡</td>
<td>1 latch-on‡</td>
<td>2 latch-ons verified‡</td>
<td>3-4 successful latch-ons verified‡</td>
<td>Feeding successfully 8-10 times/day; discuss and reinforce feeding cues and associated behaviors</td>
<td></td>
</tr>
</tbody>
</table>

¹ Replace with "ID band on and verified matching parents; bulb syringe (for suction) at bedside; newborn safety alarm system activated".
### Chapter 19

#### Assessment and Care of the Newborn

<table>
<thead>
<tr>
<th>Category</th>
<th>Action</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formula</strong></td>
<td>Sips to verify suck, swallow, and breathing</td>
<td>2 feedings—15-25 ml each; 3 successful feedings verified—15-30 ml each</td>
</tr>
<tr>
<td><strong>Elimination</strong></td>
<td>Check</td>
<td>1 void</td>
</tr>
<tr>
<td><strong>Stooling</strong></td>
<td>Check for stool</td>
<td>1 meconium documented</td>
</tr>
<tr>
<td><strong>Parent Interaction</strong></td>
<td>Initiated eye contact and verbalization</td>
<td>Continued involvement in newborn care</td>
</tr>
<tr>
<td><strong>Cord Care</strong></td>
<td>Cord clamped</td>
<td>Cord drying; no drainage</td>
</tr>
<tr>
<td><strong>Circumcision</strong></td>
<td>Pain management—recommend topical anesthesia with DPNB or regional and oral suxone; verify after procedure</td>
<td>Continued evaluation for absence of bleeding and presence of voiding</td>
</tr>
<tr>
<td><strong>Billirubin</strong></td>
<td>&lt;5-6 mg/dl</td>
<td>&lt;5-6 mg/dl; color pink; note if jaundice present and documented; transcutaneous bilirubin check per protocol</td>
</tr>
</tbody>
</table>

#### Note skin color; transcutaneous jaundice meter reading per protocol AND check serum bilirubin at 24-36 hr:

- 7 mg/dl—low risk
- 7-13 mg/dl—low intermediate risk
- >13 mg/dl—high risk

Reinforce teaching and care—approximately 1-2 stools/72-96 hr after first week of life depending on feeding method; more if breastfeeding.
### CARE PATH: Healthy Term Newborn—cont’d

<table>
<thead>
<tr>
<th>CARE ASPECTS</th>
<th>FIRST HOUR</th>
<th>2-3 HR</th>
<th>6 HR</th>
<th>12 HR</th>
<th>18 HR</th>
<th>24 HR</th>
<th>36-48 HR TO DISCHARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Billirubin—cont’d</strong></td>
<td></td>
<td>No visible jaundice; pink</td>
<td>No visible jaundice; pink</td>
<td>No visible jaundice; pink</td>
<td>Check for jaundice</td>
<td>Note color—document</td>
<td>Provide parent instruction regarding jaundice and follow-up visit with primary care practitioner within 3-4 days</td>
</tr>
<tr>
<td><strong>Newborn screening</strong></td>
<td></td>
<td></td>
<td>Hearing screening completed and documented</td>
<td></td>
<td>Newborn screening completed after 24 hr—document time and method</td>
<td>Verify newborn screening completed, including PKU after 24 hr of oral intake—reschedule if needed</td>
<td></td>
</tr>
<tr>
<td><strong>Medications</strong></td>
<td>Eye prophylaxis</td>
<td>Vitamin K</td>
<td>Maternal HBsAg status verified and documented</td>
<td>Hepatitis B vaccine within 12 hr of birth if mother positive; document</td>
<td>Check eye status; verify free of drainage</td>
<td>Reinforce hepatitis B vaccination at follow-up if not given in birth hospital</td>
<td></td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Active, flexed, primitive reflexes present (Moro, suck, tonic neck, Babinski)</td>
<td>May be drowsy but arousable</td>
<td>Active and alert</td>
<td>Active and alert</td>
<td>Sleep periods noted</td>
<td>Reflexes present</td>
<td>Neurologic status intact</td>
</tr>
</tbody>
</table>

Prepared by David Wilson, MS, RNC.

SPM: Dorsal penile nerve block; DPNB, Dorsal penile nerve block; HBsAg, hepatitis B surface antigen; ID, identification; PKU, phenylketonuria; VS, vital signs.

*NB alarm system is the hospital protocol designed to protect infant from abduction.
†If still in hospital.
‡Minimum observed and documented.
apart in all directions, handwashing facilities, and areas for cleaning and storing equipment and supplies. Only those personnel directly involved in the care of mothers and infants are allowed in these areas, thereby reducing the opportunities for the transmission of pathogenic organisms.

**NURSE ALERT** Personnel are instructed to use good handwashing techniques. Handwashing between each infant handling is the single most important measure in the prevention of neonatal infection.

Health care personnel must wear gloves when handling the infant until blood and amniotic fluid have been removed from the infant’s skin, when drawing blood (e.g., heel stick), when caring for a fresh wound (e.g., circumcision), and during diaper changes.

Visitors and health care providers such as nurses, physicians, parents, brothers and sisters, department supervisors, electricians, and housekeepers are expected to wash their hands before having contact with infants or equipment. Cover gowns are not necessary.

Individuals with infectious conditions are excluded from contact with newborns or must take special precautions when working with infants. This includes persons with upper respiratory tract infections, gastrointestinal tract infections, and infectious skin conditions. Most agencies have now coupled this day-to-day self-screening of personnel with yearly health examinations.

- Safety factors: Health care institutions must be proactive in protecting newborns from abductions. Examples of the measures include placing identification bracelets on infants and their parents, using identification bands with radiofrequency transmitters that set off an alarm if the bracelet is removed or if a certain threshold is crossed (doorway to exit unit or building), and footprinting or taking identification pictures immediately after birth, before the infant leaves the mother’s side (Fig. 19-14). Personnel wear picture identification badges or other badges that identify them as newborn unit personnel (Fig. 19-15). Mother-baby units may have infant tracking systems that will set off an alarm if a baby is left alone or is with unauthorized personnel. Mothers are instructed to be certain they know the identity of anyone who cares for the infant and never to release the infant to anyone who is not wearing the appropriate identification.

**Supporting parents in the care of their infant**

The sensitivity of the caregiver to the social responses of the infant is basic to the development of a mutually satisfying parent-child relationship. Sensitivity increases over time as parents become more aware of their infant’s social capabilities (Cultural Considerations box).

**Social interaction.** The activities of daily care during the neonatal period are the best times for infant and family interactions. While caring for their baby, the mother and father can talk to the infant, play baby games, caress and cuddle the child, and perhaps use infant massage. Too much stimulation should be avoided after feeding and before a sleep period. Older children’s contact with a newborn is encouraged and supervised based on the developmental level of the child (Fig. 19-16).

**Infant feeding.** The infant is put to breast as soon as possible after birth or at least within 4 hours. If the infant is to be bottle-fed, a nurse may first offer a few sips of sterile water to make certain the sucking and swallowing reflexes are intact and that there are no anomalies such as a tracheoesophageal fistula. Most infants are on demand feeding schedules and are allowed to feed when they awaken. Ordinarily mothers are encouraged to feed their infants every 3 to 4 hours during the day and only when the infant awakens during the night in the first few days after birth. Formula-fed infants usually eat approximately every 3 to 4 hours.
Breastfed babies nurse more often (every 2 to 3 hours) than bottle-fed babies because breast milk is digested faster than formulas made from cow’s milk, and the stomach empties sooner as a result. Water supplements are not recommended. For a thorough discussion of infant feeding, see Chapter 20.

**Therapeutic and surgical procedures**

**Intramuscular injection.** As discussed previously, it is routine to administer a single dose of 0.5 to 1 mg of vitamin K intramuscularly to an infant soon after birth (see Medication Guide box on p. 579).

Hepatitis B (Hep B) vaccination is recommended for all infants. Infants at highest risk for contracting hepatitis B are those born to women who come from Asia, Africa, South America, the South Pacific, or southern or eastern Europe (Medication Guide). If the infant is born to an infected mother or to a mother who is a chronic carrier, hepatitis vaccine and hepatitis B immune globulin (HBIG) should be administered within 12 hours of birth (Medication Guide). The hepatitis vaccine is given in one site and the HBIG in another. For infants born to healthy women, the first dose of the vaccine may be given at birth or at age 1 or 2 months. Parental consent should be obtained before these vaccines are administered.

