30 Assessing Newborns and Infants

Structure and Function

A newborn, or neonate, is the term used to describe a child from birth to 28-days-old. An infant refers to a child between the ages of 28 days and 1 year.

SKIN, HAIR, AND NAILS

At birth, the newborn's skin is smooth and thin. It may appear ruddy because of visible blood circulation through the newborn's thin layer of subcutaneous fat. This thin layer of fat, combined with the skin's inability to contract and shiver, results in ineffective temperature regulation. The skin may appear mottled on the trunk, arms, or legs. The dermis and epidermis are thin and loosely bound together. This increases the skin's susceptibility to infection and irritation and creates a poor barrier, resulting in fluid loss. When the newborn's body temperature drops, the hands and/or feet may appear blue (acrocyanosis). Vernix caseosa may be visible on the skin. It appears as a thick, cheesy, white substance on the skin and is especially prevalent in skin folds. This is normal and usually absorbs into the skin.

After birth, the newborn's sebaceous glands are active because of high levels of maternal androgen. Milia develop when these glands become plugged. Eccrine glands function at birth, creating palmar sweating, which is helpful when assessing pain. Apocrine glands stay small and nonfunctional until puberty.

The fine, downy hairs called lanugo, which appear on the newborn's body, shoulders, and/or back at birth, develop in the fetus at 3 months gestation and disappear within the first 2 weeks of life. Scalp hair-follicle growth phases occur concurrently at birth but are disrupted during early infancy. This may result in overgrowth or alopecia (hair loss).

Nails are usually present at birth. Missing or short nails usually signify prematurity, and long nails usually signify postmaturity. Nails are usually pink, convex, and smooth throughout childhood and adolescence.

HEAD AND NECK

Head growth predominates during the fetal period. At birth, the head circumference is greater (by 2 cm) than that of the chest. The cranial bones are soft and separated by the coronal, lambdoid, and sagittal sutures, which intersect at the anterior and posterior fontanelle (Fig. 30-1). Ossification begins in infancy and continues into adulthood.

The newborn's skull is typically asymmetric (plagiocephaly) because of molding that occurs as the newborn passes through the birth canal. The skull molds easily during birth, allowing for overlapping of the cranial bones.

The posterior fontanelle usually measures 1 to 2 cm at birth and usually closes at 2 months. The anterior fontanelle usually measures 4 to 6 cm at birth and closes between 12 and 18 months.

➤ **Clinical Tip** • *A full anterior fontanelle may be palpable when the newborn cries.*

Visible pulsations may also appear, representing the peripheral pulse. The sutures and fontanelles allow the skull to expand to accommodate brain growth. Brain growth is reflected by head circumference (occipital—frontal circumference), which increases six times as much during the first year as it does the second. Half of postnatal brain growth is achieved within the first year of life.

The neck is usually short during infancy (lengthening at about age 3 or 4 years). Lymphoid tissue is well developed at birth and reaches adult size by age 6 years.

EYES

Eye structure and function are not fully developed at birth. The iris shows little pigment, and the pupils are small. The macula, which is absent at birth, develops at 4 months and is mature by 8 months. Pupillary reflex is poor at birth and improves at 5 months of age. The sclera is clear. Small subconjunctival hemorrhages are normal after birth. Peripheral vision is developed, but central vision is not. The newborn is farsighted and has a visual acuity of 20/200. At 4 months, an infant can fixate on a singular

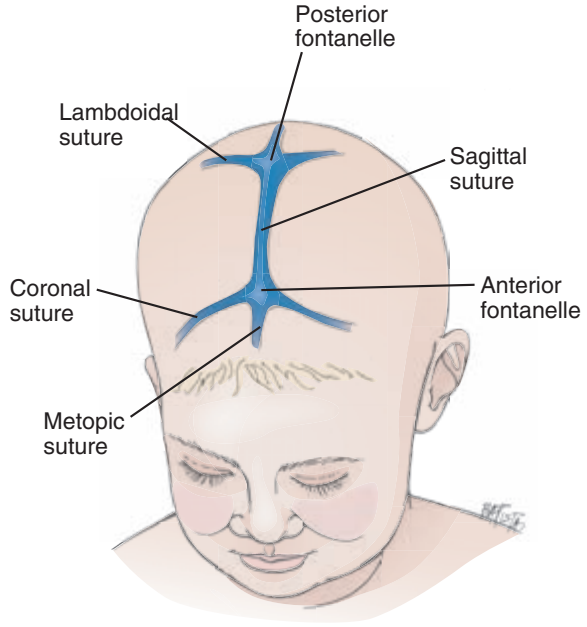

Figure 30-1 The infant head.

