Newborn

R.Thomas

Apgar Scoring

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

Apgar Scoring for Newborns

TABLE 18.1 Apgar Scoring for Newborns

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

Data from Cunningham, F. G., Leveno, K. J., Bloom, S. L., Dashe, J. S., Hoffman, B. L., Casey, B. M., & Spong, C. Y. (2018). *William's obstetrics* (25th ed.). McGraw-Hill Education; Gowen, C. W. (2019). Assessment of the mother, fetus, and newborn. In K. Marcdante & R. M. Kliegman (Eds.), *Nelson essentials of pediatrics* (8th ed.). Elsevier.

Immediate Newborn Period

- Maintaining airway patency
- Ensuring proper identification
- Administering prescribed medications
  Vitamin K
  - Eye prophylaxis
- Maintaining thermoregulation

Anatomic and Physiologic Comparison of the Fetus and Newborn

TABLE 17.1 Anatomic and Physiologic Comparison of the Fetus and Newborn

Topic of Comparison	Fetus	Newborn
Respiratory system	Fluid-filled, high-pressure system causes blood to be shunted from the lungs through the ductus arteriosus to the rest of the body.	Air-filled, low-pressure system encourages blood flow through the lungs for gas exchange; increased oxygen content of blood in the lungs contributes to the closing of the ductus arteriosus (becomes a ligament).
Site of gas exchange	Placenta	Lungs
Circulation through the heart	Pressures in the right atrium are greater than in the left, encouraging blood flow through the foreman ovale.	Pressures in the left atrium are greater than in the right, causing the foreman ovale to close.
Hepatic portal circulation	Ductus venosus bypasses; maternal liver performs filtering functions.	Ductus venosus closes (becomes a ligament); hepatic portal circulation begins.
Thermoregulation	Body temperature is maintained by maternal body temperature and the warmth of the intrauterine environment.	Body temperature is maintained through a flexed posture and brown fat.

King, T. L., Brucker, M. C., Osborne, K., & Jevitt, C. M. (2019). *Varney's midwifery* (6th ed.). Jones & Bartlett Learning; Martin, G. I., & Rosenfeld, W. (2019). *Common problems in the newborn nursery: An evidence and case-based guide*. Springer Publishers; and Resnik, R., Lockwood, C. J., Moore, T. R., Greene, M. F., Copel, J. A., & Silver, R. M. (2019). *Creasy & Resnik's maternal-fetal medicine: Principles & practice*. Elsevier.

Physiological Adaptations Respiratory & Cardiovascular

- Lung fluid & surfactant

- Respiratory changes
  - Breathing
- Cardiovascular changes
  - Foramen ovale
  - Ductus venosus
  - Ductus arteriosus

S/S of Respiratory Distress

- Nasal flaring
- See saw respirations
- Chest retraction
- Grunting on exhalation
- Labored breathing
- Generalized cyanosis
- Abnormal breath sounds
- Tachypnea or bradypnea

Normal Newborn Blood Values

TABLE 17.2 Normal Newborn Blood Values

Lab Data	Normal Range
Hemoglobin	16–18 g/dL
Hematocrit	46–68%
Platelets	150,000–350,000/μL
Red blood cells	4.5–7.0 (1,000,000/μL)
White blood cells	10–30,000/mm^3

Blackburn, S. T. (2018). *Maternal, fetal, neonatal physiology: A clinical perspective* (5th ed.). Elsevier; Gleason, C. A., & Juul, S. E. (2018). *Avery's diseases of the newborn* (10th ed.). Elsevier; and Webster, S., Morris, G., & Kevelighan, E. (2018). *Essential human development.* John Wiley & Sons.

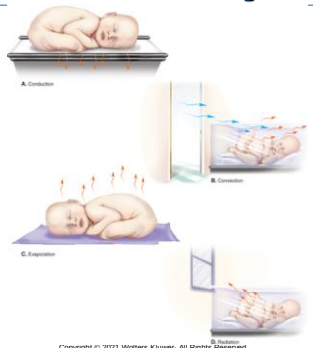
Characteristics Predisposing Newborn to Heat Loss