Intramuscular injection must be given in muscles large enough to accommodate the medication, and major nerves and blood vessels must be avoided. The muscles of newborns may not tolerate more than a 0.5 ml per intramuscular injection. The injection site for newborns is the vastus lateralis (Fig. 19-17). The dorsogluteal muscle is very small, poorly developed, and dangerously close to the sciatic nerve, which occupies a larger area in infants compared with older children. Therefore it

**Cultural Considerations**

**Cultural Beliefs and Practices**

Nurses working with childbearing families from other cultures and ethnic groups must be aware of cultural beliefs and practices that are important to individual families. People with a strong sense of heritage may hold on to traditional health beliefs long after adopting other U.S. lifestyle practices. These health beliefs may involve practices regarding the newborn. For example, some Asians, Hispanics, eastern Europeans, and Native Americans delay breastfeeding because they believe that colostrum is "bad." Some Hispanics and African-Americans place a belly band over the infant’s navel. The birth of a male child is generally preferred by Asians and Indians, and some Asians and Haitians delay naming their infants (D’Avanzo & Geissler, 2003).

![Fig. 19-19 Mother supervising contact of older sibling with newborn. (Courtesy Rebekah Vogel, Fort Collins, CO.)(Image 1)](image-url)
is not recommended that it be used as an injection site until the child has been walking for at least 1 year. The newborn’s deltoid muscle has an inadequate amount of muscle for intramuscular injection. The neonate’s leg should be stabilized. Gloves should be worn by the person giving the injection. The nurse cleanses the injection site with an appropriate skin antiseptic (e.g., alcohol), then pinches up the infant’s muscle between the thumb and forefinger. The needle is inserted into the vastus lateralis at a 90-degree angle. The muscle is released and the plunger of the syringe gently withdrawn. If no blood is aspirated, the medication is injected. If blood is aspirated, the needle is withdrawn and the injection is given in another site. After the injection has been given, the needle is withdrawn quickly and the site massaged with a gauze square to hasten absorption, unless contraindicated. A small amount of bleeding at the injection site is not uncommon, but it is not necessary to cover the site with an adhesive bandage. Pressure should be applied until bleeding stops.

The nurse should always remember to comfort the infant after an injection and to discard equipment properly. It is important to record the name of the medication, date and time of administration, amount, route, and site of injection on the newborn’s chart.

Therapy for hyperbilirubinemia. The best therapy for hyperbilirubinemia is prevention. Because bilirubin is excreted primarily through stooling, prevention can be facilitated by early feeding, which stimulates the passage of meconium. However, despite early passage of meconium, the term infant may have trouble conjugating the increased amount of bilirubin derived from disintegrating fetal red blood cells. As a result, the serum levels of unconjugated bilirubin may increase beyond normal limits, causing hyperbilirubinemia (see Chapter 18). The goal of treatment of hyperbilirubinemia is to help reduce the newborn’s serum levels of unconjugated bilirubin. The two principal ways of doing this are phototherapy and, rarely, exchange blood transfusion. Exchange transfusion treats those infants whose increased levels of bilirubin cannot be controlled by phototherapy (Ip et al., 2004).

Phototherapy. During phototherapy the unclothed infant is placed beneath a bank of lights. The distance may
vary based on unit protocol and the type of light used. There should always be a Plexiglas panel or shield between the lights and the infant when conventional lighting is used. The most effective therapy is achieved with lights at 400 to 500 manometers, and blue light spectrum is the most efficient. The lamp energy should be monitored routinely during treatment with a photometer to ensure efficacy of therapy. Phototherapy is carried out until the infant’s serum bilirubin level decreases to within an acceptable range. The decision to discontinue therapy is based on the observation of a definite downward trend in the bilirubin values. After therapy has been terminated, the infant may have a rebound in bilirubin levels, which is usually harmless (Kliegman, 2002).

Several precautions must be taken while the infant is undergoing phototherapy. The infant’s eyes must be protected by an opaque mask to prevent overexposure to the light. The eye shield should cover the eyes completely but not occlude the nares. Before the mask is applied, the infant’s eyes should be closed gently to prevent excoriation of the corneas. The mask should be removed during infant feedings so that the eyes can be checked and the parents can have visual contact with the infant (Fig. 19-18).

To promote optimal skin exposure during phototherapy, the diaper may be left off, or a “string bikini” made from a disposable face mask may be used to cover the infant’s genital area. Before placing the mask on the infant, the metal strip must be removed from the face mask to prevent burning the infant. Lotions and ointments should not be used during phototherapy because they absorb heat, and this can cause burns.

Phototherapy may cause changes in the infant’s temperature depending partially on the bed used: bassinet, isolette, or radiant warmer. The infant’s temperature is closely monitored. Phototherapy lights may increase insensible water loss, placing the infant at risk for fluid loss and dehydration; therefore it is important that the infant be adequately hydrated. Hydration maintenance in the healthy newborn is accomplished with human milk or infant formula; there is no reason to administer glucose water or plain water because these do not promote excretion of bilirubin in the stools and may actually perpetuate enterohepatic circulation, thus delaying bilirubin excretion. Urine output may be decreased or unaltered; the urine may have a brown or gold appearance. All aspects of the phototherapy treatment should be accurately recorded in the infant’s chart.

An alternative device for phototherapy that is safe and effective is a fiberoptic panel attached to an illuminator. This fiberoptic blanket may be wrapped around the newborn’s torso or flat in the bed, thus delivering continuous phototherapy. Although the fiberoptic lights do not produce heat as do conventional lights, staff should ensure that there is a covering pad between the infant’s skin and the fiberoptic device. This helps to prevent burns, especially in preterm infants. During treatment with the fiberoptic blanket the newborn can remain in the mother’s room in an open crib or in her arms (Fig. 19-18, C); follow unit protocol for the use of eye patches. The blanket also may be used for home care. In certain instances the infant’s bilirubin levels may be increasing rapidly and intensive phototherapy is required; this involves the use of a combination of conventional lights and fiberoptic blankets.

Exchange transfusion. Exchange transfusion is usually reserved for infants at risk for kernicterus because of high bilirubin levels. Small amounts of cross-matched whole blood are transfused into the infant as equivalent amounts of the infant’s blood are withdrawn and discarded. This is most often accomplished through an umbilical venous catheter. Potential complications of exchange transfusion include transfusion reaction, infection, metabolic instability, and complications related to placement of the umbilical catheter (Kliegman, 2002) (see Chapter 27).
Parent education. Serum levels of bilirubin in the newborn continue to increase until the fifth day of life. Many parents leave the hospital within 24 hours, and some as early as 6 hours after birth. Therefore parents must be able to assess the newborn’s degree of jaundice. They should have written instructions for assessing the infant’s condition and the name of the contact person to whom to report their findings and concerns. Some health care agencies have a nurse make a home visit to evaluate the infant’s condition. If it proves necessary to measure the infant’s bilirubin levels after discharge from the hospital, either the home care nurse may draw the blood specimen or the parents may take the baby to a laboratory for the determination. Home phototherapy. Healthy term infants may at times be discharged home and need phototherapy for hyperbilirubinemia. Candidates for home phototherapy include those infants who are healthy and active with no signs and symptoms of other complications; the parents or other caregivers must be willing and able to assume responsibility for therapy maintenance and monitoring, and the home environment should be adequate with a telephone, heat, and electricity (University of California San Francisco Home Health Care, 2001). Home health care nurses are usually responsible for assessing the parents’ other caregivers’ willingness to use the equipment and monitor the infant and making home visits to assess the infant’s response to therapy, including obtaining blood specimens for measuring bilirubin levels. The company that provides the home therapy equipment is responsible for setting up the phototherapy unit and teaching the parents or caregivers how to use the equipment. The home care nurse schedules home visits to assess the infant’s response to therapy including weight, feeding, output, and temperature stability. Additional education of parents may be necessary; their understanding of the therapy and their responsibilities is assessed. Blood may be drawn for laboratory work, and results reported to the primary health care provider. When therapy is discontinued, follow-up visits for monitoring may be ordered. The equipment company is called to arrange for pick-up of the phototherapy unit (UCSF Home Health Care, 2001).