object with both eyes simultaneously (binocularity). Tearing and voluntary control over eye muscles begin at 2 to 3 months; by 4 months, infants establish binocular vision and focus on a single image with both eyes simultaneously. These functions are better developed by 9 months. Newborns cannot distinguish between colors; this ability develops by 8 months.

EARS

The inner ear develops during the first trimester of gestation. Therefore, maternal problems during this time, such as rubella, may impair hearing. Newborns can hear loud sounds at 90 decibels and react with the startle reflex. They respond to low-frequency sounds, such as a heartbeat or a lullaby, by decreasing crying and motor movement. They react to high-frequency sounds with an alerting reaction. In infants, the external auditory canal curves upward and is short and straight. Therefore, the pinna must be pulled down and back to perform the otoscopic examination. The eustachian tube is wider, shorter, and more horizontal, increasing the possibility of infection rising from the pharynx.

MOUTH, THROAT, NOSE, AND SINUS

Saliva is minimal at birth but drooling is evident by 3 months because of the increased secretion of saliva. Drooling persists for a few months until the infant learns to swallow the saliva. Drooling does not signify tooth eruption. The development of both temporary (deciduous) and permanent teeth begins in utero. Deciduous tooth eruption takes place between the ages of 6 and 24 months.

The tonsils and adenoids are small in relation to body size and hard to see at birth. The pharynx is best seen when the newborn is crying.

Newborns are obligatory nose breathers and, therefore, have significant distress when their nasal passages are obstructed. The maxillary and ethmoid sinuses are present at birth but they are small and cannot be examined until they develop.

THORAX AND LUNGS

At term gestation, the fetal lungs should be developed and the alveoli should be collapsed. Gas exchange is performed by the placenta. Immediately after birth, the lungs aerate; blood flows through them more vigorously, causing greater expansion and relaxation of the pulmonary arteries. The decrease in pulmonary pressure closes the foramen ovale, increasing oxygen tension and closing the ductus arteriosus. The lungs continue to develop after birth, and new alveoli form until about 8 years of age.

BREASTS

Ventral epidermal ridges (milk lines), which run from the axilla to the medial thigh, are present during gestation. True breasts develop along the thoracic ridge; the other breasts along the milk line atrophy. Occasionally a supernumerary nipple persists along the ridge track. At birth, lactiferous ducts are present in the nipple but there are no alveoli. Although the newborn's breasts may be temporarily enlarged from the effects of maternal estrogen, they are usually flat and remain so until puberty.

HEART

Because oxygenation takes place in the placenta in fetal circulation, the lungs are bypassed and arterial blood is returned to the right side of the heart. Blood is shunted through the foramen ovale and ductus arteriosus into the left side of the heart and out the aorta. At birth, lung aeration causes circulatory changes. The foramen ovale closes within the first hour because of the newly created low pressure in the right side of the heart, and the ductus arteriosus closes about 10 to 15 hours after birth.

When listening to the heart in the infant, systolic murmurs may be audible due to the transition from intrauterine to extrauterine life. This murmur generally resolves within 24 to 48 hours after birth. The pulse rate is usually between 120 to 160 b/minute. The rate decreases as the child ages, having a normal heart rate of 120 to 160 at birth and declining to approximately 120s at 6 months of age and down to 110s from 6 months to 1 year old. The heart should be auscultated at approximately the 4th intercostal margin to the left of the midclavicular line. The heart lays more horizontal in the chest and may seem enlarged with percussion. Heart sounds are also more audible in the newborn secondary to the thin subcutaneous layer of skin on the newborn.

PERIPHERAL VASCULAR SYSTEM

The skin should appear pink and well perfused. The hands and feet may appear blue at times (acrocyanosis) which is normal, especially when the newborn is cold. With warming the extremities, skin color should return to pink normal color. If the infant does not respond to this technique, consider a congenital heart defect in the newborn.