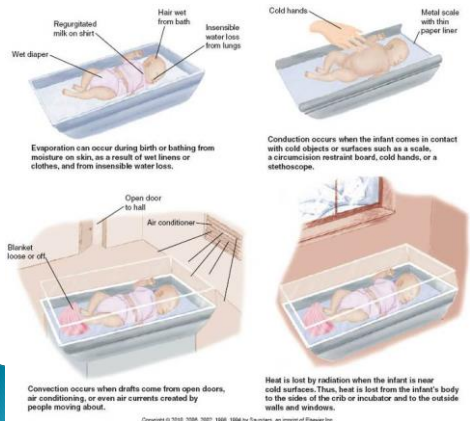
- Thin skin; blood vessels close to the surface
- Lack of shivering ability; limited stores of metabolic substrates (glucose, glycogen, fat)
- Limited use of voluntary muscle activity
- Large body surface area relative to body weight
- Lack of subcutaneous fat; little ability to conserve heat by changing posture
- No ability to adjust own clothing or blankets to achieve warmth
- Infants cannot communicate that they are too cold or too warm

Mechanisms of Heat Exchange #1

- Conduction: transfer of heat from object to object when the two objects are in direct contact with each other
- Convection: flow of heat from body surface to cooler surrounding air or to air circulating over a body surface
- Evaporation: loss of heat when a liquid is converted to a vapor
- Radiation: loss of body heat to cooler, solid surfaces in close proximity but not in direct contact

Mechanisms of Heat Exchange #2

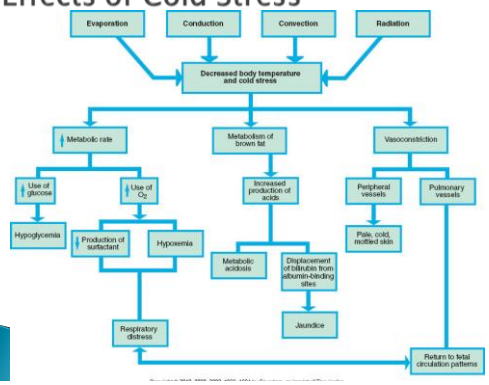




Thermoregulation of the Newborn

- Thermoregulation: balance between heat loss and heat production
  - Heat production: primarily through nonshivering thermogenesis
  - Heat loss via four mechanisms leading to cold stress
- Need for a neutral thermal environment (NTE)
- Overheating
  - Large body surface area
  - Limited insulation
  - Limited sweating ability

Effects of Cold Stress



Physiological Adaptations Hematologic

- Blood
  - Erythrocytes and hemoglobin
  - Hematocrit
  - Leukocyte
- Clotting Deficiency
  - Vitamin K

Hepatic System Function

- Iron storage
- Carbohydrate metabolism
- Bilirubin conjugation
  - Three groups of jaundice based on mechanism of accumulation of bilirubin
    - Overproduction
    - Decreased conjugation
    - Impaired excretion

Physiological Adaptations Hepatic System

- Blood glucose
- Conjugation of bilirubin
  - Physiologic jaundice
  - Pathologic jaundice
- Factors ↑ bilirubin
  - Excess production
  - Red blood cell life
  - Liver immaturity
  - Intestinal factors
  - Delayed feeding
  - Trauma can result in increased hemolysis of red blood cells.
  - Fatty acids are released when brown fat is used.
- Measures to decrease jaundice

Hepatic System: Jaundice Associated with Breastfeeding

- Breastfeeding jaundice
  - Inadequate intake
  - Sleepy infant with poor suck
  - Delay in elimination of meconium
  - Lack of adequate suckling

Hepatic System: Jaundice Associated with Breastfeeding (Cont.)

- True breast milk jaundice
  - Bilirubin levels rise after the first 3 to 5 days.
  - Substances in breast milk may interfere with conjugation of bilirubin.
  - Closely monitor bilirubin levels.
  - Treat with phototherapy; may discontinue breastfeeding.