Circumcision. Circumcision of newborn males is commonly performed in the United States, although there is controversy over its value. The AAP Task Force on Circumcision (1999) noted that, although there is scientific evidence of potential medical benefits of circumcision, the data are not sufficient to recommend routine circumcision. The Task Force further recommended that if circumcision is performed, analgesia should be used. ACOG (2001) and the American Medical Association (2005) have issued similar recommendations regarding newborn circumcision.

Circumcision is a matter of personal parental choice. Parents usually decide to have their newborn circumcised for one or more of the following reasons: hygiene, religious conviction, tradition, culture, or social norms. Regardless of the reason for the decision, parents should be given unbiased information and the opportunity to discuss the benefits and risks of the procedure. Suggested medical benefits of circumcision for the infant include decreased incidence of urinary tract infection and decreased risk for sexually transmitted infection, penile cancer, and human papilloma virus (HPV) infection. There may be a lower risk of cervical cancer among female partners of circumcised men (Alanis & Lucidi, 2004). Although there may be potential benefits, none of these are deemed sufficient to suggest that newborn males be routinely circumcised (AAP Task Force on Circumcision, 1999). Risks and potential complications associated with circumcision include hemorrhage, infection, and penile injury (removal of excessive skin, damage to the meatus or glans) (Alanis & Lucidi, 2004).

Expectant parents should begin learning about circumcision during the prenatal period, but circumcision often is not discussed with the parents before labor. In many instances, it is only when the mother is being admitted to the hospital or birth unit that parents are first confronted with the decision regarding circumcision. Because the stress of the intrapartal period makes this a difficult time for parental decision making, this is not an ideal time to broach the topic of circumcision and expect a well-thought-out decision.

Procedure. Circumcision involves removing the prepuce (foreskin) of the glans. The procedure is usually not done immediately after birth because of the danger of cold stress but is performed in the hospital before the infant’s discharge. The circumcision of a Jewish male is commonly performed on the eighth day after birth and is done at home, in a ceremony called a bris. This timing is logical from a physiologic standpoint because clotting factors decrease somewhat immediately after birth and do not return to prebirth levels until the end of the first week.

Formula feedings are usually withheld up to 4 hours before the circumcision to prevent vomiting and aspiration; breastfeeding infants may be allowed to nurse up until the procedure is done; this varies with unit protocol. To prepare the infant for the circumcision, he is positioned on a plastic restraint form (Fig. 19-19), and his penis is cleansed with soap and water or a preparatory solution such as povidone-iodine. The infant is draped to provide warmth and a sterile field, and the sterile equipment is readied for use. Although some circumcision procedures require no special equipment or appliances (Fig. 19-20), numerous instruments have been designed for this purpose. Use of the Gomco, Yellen, or Mogen clamp (Fig. 19-21) may make this an almost bloodless operation. The procedure itself takes only a few minutes. After it is completed, a small petrolatum gauze dressing or a generous amount of petrolatum may be applied for the first day or two to prevent hemorrhage during the procedure and afterward protects against infection, keeps the site from sticking to the diaper, and prevents pain with urination. To use the bell for circumcision, first fit it over the glans, tie the suture around the rim of the bell, and then cut away.
excess prepuce. The plastic rim remains in place for about a week until it falls off, after healing has taken place (Fig. 19-22). Petrolatum need not be applied when the PlastiBell is used (Glass, 2005).

Discomfort. Circumcision is painful, and the pain is manifested by both physiologic and behavioral changes in the infant. The AAP Task Force on Circumcision (1999) recommends the use of environmental, nonpharmacologic, and pharmacologic pain interventions to prevent, decrease, or alleviate pain during neonatal circumcision.

Three types of anesthesia and analgesia are used in newborns who undergo circumcisions. These include (from most effective to less effective) ring block, dorsal penile nerve block (DPNB), and topical anesthetic (AAP Task Force on Circumcision, 1999). Nonpharmacologic methods such as nonnutritive sucking, containment, and swaddling may be used in addition to pharmacologic use of oral acetaminophen and a concentrated oral glucose solution. A combination of ring block or DPNB, topical anesthetic, nonnutritive sucking, oral acetaminophen, concentrated oral sucrose solution (2 ml of a 24% concentration given during the procedure on a pacifier, with a syringe or nipple), and swaddling has been shown to be the most effective at decreasing the pain associated with circumcision.

A ring block is the injection of buffered lidocaine administered subcutaneously on each side of the penile shaft. A DPNB includes subcutaneous injections of buffered lidocaine at the 2 o’clock and 10 o’clock positions at the base of the penis. The circumcision should not be done for at least 5 minutes after these injections.

A topical cream containing prilocaine-lidocaine such as EMLA can be applied to the base of the penis at least 1 hour before the circumcision. The area where the prepuce attaches

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**Fig. 19-19** Proper positioning of infant in Circumstraint. (Photo by Paul Vincent Kuntz, Texas Children’s Hospital, Houston, TX.)

**Fig. 19-20** Technique of circumcision. A to D, Prepuce is stripped and slit to facilitate its retraction behind glans penis. E, Prepuce is clamped and excessive prepuce cut off. F and G, A very small needle and plain 2-0 or 3-0 catgut are used for suture material; some physicians prefer silk.

**Fig. 19-21** Circumcision with Yellen clamp. A, Prepuce drawn over cone. B, Yellen clamp is applied, hemostasis occurs, and then prepuce (over cone) is cut away.
to the glans is well coated with 1 g of the cream and then covered with a transparent occlusive dressing or finger cot. Just before the procedure, the cream is removed. Blanching or redness of the skin may occur (Taddio, Ohlsson, & Ohlsson, 2001).

After the circumcision, the infant is comforted until he is quieted. If the parents were not present during the procedure, the infant is returned to them. The infant may be fussy for several hours, or he may be sleepy and difficult to awaken for feedings. Oral acetaminophen may be administered after the procedure every 4 hours (as ordered by the practitioner) for a maximum of five doses in 24 hours or a maximum of 75 mg/kg/day (Alanis & Lucidi, 2004).

Nurses are instrumental in implementing changes in health care practices to effectively manage the pain of neonatal circumcision (Razmus, Dalton, & Wilson, 2004).

**Neonatal pain**

Until recent years, pain in the neonate was unrecognized and untreated. A common myth was that because newborns are developmentally immature, they do not experience pain, nor do they recall having felt pain. Fortunately, care providers now acknowledge that newborns actually do feel pain. Much attention has been drawn to assessment of that pain as well as to interventions that alleviate discomfort and return the newborn to a state of equilibrium (Clifford, Stringer, Christensen, & Mountain, 2004).

Pain has physiologic and psychologic components. The psychologic component of pain and the diffuse total body response to pain exhibited by the neonate led many health care providers to believe that infants, especially preterm infants, do not experience pain. The central nervous system is well developed, however, as early as 24 weeks of gestation. The peripheral and spinal structures that transmit pain information are present and functional between the first and second trimester. The pituitary-adrenal axis also is well developed at this time, and a fight-or-flight reaction is observed in response to the catecholamines released in response to stress (AAP & Canadian Paediatric Society, 2000; Walden & Franck, 2003).

The physiologic response to pain in neonates can be life threatening. Pain response can decrease tidal volume, increase demands on the cardiovascular system, increase metabolism, and cause neuroendocrine imbalance. The hormonal-metabolic response to pain in a term infant has greater magnitude and shorter duration than that in adults. The newborn’s sympathetic response to pain is less mature and therefore less predictable than an adult’s.

**Care of the newly circumcised infant.** Bleeding is the most common complication of circumcision (AAP Task Force on Circumcision, 1999). The nurse checks the infant hourly for the 12 hours after the procedure to make sure no bleeding is occurring and that voiding is normal. If bleeding is noted from the circumcision, the nurse applies gentle pressure to the site of bleeding with a folded sterile gauze square; absorbable gelatin sponge (Gelfoam) powder or sponge may be applied to stop bleeding. If bleeding is not easily controlled, a blood vessel may require ligation. In this event, one nurse notifies the physician and prepares the necessary equipment (circumcision tray and suture material), while another nurse maintains intermittent pressure until the physician arrives. If the parents take the baby home before the end of the 12-hour observation period, they must be instructed about postcircumcision care and when to notify the physician (Teaching Guidelines box). Before the infant is discharged, the nurse checks to see that the parents have the physician’s telephone number.