Pulses should be audible at the 4th intercostal space. Pulses should be felt in extremities, assessing the radial, brachial, and femoral pulses bilaterally. Weakness or absence of femoral pulses may indicate coarctation of the aorta. Bounding pulses can be seen with patent ductus arteriosus.

ABDOMEN

The umbilical cord is prominent in the newborn and contains two arteries and one vein. The umbilicus consists of two parts: the amniotic portion and the cutaneous portion. The amniotic portion is covered with a gel-like substance and dries up and falls off within 2 weeks of life. The cutaneous portion is covered with skin and draws back to become flush with the abdominal wall.

The abdomen of infants is cylindrical. Peristaltic waves may be visible in infants and may be indicative of a disease or disorder.

The newborn's liver is palpable at 0.5 to 2.5 cm below the right costal margin, thereby occupying proportionately more space than at any other time after birth. In infants and small children, the liver is palpable at 1 to 2 cm below the right costal margin, indicative of a disease or disorder. Kidney development is not complete until 1 year of age.

Bladder capacity increases with age; the bladder is considered an abdominal organ in infants because it is located between the symphysis pubis and the umbilicus (higher than in adults).

GENITALIA

In male infants the testes develop prenatally and drop into the scrotum during month 8 of gestation. Each testis measures about 1 cm wide and 1.5 to 2 cm long.

At birth, female genitalia may be engorged. Mucoid or bloody discharge may be noted because of the influence of maternal hormones. The genitalia return to normal size in a few weeks and remain small until puberty.

ANUS, RECTUM, AND PROSTATE

Meconium is passed during the first 24 hours of life, signifying anal patency. Stools are passed by reflex, and anal sphincter control is not reached until 1.5 to 2 years of age after the nerves supplying the area have become fully myelinated. Meconium not passed within 24 hours of birth could signify a problem. In boys, the prostate gland is underdeveloped and not palpable.

MUSCULOSKELETAL SYSTEM

At birth the newborn should have full range of motion of all extremities. Many newborns have feet that may appear deformed in position due to the intrauterine position of extremities. The feet should turn to the normal position with ease by the examiner.

The hips should also be checked for dislocation and ease of movement by performing Ortolani test and Barlow's sign.

The newborn vertebral column differs in contour from the normal adult vertebral column. The spine has a single C-shaped curve at birth. By 3 to 4 months, the anterior curve in the cervical region develops from the infant raising its head when prone.

NEUROLOGIC SYSTEM

The neurologic system is not fully developed at birth. Motor control is maintained by the spinal cord and medulla, and most actions in the newborn are primitive reflexes. As myelinization develops and the number of brain neurons grows rapidly, from the 30th week of gestation through the first year of life, voluntary control and advanced cerebral functions appear and the more primitive reflexes diminish or disappear. The nervous system grows rapidly during fetal and early postnatal life reaching 25% of adult capacity at birth, 50% by age 1 year, 80% by age 3, and 90% by age 7.

Newborns have rudimentary sensation; any stimulus must be strong to cause a reaction, and the response is not localized. A strong stimulus causes a vigorous response of crying with whole-body movements. As myelinization develops, stimulus localization becomes possible and the child responds in a more localized manner. Motor control develops in a head-to-neck to trunk-to-extremities sequence.

Health Assessment

COLLECTIVE SUBJECTIVE DATA: THE NURSING HEALTH HISTORY

Interviewing Parents

The initial assessment of the newborn occurs immediately after delivery. Therefore, parent interviewing is not performed. However, the nurse needs to get a complete maternal history of the mother before and during pregnancy. Delivery record information is also imperative for the initial newborn assessment. This information is usually obtained from the maternal hospital chart.

For assessment following this time period, the nurse interviews the parent(s).

Subjective assessment of the infant encompasses interviewing and compiling a complete nursing history from the parents or the primary care taker. The nurse should use a friendly, nonjudgemental approach when interviewing the family. Portray proficiency and competence when talking with the parents. Explain the purpose of the interview and clarify any misunderstandings during this time. Explain the importance of getting accurate information about the infant to ensure that the correct diagnosis and treatment are provided for the infant. Realize that common behaviors of the family may not be portrayed at this setting. The unfamiliar setting and concerns for the infant, especially if the infant is ill, may cause the parents to be very nervous and anxious during the interview. Providing a safe, relaxed environment will help the parents to be calm and be able to answer questions accurately.