Nursing Interventions for Hypoglycemia

- Plasma glucose concentration less than 45 mg/dL in the first 72 hours of life.
- Rapid acting glucose source
  - Dextrose gel
  - Breastfeeding
  - Formula feeding
- Monitor for symptoms (many asymptomatic)

Gastrointestinal System Adaptations

- Development of a mucosal barrier to prevent the penetration of harmful substances
- Physiologic capacity of the newborn stomach is considerably less than anatomic capacity
- Cardiac sphincter and nervous control of stomach are immature leading to regurgitation and uncoordinated peristaltic activity
- To gain weight the newborn requires an intake of 108 kcal/kg/day from birth to 6 months of age

Physiological Adaptations GI System

- Bowel sound
- Weight loss
- Stool output
  - Meconium
  - Transitional
  - Milk Stools
    - Breast fed
    - Formula fed

Characteristics of Newborn Stools

- Stools: meconium, then transitional stool, then milk stool
  - Breast-fed newborns: yellow-gold, loose, stringy to pasty, sour-smelling
  - Formula-fed newborns: yellow, yellow-green, loose, pasty, or formed, unpleasant odor

Renal System Changes

- Limited ability to concentrate urine until about 3 months of age (urine has a low specific gravity)
- Six to eight voids per day considered normal
- Low glomerular filtration rate and limited excretion and conservation capability: affect newborn's ability to excrete salt, water loads, and drugs

Physiological Adaptations Urinary System

- Urine Output
- Brick dust spots
- Pseudomenstruation

Immune System Adaptations

- Natural immunity: physical barriers, chemical barriers, and resident nonpathologic organisms
- Acquired immunity
  - Development of circulating immunoglobulins; formation of activated lymphocytes
  - Absent until after first invasion by foreign organism or toxin
  - Newborn primarily dependent on three immunoglobulins: IgG, IgA, and IgM

Physiological Adaptations Immunological

- Risk for infection
  - GBS +
- IgG
- IgM
- IgA

Integumentary System Adaptations

- Protective barrier between body and environment
- Functions: limits loss of water, prevents absorption of harmful agents, protects thermoregulation and fat storage, and protects against physical trauma.
- Accelerated epidermal development with exposure to air for all newborns

Neurologic System Adaptations

- Development follows cephalocaudal and proximal–distal patterns
- Acute senses of hearing, smell, taste, touch, and vision
- Adaptations of respiratory, circulatory, thermoregulatory, and musculoskeletal systems indirectly indicating central nervous system transition
- Reflexes: indication of neurologic development and function

Behavioral Patterns of Newborns

- First period of reactivity
  - Birth to 30 minutes to 2 hours after birth
  - Newborn is alert, moving, may appear hungry
- Period of decreased responsiveness
  - 30 to 120 minutes old
  - Period of sleep or decreased activity
- Second period of reactivity
  - 2 to 8 hours
  - Newborn awakens and shows an interest in stimuli

Newborn Behavioral Responses

- Orientation: response to stimuli
- Habituation: ability to process and respond to auditory and visual stimuli; ability to block out external stimuli after newborn has become used to activity
- Motor maturity: ability to control movements
- Self-quieting ability: consolability
- Social behaviors: cuddling and snuggling

Physiological Adaptations Neurologic & Sensory

- Behavioral States (Brazelton)
  - Sleep states
    - Quiet sleep state
    - Active sleep state
    - Drowsy state
  - Alert states
    - Quiet alert state
    - Active alert state
    - Crying state
- Responses
- Visual
- Auditory
- Olfactory
- Tactile

Early Focused Assessment: Assessment for Anomalies

- Head
  - Fontanels
  - Caput succedaneum
  - Cephalohematoma
- Face
- Neck and clavicles
- Cord
- Extremities
- Hands and feet
- Hips
- Vertebral column
- Measurements
  - Weight
  - Length
  - Head
  - Chest

Initial Newborn Assessments #1

- Signs indicating a problem
  - Nasal flaring, chest retractions
  - Grunting on exhalation, labored breathing
  - Generalized cyanosis, flaccid body posture
  - Abnormal breath sounds, abnormal respiratory rates
  - Abnormal heart rates, abnormal newborn size

Initial Newborn Assessments #2

- Apgar scoring (see Table 18.1)
- Length and weight
- Vital signs (see Table 18.2)
- Gestational age assessment (see Figure 18.3)
- Physical maturity (skin texture, lanugo, plantar creases, breast tissue, eyes and ears, genitals)
- Neuromuscular maturity (posture, square window, arm recoil, popliteal angle, scarf sign, heel to ear)

Initial Newborn Assessments #2

- Apgar scoring (see Table 18.1)
- Length and weight
- Vital signs (see Table 18.2)
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Physical Assessment

- Environment
- General Appearance
- Measurements
  - Weight
  - Length
  - Head circumference
  - Chest circumference
  - Vital signs