If the PlastiBell technique was used, the parents are instructed to observe the position of the plastic ring on the glans; it should remain on the glans (not on the shaft of the penis) and should fall off within 5 to 7 days. No petrolatum is used in caring for the penis circumcised with the PlastiBell technique. Otherwise, care is the same as for the other types of circumcision.

**Fig. 19-22** Circumcision by using Hollister PlastiBell. **A,** Suture around rim of PlastiBell controls bleeding. **B,** Plastic rim and suture drop off in 7 to 10 days. (Permission to use and/or reproduce this copyrighted material has been granted by the owner, Hollister, Inc., Libertyville, IL.)
TEACHING GUIDELINES
Care of the Circumcised Newborn at Home

- Wash hands before touching the newly circumcised penis.
- Check for bleeding
- Check circumcision for bleeding with each diaper change.
- If bleeding occurs, apply gentle pressure with a folded sterile gauze square. If bleeding does not stop with pressure, notify primary health care provider.
- Observe for urination
- Check to see that the infant urinates after being circumcised.
- Infant should have a wet diaper 6 to 10 times per 24 hours.
- Keep area clean
- Change diaper and inspect circumcision at least every 4 hours.
- Wash penis gently with warm water to remove urine and feces. Apply petrolatum to the glans with each diaper change (omit petrolatum if PlastiBell was used).
- Fanfold diaper to prevent pressure on the circumcised area.
- Check for infection
- Glans penis is dark red after circumcision, then becomes covered with yellow exudate in 24 hours. This is normal and will persist for 2 to 3 days. Do not attempt to remove it.
- Redness, swelling, or discharge indicates infection. Notify primary health care provider if you think the circumcision area is infected.
- Provide comfort
- Circumcision is painful. Handle the area gently.
- Provide extra holding, feeding, and opportunities for non-nutritive sucking for a day or two.

Assessment. Pain can be assessed in behavioral, physiologic or autonomic, and metabolic categories (Walden & Franck, 2003).

Behavioral responses. The most common behavioral sign of pain is a vocalization or crying, ranging from a whimper to a distinctive high-pitched, shrill cry. Facial expressions of pain include grimacing, eye squeeze, brow contraction, deepened nasolabial furrows, a taut and quivering tongue, and open mouth. The infant will flex and adduct the upper body and lower limbs in an attempt to withdraw from the painful stimulus (Clifford et al., 2004). The preterms infant has a lower threshold for initiation of this flex response. An infant who receives a muscle-paralyzing agent such as a vecuronium will be unable to mount a behavioral or visible pain response. Significant changes in heart rate, BP (increased or decreased), intracranial pressure, vagal tone, respiratory rate, and oxygen saturation occur during noxious stimulation (Walden & Franck, 2003). Physiologic or autonomic responses. Infants release epinephrine, norepinephrine, glucagon, corticosterone, cortisol, 11-deoxycorticosterone, lactate, pyruvate, and glucose (Walden & Franck, 2003).

In assessing pain, the care provider needs to consider the health of the neonate, the type and duration of the painful stimulus, environmental factors, and the infant’s state of alertness. For example, severely compromised neonates may be unable to generate a pain response, although they are, in fact, experiencing pain. Every patient should have an initial pain assessment as well as a pain management plan; this includes newborns. The National Association of Neonatal Nurses (NANN) (1999) developed practice guidelines stating that all nurses who care for newborns should have education and competency validation in pain assessment. Pain should be assessed and documented on a regular basis.

Several pain assessment tools have been developed for use with neonates. A combination of behavioral and physiologic indicators of pain are used to diagnose and differentiate infant pain levels. Tools that have been shown to have validity and reliability include the Neonatal Infant Pain Scale (NIPS) (Lawrence et al., 1993) and the Premature Infant Pain Profile (PIPP) (Stevens, Johnston, Petryshen, & Taddio, 1996). A pain assessment tool used by nurses in the NICU is the CRIES (Krechel & Bildner, 1995) (Table 19-3). This tool was developed for use by nurses who work with preterms and term infants. CRIES is an acronym for the physiologic and behavioral indicators of pain used in the tool: crying, requiring increased oxygen, increased vital signs, expression, and sleeplessness. Each indicator is scored from 0 to 2. The total possible pain score, which represents the worst pain, is 10. A pain score greater than 4 should be considered significant. This tool can be used on infants between ages 32 weeks of gestation and 20 weeks after birth (Paseiro, 2002).

Management of neonatal pain. The goals of the management of neonatal pain are to (1) minimize the intensity, duration, and physiologic cost of the pain; and (2) maximize the neonate’s ability to cope with and recover from the pain (Walden & Franck, 2003). Nonpharmacologic and pharmacologic strategies are used.

Nonpharmacologic management. Containment, also known as swaddling, is effective in reducing excessive immature motor responses. This may provide comfort through other senses, such as thermal, tactile, and proprioceptive senses. Nonnutritive sucking on a pacifier, with or without sucrose, is a common comfort measure used with newborns. Skin-to-skin contact with the mother during a painful procedure can help to reduce pain. Combining these nonpharmacologic methods results in greater pain reduction. Distraction with visual, oral, auditory, or tactile stimulation...
Pharmacologic management

Pharmacologic agents are used to alleviate pain in neonates related to procedures. Local anesthesia has become routine during procedures such as chest tube insertion and circumcision. Topical anesthesia has been used for circumcision, lumbar puncture, venipuncture, and heel sticks. Nonopioid analgesia (acetaminophen) is effective for mild to moderate pain from inflammatory conditions. Morphine and fentanyl are the most widely used opioid analgesics for pharmacologic management of neonatal pain. Continuous or bolus intravenous infusion of opioids provides effective and safe pain control (AAP Committee on Fetus and Newborn, 2000). Ketorolac (Toradol) has been shown to be effective in the management of postoperative neonatal pain (Bund & Tobias, 2002). Postoperative neonatal pain should be managed with around-the-clock dosing or use of a continual drip. Dosing as needed (prn) is not considered to be an effective management of chronic or postoperative pain (Hummel & Puchalski, 2001). Traditional belief holds that the continued use of opioids for neonates in the postoperative period results in prolonged intubation. Consequently, traditional practice is to discontinue all opioids several hours before and after extubation, preventing pain relief. Furdon and colleagues (1998) found that continuous opioid infusion in infants without an underlying pulmonary or neurologic pathologic condition actually shortened the time to extubation and caused no problems of respiratory depression that required reintubation.

**TABLE 19-3**

**CRIES Neonatal Postoperative Pain Scale**

<table>
<thead>
<tr>
<th>Description</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crying</td>
<td>No</td>
<td>High pitched</td>
<td>Inconsolable</td>
</tr>
<tr>
<td>Requires O₂ for saturation &gt; 95%</td>
<td>No</td>
<td>&lt;30%</td>
<td>&gt;30%</td>
</tr>
<tr>
<td>Increased vital signs</td>
<td>Heart rate and blood pressure equal to or less than preoperative state</td>
<td>Heart rate and blood pressure &lt; 20% of preoperative state</td>
<td>Heart rate and blood pressure &gt; 20% of preoperative state</td>
</tr>
<tr>
<td>Expression</td>
<td>None</td>
<td>Grimace</td>
<td>Wakes at frequent intervals</td>
</tr>
<tr>
<td>Sleepless</td>
<td>No</td>
<td>Grimace</td>
<td>Constantly awake</td>
</tr>
</tbody>
</table>

**CODING TIPS FOR USING CRIES**

**Crying**
- The characteristic cry of pain is high pitched.
- If no cry or cry that is not high pitched, score 0.
- If cry is high pitched and infant is easily consolable, score 1.
- If cry is high pitched and infant is inconsolable, score 2.

**Requires O₂ for saturation > 95%**
- Look for changes in oxygenation. Infants experiencing pain manifest decreases in oxygenation as measured by IC0₂ or oxygen saturation. (Consider other causes of changes in oxygenation, such as atelectasis, pneumothorax, oversedation.)
- If no oxygen is required, score 0.
- If >30% O₂ is required, score 1.
- If >30% O₂ is required, score 2.

**Increased vital signs**
- Note: Measure blood pressure last because this may wake child, causing difficulty with other assessments. Use baseline preoperative parameters from a nonstressed period.
- Multiply baseline heart rate (HR) × 0.2, then add this to baseline HR to determine the HR that is 20% over baseline. Do likewise for blood pressure (BP). Use mean BP.
- If HR and BP are both unchanged or less than baseline, score 0.
- If HR or BP is increased but increase is <20% of baseline, score 1.
- If either one is increased >20% over baseline, score 2.