Cultural variations may also exist with the family. The nurse should provide a nonjudgemental environment, using active listening skills and providing empathy as appropriate.

Nurses should also be aware of barriers to effective nurse–parent communication. These include time constraints, frequent interruptions, lack of privacy and language differences as well as provider callousness and cultural insensitivity. Make every effort to prevent these barriers. Providing enough time for the interview, keeping interruptions to a minimum, maintaining patient privacy, and using interpreters when language barriers exist will help with obtaining accurate information regarding the newborn's history.

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BIOGRAPHIC DATA

Question	Rationale
What is the child's name? Nickname? What are the parents' or caregivers' names?	Knowing personal information about the child and caregivers helps to establish rapport with child and family.
Who is the child's primary health care provider, and when was the child's last well-child care appointment?	This determines the child's access to health care. It tells the nurse where to find the client's previous medical information/record.
Where does the child live? (Address)	In addition, assess the family's living conditions.
Do the parents and child live in the same residence? Are the child's parents married, single, divorced, homosexual? Who else lives in this residence? What are the parents' ages?	This indicates the availability of potential caregivers and support people for the client. It also helps to define familial relationships.
What is the child's age? What is the child's date of birth?	This provides a reference for assessing the child's developmental level.
Is the child adopted, foster, natural?	Certain health problems run in families. It is helpful to know the child's genetic relationship with the parents.
What is the child's ethic origin? Religion?	This information helps the nurse to examine special needs and beliefs that may affect the client or family's health care.
What do the child's parents do for a living?	This provides insight into the economic status of the family.

HISTORY OF PRESENT HEALTH CONCERN/CURRENT HEALTH STATUS

Elicit the reason for seeking care and ask questions about the child's current health status. During the first year of life, many visits to the health care provider will be well visits (check-ups).

Question	Rationale
Describe the child's general state of health. Does the child have a chronic illness?	Obtaining baseline information about the client helps to identify important areas of assessment.
Does the child have any allergies? If so, what is the specific allergen? How does the child react to it?	This identifies allergens and helps the nurse plan to prevent exposure.
What prescriptions, over-the-counter medications, devices, and treatments, and home or folk remedies is the child taking? Please provide the name of the drug, dosage, frequency, and reason it is administered.	It is always important to know what medications a client is taking, especially young clients.

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COLDSPA Example

If there is a health concern, use the **COLDSPA** mnemonic as a guideline to collect needed information for each symptom the client shares.

Mnemonic	*Question*	*Client Response Example*
Character	Describe the sign or symptom (feeling, appearance, sound, smell, or taste if applicable).	Inability to nurse
Onset	When did it begin?	"The first time I tried to nurse my infant."
Location	Where is it? Does it radiate? Does it occur anywhere else?	"I tried both breasts."
Duration	How long does it last? Does it recur?	"I have tried with to breast feed with the nurse's help three times already."
Severity	How bad is it? or How much does it bother you?	"I am really worried because this is the best way to bond with my baby and I want him to have the immunity from my milk."
Pattern	What makes it better or worse?	"I've tried all positions and nothing works."
Associated factors/How it **A**ffects the client	What other symptoms occur with it? How does it affect you?	"I'm very stressed about being unable to breast feed."

PAST HEALTH HISTORY

Question	*Rationale*
Ask about the pregnancy:	
Was the pregnancy planned? How did you feel when you found out you were pregnant?	The caregiver's answer may provide insight into her feelings about the child.
When did you first receive prenatal care? How was your general health during pregnancy?	Prenatal information helps to identify potential health problems for the child.
Did you have any problems with your pregnancy?	
Did you have any accidents during this pregnancy?	
Did you take any medications during pregnancy?	Certain medications should not be taken during pregnancy and may be harmful to the child.
Did you use any tobacco, alcohol, or drugs during this pregnancy?	Smoking, alcohol, and drug use may cause complications or anomalies with the fetus.
Ask about delivery of the child:	Delivery details and complications are pertinent for assessing fetal injury and potential risk for infection.
Where was the child born?	
What type of delivery did you have?	
Were there any problems during the delivery? Did you have any vaginal infections at time of delivery?	
What was the child's Apgar score?	
What were the child's weight, length, and head circumference? Did the child have any problems after birth (e.g., feeding, jaundice)?	
Ask about past illnesses or injuries:	Previous illnesses and hospitalizations may affect the present examination.
Has the child ever been hospitalized?	
Has the child ever had any major illnesses?	
What immunizations has the child received thus far? Has your child had any reactions to immunizations?	This helps identify risk for infection and/or potential reactions to immunizations.