Newborn Vital Signs

TABLE 18.2 Newborn Vital Signs

Newborn Vital Signs	Ranges of Values
Temperature	97.7–99.5°F (36.5–37.5°C)
Heart rate (pulse) to 180 during crying	110–160 bpm; can increase
Respirations	30–60 breaths/min at rest; will increase with crying
Blood pressure	50–75 mm Hg systolic, 30–45 mm Hg diastolic

Data from Gowen, C. W. (2019). Assessment of the mother, fetus, and newborn. In K. Marcdante & R. M. Kliegman (Eds.), *Nelson essentials of pediatrics* (8th ed.). Elsevier; Martin, G. I., & Rosenfeld, W. (2019). *Common problems in the newborn nursery: An evidence and case-based guide*. Springer.

Skin

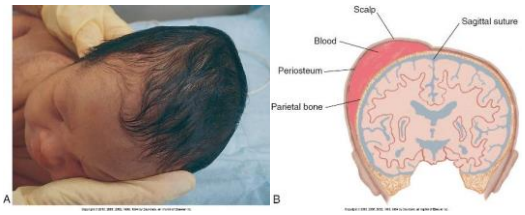
- Acrocyanosis
- Mottling
- Harlequin
- Jaundice
- Erythema toxicum
- Milia
- Skin turgor
- Vernix caseosa
- Telangiectatic nevi (stork bites)
- Mongolian spots
- Marks
- Nevus Flammeus
- Nevus Vasculosis (strawberry hemangioma)

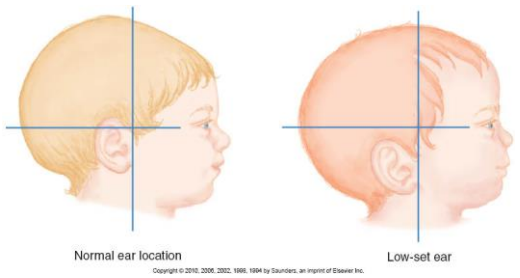
Variations in Head Size and Shape in the Newborn

- Variations
  - Molding
  - Caput succedaneum
  - Cephalohematoma
- Abnormalities
  - Microcephaly
  - Macrocephaly
  - Large, small, or closed fontanelles

Head & Neck

- Head- previous slide
- Face
- Eyes
- Nose
- Mouth
- Ears
- Neck





Chest

- Shape
- Breast/ areola
- Supernummary nipples
- Respirations
- Heart

Abdomen

- Shape
- Bowel sounds
- Umbilical Cord

Genitals

- Female
  - Hymenal tag
  - Discharge
  - Pseudomenstruation
- Male
  - Hypospadius
  - Epispadius
  - Phimosis
  - Scrotum: R/O cryptorchidism
  - hydrocele
- Anus

Extremities

- Polydactaly
- Syndactaly
- Palmar creases
- Simian line
- Brachial palsy (Erb Duchanne)
- Legs & Feet
  - Length
  - Hip dislocation
  - Ortolano maneuver & Barlow manuever
  - Talipes equinovarus

Back

- Spine
- Dermal sinus
- "hairy nerves"

Reflexes

- Tonic neck (fencer)
- Grasp
- Moro (startle)
- Rooting
- Sucking
- Babinski
- Stepping
- Crawl

TABLE 18.4 NEWBORN REFLEXES: APPEARANCE AND DISAPPEARANCE

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

Reflexes

Moro reflex
The Moro reflex is the most dramatic reflex. It occurs when the infant's head and trunk are allowed to drop back 30 degrees when the infant is in a slightly raised position. The infant's arms and legs extend and abduct, with the fingers forming open and thumbs and forefingers forming a C position. The arms then return to their normally flexed state with an embracing motion. The legs may also extend and then flex.

A

Palmar grasp reflex
The palmar grasp reflex occurs when the infant's palm is touched near the base of the fingers. The hand closes into a tight fist. The grasp reflex may be weak or absent if the infant has damage to the nerves of the arms.

B

Plantar grasp reflex
The plantar grasp reflex is similar to the palmar grasp reflex. When the area below the toes is touched, the infant's toes curl over the nurse's finger.

C

Babinski reflex
The Babinski reflex is elicited by stroking the lateral sole of the infant's foot from the heel forward and across the ball of the foot. This causes the toes to flare outward and the big toe to dorsiflex.

D

Reflexes (Cont.)