**Expression**
- The facial expression most often associated with pain is a grimace. This may be characterized by brow lowering, eyes squeezed shut, deepening of the nasolabial furrow, open lips and mouth.
- If no grimace is present, score 0.
- If grimace alone is present, score 1.
- If grimace and noncry vocalization grunt is present, score 2.

**Sleepless**
- This is scored based on the infant’s state during the hour preceding this recorded score.
- If the child has been continuously asleep, score 0.
- If he or she has awakened at frequent intervals, score 1.
- If he or she has been awake constantly, score 2.

The following topics should be reviewed:

- Temperature
- Feedings
- Nutrition
- Urinary output
- Respirations
- Fever
- Hyperbilirubinemia
- Other signs of distress

Evaluation

Evaluation is based on the expected outcomes of care. The plan is revised as needed, based on the evaluation findings.

Infant care activities can cause much anxiety for the new parent (see Plan of Care). Support from nursing staff members can be an important factor in determining whether new mothers seek and accept help in the future. Whether this is the woman’s or couple’s first newborn or an adolescent whose mother will be the primary caregiver, and whether or not the parents attended childbirth preparation classes, parents appreciate anticipatory guidance in the care of their infant. The nurse should not try to cover all the content at one time because the parents can be overwhelmed by too much information and become anxious. However, because early discharge of new mothers is currently common practice, it may be a problem for the nurse to teach all the content in one visit. As a result, many institutions have developed home visitation programs that take the necessary teaching to the new parents, although the hospital nurse still provides most of the essential information for newborn care (see Community Activity box).

To set priorities for teaching, the nurse follows parental cues. Deficient knowledge should be identified before the nurse begins to teach. The nurse can use a tool such as the Infant Teaching/Discharge Record (Fig. 19-23) to identify parental needs. Normal growth and development and the changing needs of the infant (e.g., for stimulation, exercise, and social contacts), as well as the topics that follow, should be included during discharge planning with parents.

Temperature

The following topics should be reviewed:

- Ways to promote normal body temperature, such as dressing the infant appropriately for the environmental air temperature and protecting the infant from exposure to direct sunlight
- Use of warm wraps or extra blankets in cold weather
- Technique for taking the newborn’s axillary temperature

Respirations

Review the following points:

- Normal variations in the rate and rhythm
- Reflexes such as sneezing to clear the airway
- Need to protect the infant from the following:
  - Exposure to people with upper respiratory tract infections and respiratory syncytial virus (RSV)
  - Exposure to second-hand tobacco smoke
  - Suffocation from loose bedding, water beds, and beanbag chairs; drowning (in bath water); entrapment under excessive bedding or in soft bedding; anything tied around the infant’s neck; poorly constructed playpens, bassinets, or cribs
- Sleep position—on back when put to sleep
- Aspiration pneumonia; symptoms of the common cold
- A commonly aspirated substance is baby powder, which usually is a mixture of talc (hydrous magnesium silicate) and other silicates. Parents are advised that, if they prefer to use a powder, a cornstarch preparation can be substituted. Whenever a powder is used, it should be placed in the caregiver’s hand and then applied to the skin, never sprinkled directly onto the skin.
- Symptoms of the common cold include nasal congestion and excess drainage of mucus, coughing, sneezing, difficulty in swallowing or breathing, decreased vigor in feeding, and low-grade fever. Advise the parents on measures to help the infant, such as the following:
  - Feeding smaller amounts more often to prevent overtiring the infant
  - Holding the baby in an upright position to feed
  - For sleeping, raising the infant’s head and chest by raising the mattress 30 degrees (do not use pillow)
  - Avoiding drafts; not overdressing the baby
  - Using only medications prescribed by a physician
  - Using nasal saline drops in each nostril and sucking mucus into the infant’s mouth
  - Avoiding drafts; not overdressing the baby
  - Using only medications prescribed by a physician
  - Using nasal saline drops in each nostril and sucking mucus into the infant’s mouth

Feeding Schedules

Feeding practices and schedules for newborns are discussed in Chapter 20.

Elimination

A review includes the following reminders:

- Color of normal urine and number of voidings (6 to 8) to expect each day
- Changes to be expected in the color of the stool (i.e., meconium to transitional to soft yellow or golden
### Infant Teaching/Discharge Record

Our nursing staff wish to give you the information you want and need most during your stay with us. Please look over the following list of educational topics and complete the form by putting a check in the column that most applies to you, using the following scale:

1 = Most important to learn before I go home    2 = I would like to review    3 = I already know or am comfortable with

<table>
<thead>
<tr>
<th><strong>BABY CARE</strong></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crying as Communication</td>
<td>Hunger, pain from not burping or gas, need for diaper change, too warm, too cold</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microtrials and Smooching</td>
<td>Normal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bath Sponge/Tub</td>
<td>Bath as needed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soaps</td>
<td>Mild (Evel, Neutrogena, baby care products)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nail Care</td>
<td>Emery board</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cord Care</td>
<td>Keep dry. Fold diaper below cord. Cord falls off 1–2 weeks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin Care/Draper Rash</td>
<td>Air dry, zinc oxide. Call advice if no improvement in 2 days.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diaper Change</td>
<td>Wash girls front to back</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Umbilicus</td>
<td>Vaginal care—white or pink discharge, cheesy material, normal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumcision Care</td>
<td>Remove Vaseline gauze after 4′ if present. Vaseline applied to diaper as needed for 24′</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unencircumized Baby Care</td>
<td>No need to retract foreskin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elimination</td>
<td>Meconium first, then seedy soft yellow. Urinates 6–8 times/day.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axillary Temperature</td>
<td>Normal axillary temp. 97.6° F. Call advice if over 100° F.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positioning</td>
<td>Side or back, NOT STOMACH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulb Syringe/Choking</td>
<td>Keep within reach/use to clear nose and mouth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handwashing</td>
<td>Viruses and bacteria easily transmitted through hands. Wash frequently.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td>Smoke free, smoke detector.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car Seat</td>
<td>Calif. Vehicle Code #27365.5. Follow manufacturer’s directions for installation.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Breastfeeding

- **Breastfeeding:** Demand feed, usually every 1½–3 hours around the clock. Be flexible.
- **Positioning Mom/Baby:**
  - Frequency: 8–12 times in 24 hours.
  - Duration: 10–15 minutes of feed followed by each breast each feeding.
- **Frequency & Lengths of Care of Breasts/Nipples:**
  - Breast engorgement: Hot soaks or hot showers, hand express, frequent nursing.
- **Supplements:** Not necessary.

### Bottle Feeding

- **Bottle Feeding:** Demand feed, usually every 3–4 hours. Be sure tongue is under nipple.
- **Frequency & Lengths of Formula Preparation:**
  - No need to sterilize.
  - May use tap or bottled water to mix formula.
  - Refrigerate extra feeding in quantities taken per feeding.
  - Do not microwave formula.
  - Do not prop bottle.

### Seek Medical Advice for the Following:

- Redness, discharge or foul odor from circumcision or umbilical cord.
- Less than 4 wet diapers/day by 4 days old.
- Less than 6–8 wet diapers/day by 6 days old.
- Frequent, explosive, watery stools that soak through the diaper.
- Axillary temperature of less than 97.4° F or greater than 100° F.
- Poor feeding, weak suck, no interest in eating.
- Yellow coloring of skin (jaundice) or whites of eyes.
- Vomiting forcefully several times (not just spitting up).
- Very irritable or excessive sleepiness.

Special instructions or comments:

- Home Health referral:
- Mother verbalizes understanding of discharge instructions.

### Signature

I acknowledge receipt of my baby and have received educational instructions and materials.

---

**Fig. 19-23** Infant Teaching/Discharge Record. (Courtesy Kaiser Permanente, Redwood City, CA.)
yellow) and the number of bowel evacuations, plus the odor of stools for breastfed or bottle-fed infants (see Chapter 20)

- Expected pattern of stools in formula-fed infants may be as few as one stool every other day after first few weeks of life

**Positioning and Holding**

The AAP Task Force on Infant Sleep Position and Sudden Infant Death Syndrome (2000), recommends placing the infant in the supine position during the first few months of life to prevent sudden infant death syndrome (SIDS). The prone position has been associated with an increased incidence of SIDS. Death rates from SIDS have decreased by more than 40% in the United States since the original sleep position statement recommending supine sleeping for all newborns was made in 1992.