continued

FAMILY HISTORY

Question	Rationale
Please list any chronic health conditions in the family.	Certain conditions tend to run in families and increase the client's risk for such condition.
Please list the age and cause of death for blood relatives.	This helps to identify risk factors.
Does the child have family members with communicable diseases?	This also helps to identify risk factors.

REVIEW OF SYSTEMS

Question	Rationale
Skin, Hair, Nails	
Has your child had any changes in hair texture?	Changes may indicate an underlying problem.
Does your child exhibit scaling on her scalp?	Cradle cap is a common problem.
Has your child been exposed to any contagious disease such as measles, chickenpox, lice, ringworm, scabies and the like?	This helps to identify risks for health problems.
Has your child ever had any rashes or sores? Does your child have diaper rash?	Diaper rash is a common finding in infants.
Has your child had any excessive bruising or burns?	This helps to assess for child abuse. Excessive bruising or burns suggest abuse.
Does your child have any birthmarks?	Birthmarks are normal findings.
Head and Neck	
Has your child ever had a head injury?	Head injuries may cause neurological problems.
Did the fontanelles close on schedule? Does the child have head control? If so, at what age did this occur?	These questions assess normal growth and development.
Eyes and Vision	
Does your infant have any unusual eye movements? Does your infant/child excessively cross eyes?	This helps to determine eye and vision development.
Does your infant blink when necessary?	Absent blinking is abnormal.
Is your infant able to focus on moving objects?	By one month, the infant should be able to follow a moving object or light.
Has your infant ever had cloudiness in the eyeball?	Cloudiness of the eyeball may indicate the presence of cataracts.
Ears and Hearing	
Does your child appear to be paying attention when you speak? (Infants should respond to the human voice.) Does the child respond to loud noise?	Infants who do not respond to the human voice or loud voices may have a hearing loss.
Has your child had frequent ear infections? Tubes in ears?	Frequent otitis media is a risk factor for hearing loss.
Does anyone in the child's home smoke?	Smoking increases the risk of otitis media.

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REVIEW OF SYSTEMS *Continued*

Question	Rationale
Mouth, Throat, Nose, and Sinuses	
Does your child have any teeth?	No teeth by age one is a variation of normal.
Does your child attend day care?	Attending day care increases risk of upper respiratory infections (through exposure to other children).
Thorax and Lungs	
Has your child ever had cough, wheezing, shortness or breath, nocturnal dyspnea; if so, when does it occur? Has your child had frequent or severe colds?	Positive answers to any of these questions may indicate upper respiratory disorders.
Heart and Neck Vessels	
Does your infant become fatigued or short of breath during feedings?	Infants who fatigue easily with feedings may have congenital heart defect or disorder.
Peripheral Vascular System	
Does your child ever experience bluing of the extremities? Do our child's hands and/or feet get unusually cold?	These questions assess vascular supply and perfusion.
Abdomen	
Are you breast or bottle feeding? What foods does the infant eat?	Feeding patterns help the nurse to assess nutrition and gastrointestinal function.
Has your child ever had any excessive vomiting? Abdominal pain? Please describe.	Excessive vomiting may indicate neurological disorder.
Genitalia	
How often does your child urinate? How many wet diapers do you change per day?	The caregiver's answer helps the nurse to assess the genitourinary system.
Is the child prone to frequent diaper rash.	Diaper rash (irritant contact dermatitis) is common in infants.
Anus and Rectum	
How often does your child have bowel movement? What does it look like?	These questions help to assess gastrointestinal function.
Is there any history of bleeding, constipation, diarrhea, or hemorrhoids?	
Musculoskeletal System	
Has your child ever had limited range of motion, joint pain, stiffness, paralysis?	These questions assess musculoskeletal development.
Has your child ever had any fractures? Have you noticed any bone deformities?	Frequent fractures may indicate child abuse.
Neurologic System	
Has your child ever had a seizure?	Seizures indicate a neurologic or other systemic disorder.
Has your child ever experienced any problems with motor coordination?	If the child is not meeting developmental landmarks, it may indicate an underlying problem.