Rooting reflex
The rooting reflex is important in feeding and is most often demonstrated when the infant is hungry. When the infant's cheek is touched or stroked, the head turns toward the side that has been stroked. The response helps the infant find the nipple for feeding. The reflex occurs when either side of the mouth is touched. Touching the cheeks on both sides at the same time confuses the infant.

E

Sucking reflex
The sucking reflex is essential to normal life. When the mouth or palate is touched by the nipple or a finger, the infant begins to suck. The sucking reflex is assessed for its presence and strength. Feeding difficulties may be related to problems in the infant's ability to suck and to coordinate sucking with swallowing and breathing.

F

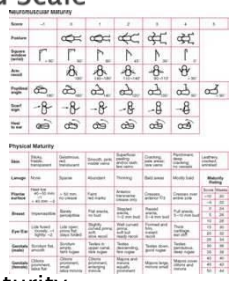
Tonic neck reflex
The tonic neck reflex refers to the posture assumed by newborns when in a supine position. The infant extends the arm and leg on the side to which the head is turned and flexes the extremities on the other side. This response is sometimes referred to as the "fencing reflex" because the infant's position is similar to that of a person engaged in a fencing match.

G

Stepping reflex
The stepping reflex occurs when infants are held upright with their feet touching a solid surface. They lift one foot and then the other, giving the appearance that they are trying to walk.

Ballard Scale

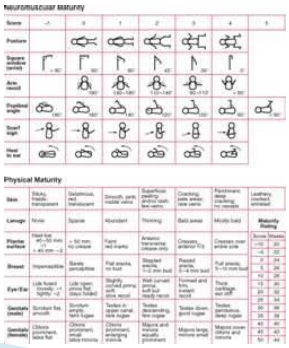
- Time frame
- Physical Maturity



- Neuromuscular Maturity

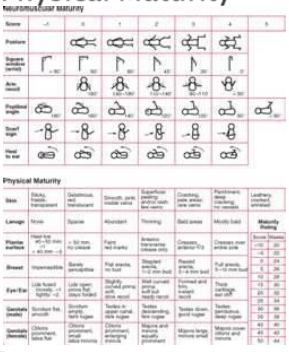
Ballard Scale- Neuromuscular Maturity

- Posture
- Square window
- Arm recoil
- Popliteal angle
- Scarf sign
- Heel to ear



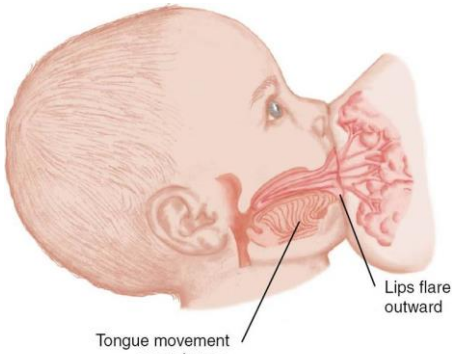
Ballard Scale- Physical Maturity

- Skin
- Lanugo
- Plantar surface
- Breast
- Eye/ear
- Genitals



Newborn Nutrition

- Breast Feeding
  - Frequency
  - LATCH Method for Assessing Breast-Feeding Sessions
    - L: How well infant latches onto the breast
    - A: Amount of audible swallowing
    - T: Nipple type
    - C: Level of comfort
    - H: Amount of help mother needs
  - During the first 3 months, an infant needs 110 to 120 calories/kg/day.



Application of the Nursing Process: Breastfeeding (Cont.)

- Interventions
  - Assist with first feeding
  - Teaching
  - Position of mother's hands
  - Latching-on
  - Suckling pattern
  - Removal from breast
  - Frequency and length of feeding
  - Preventing problems
- Evaluation

Common Breastfeeding Concerns: Infant Problems

- Sleepy
- Nipple confusion
- Suckling problems
- Infant complications
  - Jaundice
  - Prematurity
  - Illness and congenital defects

Common Breastfeeding Concerns: Maternal Concerns

- Breast problems
- Illness in mother
- Medications
- Breast surgery
- Employment
- Milk expression
- Storing milk
- Multiple births
- Weaning
- Home care

Nursing Management: Early Newborn Period: Bottle Feeding

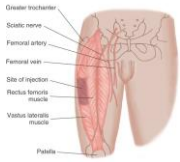
- Types of formula
- Assistance
- Positioning
- Education
- Weaning and introduction of solid foods