Anatomically, the infant’s shape—a barrel chest and flat, curveless spine—makes it easy for the infant to roll from the side to the prone position; therefore the side-lying position for sleep is not recommended. Care must also be taken to prevent the infant from rolling off flat, unguarded surfaces. When an infant is on such a surface, the parent or nurse who must turn away from the infant even for a moment should always keep one hand placed securely on the infant. The infant is always held securely with the head supported because newborns are unable to maintain an erect head posture for more than a few moments. Fig. 19-24 illustrates various positions for holding an infant with adequate support.

**Rashes**

**Diaper rash**

The warm, moist atmosphere in the diaper area provides an optimal environment for *Candida albicans* growth; dermatitis
appears in the perianal area, inguinal folds, and lower abdomen. The affected area is intensely erythematous with a sharply demarcated, scalloped edge, often with numerous satellite lesions that extend beyond the larger lesion. The usual source of infection is from handling by persons who do not practice adequate handwashing. It may also appear 2 to 3 days after an oral infection (thrush).

Therapy consists of applications of an antifungal ointment, such as clotrimazole or miconazole, with each diaper change. Sometimes the infant also is given an oral antifungal preparation such as nystatin or fluconazole to eliminate any gastrointestinal source of infection.

Washing and drying the wet and soiled area and changing the diaper immediately after voiding or stooling will prevent and help treat diaper rash. Parents can be taught to expose the buttocks to air to help dry up diaper rash. Because bacteria thrive in moist dark areas, exposing the skin to dry air decreases bacterial proliferation. A skin barrier ointment such as zinc oxide may be effective in preventing further excoriation, especially in the presence of loose stools or systemic gastrointestinal candidiasis; the latter will require treatment with a systemic antifungal drug.

Other rashes
A rash on the cheeks may result from the infant’s scratching with long unclipped fingernails or from rubbing the face against the crib sheets, particularly if regurgitated stomach contents are not washed off promptly. The newborn’s skin begins a natural process of peeling and sloughing after birth. Dry skin may be treated with a neutral pH lotion, but this should be used sparingly. Newborn rash, erythema toxicum, is a common finding (see Chapter 18) and needs no treatment.

Nail Care
Fingernails and toenails should not be cut immediately after birth, but should be allowed to grow out far enough to avoid cutting the attached skin. If needed, the infant’s hands can be covered with loose-fitting mittens to prevent scratching the face. However, this should be avoided if possible, because mittens inhibit the infant from sucking on fingers for self-consolation. Nails can be safely trimmed with manicure scissors or infant nail clippers, cutting nails straight across. Emery boards can be used to file nails. Nail care is most easily accomplished after bathing, when the nails are soft; or when the infant is sleeping.

Clothing
Parents commonly ask how warmly they should dress their infant. A simple rule of thumb is to dress the child as they dress themselves, adding or subtracting clothes and wraps for the child as necessary. A cotton shirt and diaper may be sufficient clothing for the young infant. A cap or bonnet is needed to protect the scalp and minimize heat loss if the weather is cool, or to protect against sunburn and shade the eyes if it is sunny and hot. Wrapping the infant snugly in a blanket maintains body temperature and promotes a feeling of security. Overdressing in warm temperatures can cause discomfort, as can underdressing in cold weather. Parents are encouraged to dress the infant at all times in flame-retardant clothing. Infant sunglasses are available to protect the infant’s eyes when outdoors.

Infants have sensitive skin; therefore new clothes should be washed before putting them on the infant. Baby clothes should be washed separately with a mild detergent and hot water. A double rinse usually removes traces of the potentially irritating cleansing agent or acid residue from urine or stool. If possible, the clothing and bed linens are dried in the sun to neutralize residue. Parents who have to use coin-operated machines in commercial laundries to wash and dry clothes may find it expensive or impossible to wash and rinse the baby’s clothes well.

Bedding requires frequent changing. The top of a plastic-coated mattress should be washed frequently, and the crib or bassinet should be dusted with a damp cloth. The infant’s toilet articles may be kept convenient for use in a box, basket, or plastic carrier.

Sleeping
Since 1992, the AAP has recommended that infants be placed on their backs to sleep. This supine position is associated with a decreased risk of SIDS. Loose bedding should be kept away from the infant’s face and head to avoid the risk of suffocation (Pollack & Frohna, 2002).

Safety: Use of Car Seat
Infants should travel only in federally approved, rear-facing safety seats that meet Federal Motor Vehicle Safety Standard (FMVSS) 213 and that are secured in the rear seat (Fig. 19-25). Parents should bring the car seat to the hospital before discharge for training on positioning and securing the infant as well as proper installation of the car seat. Many hospitals have staff that are specially trained and certified in car seat safety; parents can also check with local fire, police, or highway patrol agencies for assistance with proper installation of car seats.
Critical Thinking Exercise

Sudden Infant Death Syndrome and Infant Sleep Position

Maryly said that she had noticed that the nurses were placing infant in the nursery on his abdomen to sleep. Michelle was instructed to place Michael on this back to sleep. Michelle asked why she had to place Michael on his back when he was used to sleeping on his abdomen. How should the nurses respond to these questions?

1. Evidence—Is there sufficient evidence to draw conclusions about the safety and efficacy of the supine position for sleep in reducing the incidence of sudden infant death syndrome (SIDS)?

2. Assumptions—What assumptions can be made about the following factors related to infant positioning?
   a. Role modeling by nurses
   b. Sleep position in the nursery versus sleep position at home
   c. Sleep position for preterm versus term infants
   d. Nurses’ knowledge and use of research evidence

3. What implications and priorities for nursing care can be drawn at this time?

4. Does the evidence objectively support your conclusion?

5. Are there alternative perspectives to your conclusion?

The safest area of the car is the back seat. A car seat that faces the rear gives the best protection for the disproportionately weak neck and head of an infant. In this position, the force of a frontal crash is spread over the head, neck, and back; the back of the car seat supports the spine.

NURSE ALERT Infants should use a rear-facing car seat from birth to 20 pounds and to 1 year of age. If the infant reaches the weight limit before the first birthday, the rear-facing position should still be used. In cars equipped with air bags, rear-facing infant seats must not be placed in the front seat. Serious injury may occur if the air bag inflates because these types of infant seats fit closer to the dashboard.

The car seat is secured using the vehicle seat belt; the infant is secured using the harness system in the car seat. If the infant must ride in the front seat, the air bag must be turned off to prevent injury from the air bag (AAP Committee on Injury and Poison Prevention, 2002).

Infants are positioned at a 45-degree angle in a car seat to prevent slumping and subsequent airway obstruction. Many seats allow for adjustment of seat angle. For seats that are not adjustable, a tightly rolled newspaper, a solid-core Styrofoam roll, or a firm roll of fabric can be placed under the car safety seat to place the infant at a 45-degree angle (AAP Committee on Injury and Poison Prevention, 2002).

Nonnutritive Sucking

Sucking is the infant’s chief pleasure. However, sucking needs may not be satisfied by breastfeeding or bottle-feeding alone. In fact, sucking is such a strong need that infants who are deprived of sucking, such as those with a cleft lip, will suck on their tongues. Some newborns are born with sucking pads on their tongues that developed during intrauterine sucking. The newborn is able to maintain an organized state, and decreased crying.

Problems arise when parents are concerned about the sucking of fingers, thumb, or pacifier and try to restrain this natural tendency. Before giving advice, nurses should investigate the parents’ feelings and base the guidance they give on the information solicited. For example, some parents may see no problem with the use of a finger but may find the use of a pacifier objectionable. In general, there is no need to restrain either practice, unless thumb sucking persists past 4 years of age or past the time when the permanent teeth erupt. Parents are advised to consult with their pediatrician, pediatric dentist, or pediatric nurse practitioner about this topic.

If parents choose to let their child use a pacifier, they need to be aware of certain safety considerations before purchasing one. A homemade or poorly designed pacifier can be dangerous because the entire object may be aspirated if it is small, or a portion may become lodged in the pharynx. Improvised pacifiers, such as those commonly made in hospitals from a padded nipple, also pose dangers because the nipple may separate from the plastic collar and be aspirated. Safe pacifiers are made of one piece that includes a shield or flange large enough to prevent entry into the mouth and a handle that can be grasped (Fig. 19-26).

Sponge Bathing, Cord Care, and Skin Care

Bathing serves a number of purposes. It provides opportunities for (1) completely cleansing the infant, (2) observing...
often for signs of infection (e.g., foul odor, redness, and purulent discharge), granuloma (i.e., small, red, raw-appearing polyp where the umbilical cord separates), bleeding, and discharge. The cord clamp is removed when the cord is dry, in about 24 to 36 hours (see Fig. 19-5). The cord normally falls off in 10 to 14 days after birth but may remain attached for as long as 3 weeks in some cases.

Parents are instructed in appropriate home cord care (per practitioner or institution protocol) and the expected time of cord separation.

The Teaching Guidelines box contains information regarding sponge bathing, skin care, cord care, cutting nails, and dressing the infant.

### Infant Follow-up Care

With shorter hospital stays, the focus and site of infant care are changing. Home care may be provided either by a nurse as part of the routine follow-up care of patients, or through a visiting nurse or community health nurse referral service. For infants discharged early, newborn home care is essential (Teaching Guidelines box) (see also Chapter 3).

Parents should plan for their infant’s follow-up health care at the following ages: within 3 days if early discharge to check for status of jaundice, feeding, and elimination (see also Physiologic Jaundice, pp. 542 to 543 for follow-up guidelines); 2 to 4 weeks of age; then every 2 months until 6 to 7 months of age; then every 3 months until 18 months; at 2 years; at 3 years; at preschool; and every 2 years thereafter.

### Immunizations

The schedule for immunizations should be reviewed with the parents. Hepatitis B vaccine is currently administered to newborns before hospital discharge (depending on maternal hepatitis B status) with parental permission.

### Cardiopulmonary resuscitation

All personnel working with infants must have current infant cardiopulmonary resuscitation (CPR) certification. Parents should receive instruction in relieving airway obstruction (Emergency box) and CPR (Emergency box). Often classes are offered in hospitals and clinics during the prenatal period or to parents of newborns. Such instruction is especially important for parents whose infants were preterm or had cardiac or respiratory problems. Babysitters also should learn CPR.

### COMMUNITY ACTIVITY

Investigate infant car seat safety laws in your state. Find out age and weight guidelines for the various types of safety seats. Where can parents go to have their infant car seats checked for proper installation? Are there programs in your community to provide car seats for low-income families? What are hospitals in your area doing to promote infant safety?
Fit baths into family’s schedule
• Give a bath at any time convenient to you but not immediately after a feeding period because the increased handling may cause regurgitation.

Prevent heat loss
• The temperature of the room should be 24°C (75°F), and the bathing area should be free of drafts.
• Control heat loss during the bath to conserve the infant’s energy. Bathing the infant quickly, exposing only a portion of the body at a time, and drying thoroughly are all parts of the bathing technique.

Gather supplies and clothing before starting
• Clothing suitable for wearing indoors: diaper, shirt, stretch suit or nightgown optional
• Unscented, mild soap
• Pins, if needed for diaper, closed and placed well out of baby’s reach
• Towels for drying infant and a clean washcloth
• Cotton balls

Bathe the baby
• Bring infant to bathing area when all supplies are ready.
• Never leave the infant alone on bath table or in bath water, not even for a second! If you have to leave, take the infant with you or put back into crib.
• Test temperature of the water. It should feel pleasantly warm to the inner wrist—36.6°C to 37.2°C (98°F to 99°F). Do not hold infant under running water—water temperature may change, and infant may be scalded or chilled rapidly. Baby may be tub bathed after the cord drops off.
• Do not use detergent. Water temperature may change, and infant may be scalded or chilled rapidly. Baby may be tub bathed after the cord drops off.
• Do not hold infant under running water—water temperature may change, and infant may be scalded or chilled rapidly. Baby may be tub bathed after the cord drops off.
• If sponge bathing is to be done, undress the baby and wrap in a towel with the head exposed. Uncover the parts of the body you are washing, taking care to keep the rest of the baby covered as much as possible to prevent heat loss.
• Begin by washing the face with water; do not use soap on the face. Cleanse the eyes from the inner canthus out- ward, using separate parts of a clean washcloth for each eye. For the first 2 to 3 days, a discharge may result from the reaction of the conjunctiva to the substance (erythromycin) used as a prophylactic measure against infec- tion. Any discharge should be considered abnormal and reported to the health care provider.
• Cleanse ears and nose with twists of moistened cotton or a corner of the washcloth. Do not use cotton-tipped swabs because they may cause injury. The areas behind the ears need daily cleansing.
• Wash the body with mild soap; rinse and dry to decrease heat loss. Place your hand under the shoulders and lift gently to expose the neck, lift the chin, and wash the neck, taking care to cleanse between the skin folds. Wash be- tween the fingers and toes, rinse and dry thoroughly. Wash the genital area last.

Sponge bathing
Wash the face with water; do not use soap on the face. Cleanse the eyes from the inner canthus out- ward, using separate parts of a clean washcloth for each eye. For the first 2 to 3 days, a discharge may result from the reaction of the conjunctiva to the substance (erythromycin) used as a prophylactic measure against infec- tion. Any discharge should be considered abnormal and reported to the health care provider.

Skin care
• The skin of a newborn is sensitive and should be cleaned only with water between baths. Soap is drying and its use is limited to bathing. Creams, lotions, ointments, or powders are not recommended. If the skin seems ex- cessively dry during the first 2 to 3 weeks after birth, an unscented, non–alcohol-based lotion may be used; it is best to check with the health care provider for sugges- tions on skin care products. It may be advisable to laun- der baby clothes separately, using a mild laundry de- tergent (Dreft or Ivory Snow); clothes should be rinsed twice with plain water.
• The fragile skin can be injured by too vigorous cleans- ing. If stool or other debris has dried and caked on the skin, soak the area to remove it. Do not attempt to rub it off, because abrasion may result. Gentleness, patting dry rather than rubbing, and use of a mild soap without perfumes or coloring are recommended. Chemicals in the coloring and perfume can cause rashes on sensitive skin.
• Babies are very prone to sunburn and should be kept out of direct sunlight. Use of sunscreen should be discussed with the health care provider.
• Babies often develop rashes that are normal. Neonatal acne resembles pimples and may appear at 2 to 4 weeks of age, resolving without treatment by 6 to 8 months. Heat rash is common in warm weather; this appears as a fine red rash around creases or folds where the baby sweats.

Wash hair with baby wrapped to limit heat loss. (Courtesy Marjorie Pyle, RNC, Lifecircle, Costa Mesa, CA.)
CARE OF THE CORD
• Cleanse around base of the cord where it joins the skin
with soap and water. If the use of alcohol on the cord is
suggested, use cotton-tipped swabs dipped in alcohol to
 cleanse the cord at the base where the cord meets the
skin; this should be done with each diaper change. No-
tify the health care provider of any odor, discharge, or skin
inflammation around the cord. The clamp is removed
when the cord is dry (approximately 24 hr). The diaper
should not cover the cord because a wet or soiled diaper
will slow or prevent drying of the cord and foster infec-
tion. When the cord drops off after a 10 to 14 days, small
drops of blood may be seen when the baby cries. This will
heal by itself. It is not dangerous.

NAIL CARE
• Do not cut fingernails and toenails immediately after birth.
The nails have to grow out far enough from the skin so
that the skin is not cut by mistake. If the baby scratches
himself or herself, apply loosely fitted mitts over each of
the baby’s hands. Do so as a last resort, however, because
it interferes with the baby’s ability for self-consolation
sucking on thumb or finger. When the nails have grown,
the fingernails and toenails can be trimmed with mani-
cure scissors or clippers; nails should be cut straight
across. Soft emery boards may be used to file the nails.
Nails should be kept short.