Parent Education

- Circumcision
- Hand Hygiene/ Infection prevention
- Demonstration of Infant Care
  - Bathing, diapering, swaddling, feeding,
- Sleep promotion
- Bonding
- Car Seat
- Immunization & Well Baby visits
- When to call pediatrician

Medications

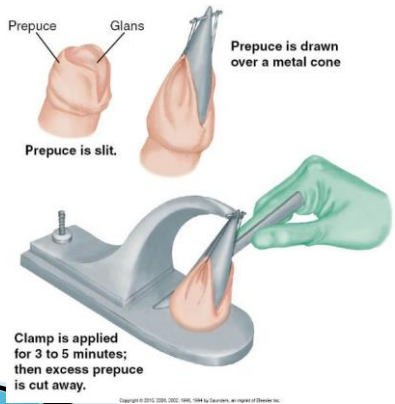
- Vitamin K (aquamephyton)
- Erythromycin Ointment
- Hepatitis B vaccine (energix)

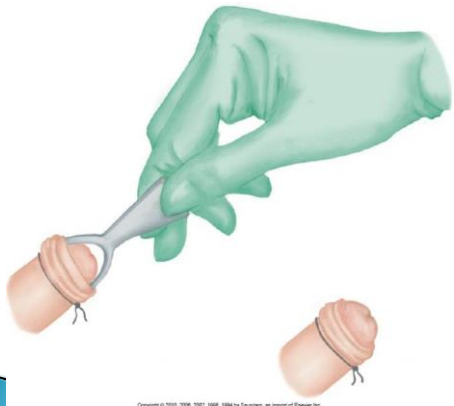


Bulb Suctioning

Circumcision

- Reasons for choosing circumcision
- Reasons for rejecting circumcision
- Pain relief
- Methods
- Nursing considerations





Newborn Screening Tests

- Hearing- universal
- Phenylketonuria (PKU)
- Congenital hypothyroidism
- Galactosemia
- Hemoglobinopathies
- Sickle cell anemia
- Congenital adrenal hyperplasia

Discharge and Newborn Follow-Up Care

- Early discharge
  - Appropriate for gestational age
  - Vital signs within normal limits
  - Feeding successfully
  - Making transition from fetal to neonatal life
  - Passed urine and stool
  - Mother able to care for infant
- Follow-up care
  - Professional follow-up care recommended with early discharge
  - Can be provided in a number of ways

Early Problems

- Infant crying
- Colic
- Shaken baby syndrome
- Sleep
- Concerns of working mothers
- Concerns of adoptive parents

Common Questions and Concerns

- Dressing and warmth
- Stool and vomiting patterns
- Smoking
- Eyes
  - Mucus
  - Transient strabismus
- Baths
- Nails

Common Questions and Concerns (Cont.)

- Sucking needs
- Teething
- Common rashes
  - Diaper rash
  - Miliaria
  - Seborrheic dermatitis

Feeding Concerns

- Regurgitation
  - The nurse should teach parents to differentiate normal spitting up from vomiting.
- Solid food
  - Infants do not need solid foods until 4 to 6 months of age.
  - When infants start solids, they drink less milk.
  - The extrusion reflex continues until approximately 4 to 6 months of age.

Growth and Development

- Anticipatory guidance
  - Help parents develop realistic expectations about infants' abilities at various ages.
- Milestones
  - Guidelines are only averages.
  - Growth proceeds at a predictable rate in normal infants.
  - Early reflexes gradually disappear to help prepare the infant to learn new skills.
- Accident prevention

Well-Baby Care

- Well-baby checkups
  - Assess growth and development
  - Answer questions about feeding and infant care
  - Observe for abnormalities
  - Mother can learn what is normal in growth and behaviors.
  - Anticipatory guidance
  - Discuss infant safety

Well-Baby Care (Cont.)

- Immunizations
  - The nurse provides information about the need for immunizations.
    - Describe conditions for which infants receive immunizations.
    - Discuss ages when immunizations are given.
    - Discuss common reactions to immunizations.

Illness

- Recognizing signs
- Calling health care provider
- Knowing when to seek immediate help
- Sudden infant death syndrome (SIDS)
  - Incidences/causes
  - Risk factors
  - Sleeping positions
  - Nursing responsibilities