CLEANSE GENITALS
• Cleanse the genitals of infants daily and after voiding or
defecating. For girls the genitals may be cleansed by sep-
arating the labia and gently washing from the pubic area
to the anus. For uncircumcised boys, gently pull back (re-
tract) the foreskin. Stop when resistance is felt. Wash and
rinse the tip (glans) with soap and warm water, and replace
the foreskin. The foreskin must be returned to its original po-
sition to prevent constriction and swelling. In most new-
borns, the inner layer of the foreskin adheres to the glans,
and the foreskin cannot be retracted. By age 3 years in 90%
of boys, the foreskin can be retracted easily without caus-
ing pain or trauma. For others, the foreskin is not retractable
until adolescence. As soon as the foreskin is partly re-
tractable and the child is old enough, he can be taught self-
care. Once healed, the circumcised penis does not require
any special care other than cleansing with diaper changes.

Sponge Bathing
- Wet diapers: 6 to 8 per day
- Breastfeeding: successful latch-on and feeding every 1.5
to 3 hours daily
- Formula-feeding: successfully, voiding as noted above,
taking approximately 3 to 4 ounces every 3 to 4 hours daily
- Circumcision: wash with warm water only; yellow exu-
date forming, nonbleeding, PlastiBell intact for 48 hours
- Stools: at least one every 48 hours (bottle-feeding) or two
to three per day (breastfeeding)
- Color: pink to ruddy when crying; pink centrally when at
rest or asleep
- Activity: has four or five wakeful periods per day and
alerts to environmental sounds and voices
- Jaundice: physiologic jaundice (not appearing in first 24
hours), feeding, voiding, and stooling as noted above, or
practitioner notification for suspicion of pathologic jaundice (appears within 24 hours of birth, ABO/Rh prob-
lem suspected; hemolysis); decreased activity; poor feed-
ing; dark orange skin color persisting beyond fifth day in
light-skinned newborn
- Cord: kept above diaper line; drying; periumbilical area
skin pink (erythematous circle at umbilical site may be
sign of omphalitis)
- Vital signs: heart rate 120 to 140 beats/min at rest; respi-
ratory rate 30 to 60 breaths/min at rest without evidence
of retractions, grunting, or nasal flaring; temperature 36.5°
to 37.2°C axillary
- Position of sleep: back

*Any deviation from the above or suspicion of poor newborn adaptation should be reported to the practitioner at once.
Relieving Airway Obstruction

- Back blow and chest thrusts are used to clear an airway obstructed by a foreign body.

**BACK BLOWS**
- Position the infant prone over forearm with the head down and the infant’s jaw firmly supported.
- Rest the supporting arm on the thigh.
- Deliver four back blows forcefully between the infant’s shoulder blades with the heel of the free hand.

**TURN INFANT**
- Place the free hand on the infant’s back to sandwich the baby between both hands; one hand supports the neck, jaw, and chest, while the other supports the back.
- Turn the infant over, and place the head lower than the chest, supporting the head and neck.
- Alternative position: Place the infant face down on your lap with the head lower than the trunk; firmly support the head. Apply back blows, and then turn the infant as a unit.

**CHEST THRUSTS**
- Provide four downward chest thrusts on the lower third of the sternum.
- Remove foreign body, if it is visible.

**OPEN AIRWAY**
- Open airway with the head tilt–chin lift maneuver, and attempt to ventilate.
- Repeat the sequence of back blows, turning, and chest thrusts.
- Continue these emergency procedures until signs of recovery occur:
  - Palpable peripheral pulses return.
  - The pupils become normal in size and are responsive to light.
  - Mottling and cyanosis disappear.
- Record the time and duration of the procedure and the effects of this intervention.

Cardiopulmonary Resuscitation (CPR)

- Wash hands before and after touching infant and equipment. Wear gloves, if possible.

**ASSESS RESPONSIVENESS**
- Observe color; tap or gently shake shoulders.
- Yell for help; if alone, perform CPR for 1 min before calling for help again.

**POSITION INFANT**
- Turn the infant onto back, supporting the head and neck.
- Place the infant on firm, flat surface.

**AIRWAY**
- Open the airway with the head tilt–chin lift method.
- Place one hand on the infant’s forehead, and tilt the head back.
- Place the fingers of other hand under the bone of the lower jaw at the chin.

**BREATHING**
- Assess for evidence of breathing:
  - Observe for chest movement.
  - Listen for exhaled air.
  - Feel for exhaled air flow.
- To breathe for infant:
  - Take a breath.
  - Place mouth over the infant’s nose and mouth to create a seal. Note: When available, a mask with a one-way valve should be used.
  - Give two slow breaths (1 to 1.5 sec/breath), pausing to inhale between breaths. Note: Gently puff the volume of air in your cheeks into infant. Do not force air.
  - The infant’s chest should rise slightly with each puff; keep fingers on the chest wall to sense air entry.

**CIRCULATION**
- Assess circulation:
  - Check pulse of the brachial artery while maintaining the head tilt.
  - If the pulse is present, initiate rescue breathing. Continue doing once every 3 sec or 20 times/min until spontaneous breathing resumes.
  - If the pulse is absent, initiate chest compressions and coordinate them with breathing.
- Chest compression
  - There are two systems of chest compression. Nurses should know both methods.
  - Maintain the head tilt and
    1. Place thumbs side-by-side in the middle third of the sternum with fingers around the chest and supporting the back.
    2. Compress the sternum 1.25 to 2 cm.
  - Place index finger of hand just under an imaginary line drawn between the nipples. Place the middle and ring fingers on the sternum adjacent to the index finger.
  - Using the middle and ring fingers, compress the sternum approximately 1.25 to 2.5 cm.
- Avoid compressing the xiphoid process.
- Release the pressure without moving the thumbs and fingers from the chest.
- Repeat at least 100 times/min, doing five compressions in 3 sec or less.
- Perform 10 cycles of five compressions and one ventilation.
- After the cycles, check the brachial artery to determine whether there is a pulse.
- Discontinue compressions when the infant’s spontaneous heart rate reaches or exceeds 80 beats/min.
- Record the time and duration of the procedure and the effects of intervention.

Sudden Infant Death Syndrome and Infant Sleep Position

1. Yes, there is ample evidence that the supine position for sleep reduces the incidence of sudden infant death syndrome (SIDS). The nurses should cite the evidence as well as explain that in preterm infants, use of the prone position can assist breathing in the early phases of recovery from respiratory distress. However, as the infant matures, he should be placed on his back to sleep.

2. a. Role modeling by nurses is a powerful teacher. Stastny and colleagues (2004) found that only 30% of nursery staff placed babies on their backs to sleep and cited fear of aspiration as the reason. Continued staff education is necessary to promote the use of the supine position for sleep.
   
   b. In the newborn nursery, nurses may place an infant on his or her side to promote drainage of secretions, although there is no evidence that this is effective. In the neonatal intensive care unit (NICU), infants in respiratory distress may breathe more easily in the prone position. As the distress lessens and the infant matures, the infant should be placed on his or her back for sleep. Parents should be counseled to place infants on their backs for sleep. During waking hours, while the parent is supervising, the infant can be placed on his or her side or abdomen.

3. a. Not all nurses read research reports and use research evidence in their practices. Therefore they do not place infants on their backs to sleep and do not instruct parents in sleep positioning. Continuing education programs for nurses working in nurseries should address the latest findings related to the prevention of SIDS by use of positioning infants on their backs to sleep.

3. b. The nurse needs to reinforce the importance of placing the infant on his or her back to sleep and discuss with the parents the acceptability of placing the infant on his back or abdomen while the infant is awake. The nurse can also advocate for continuing education programs for the nurses to update their clinical knowledge. Signs could be posted in the nursery to remind nurses of the correct positioning.

4. There is ample evidence of the efficacy of sleeping on the back in prevention of SIDS. There is also documentation that many nurses do not follow these recommendations. Stastny and colleagues (2004) found that Latina and Pacific Islander mothers were less likely than Caucasian mothers to be instructed in positioning the infant on his or her back to sleep.

5. b. In the newborn nursery, nurses may place an infant on his or her side to promote drainage of secretions, although there is no evidence that this is effective. In the neonatal intensive care unit (NICU), infants in respiratory distress may breathe more easily in the prone position. As the distress lessens and the infant matures, the infant should be placed on his or her back for sleep. Parents should be counseled to place infants on their backs for sleep. During waking hours, while the parent is supervising, the infant can be placed on his or her side or abdomen.

Discussion on sleep position for preterm versus term infants. Preterm infants may be placed in prone position to facilitate respiration; however, they should be on a cardiorespiratory monitor.

Answer Guidelines to Critical Thinking Exercise

Sudden Infant Death Syndrome and Infant Sleep Position

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