Growth and Development

Growth and development of the newborn/infant may be assessed using the Denver Developmental Screening Test (see Assessment Tool 30-1). This test is used to guide the nurse to the appropriate developmental milestones for the child's gross motor, language, fine motor, and personal social development.

Motor Development

GROSS MOTOR

Newborns can turn their heads from side to side when prone unless they are lying on a soft surface. This inability to turn their head while lying on a soft surface makes suffocation a real concern. By 3 to 4 months, there is almost no head lag and the infant may push up to prone position. Infants roll from front to back at 5 months and sit unsupported by 6 to 7 months. They pull to stand by 9 months, cruise by 10 months, and walk when hand-held by 12 months. Figure 30-2 displays gross motor development of the infant.

FINE MOTOR

The grasp reflex is present at birth and strengthens at 1 month. This reflex fades at 3 months, at which time an infant can actively hold a rattle. Five-month-old infants can grasp voluntarily, and 7-month-old infants can hand-to-hand transfer. The pincer grasp develops by 9 months, and 12-month-old infants will attempt to build a two-block tower.

Sensory Perception (Vision, Hearing, and Other Senses)

VISUAL

The newborn's visual impressions are unfocused, and the ability to distinguish between colors is not developed until approximately 8 months of age. Therefore, stimuli should be bright, simple, moving, and, preferably black and white (e.g., a mobile that consists of black and white circles and cubes; Fig. 30-3).

AUDITORY

Newborns can distinguish sounds and turn toward voices and other noises. They may be very familiar with their mother's voice, and other sounds gradually gain significance when associated with pleasure.

OLFACTORY

Smell is fully developed at birth, and a 2-week-old infant can differentiate the smell of his or her mother's milk and parents' body odors.

TACTILE

Touch is well developed at birth, especially the lips and tongue. Touch should be used frequently because infants enjoy rocking, warmth, and cuddling. Infants normally attend to the human voice; therefore, question parents as to whether their child appears to be paying attention when they speak.

Cognitive and Language Development (Piaget)

The sensorimotor stage, from birth to around 18 months, involves the development of intellect and knowledge of the environment gained through the senses. During this stage, development progresses from reflexive activity to purposeful acts. At the completion of this stage, the infant achieves a sense of object permanence (retains a mental image of an absent object; sees self as separate from others). An emerging sense of body image parallels sensorimotor development.

Crying is the first means of communication, and parents can usually differentiate cries. Cooing begins by 1 to 2 months, laughing and babbling by 3 to 4 months, and consonant sounds by 3 to 4 months. The infant begins to imitate sounds by 6 months. Combined syllables ("mama") are vocalized by 8 months, and the infant understands "no-no" by 9 months. "Mama" and "dada" are said with meaning by 10 months, and the infant says a total of 2 to 4 words with meaning by 12 months.

Moral Development (Kolberg)

Although Kolberg's theory of moral development begins with toddlerhood, infants cannot be overlooked. Child moral development begins with the value and belief system of the parents and the infant's own development of trust. Parental discipline patterns may start with the young infant in the form of interventions for crying behaviors. Stern discipline and withholding love and affection may affect infant moral development. Love and affection are the building blocks of an infant's developing sense of trust (Fig. 30-4).

Psychosocial Development (Erikson)

The crisis faced by an infant (birth to 1 year) is termed trust versus mistrust. In this stage, the infant's significant other is the "caretaking" person. Developing a sense of trust in caregivers and the environment is a central focus for an infant. This sense of trust forms the foundation for all future psychosocial tasks. The quality of the caregiver—child relationship is a crucial factor in the infant's development of trust. An infant who receives attentive care learns that life is predictable and that his or her needs will be met promptly; this fosters trust. In contrast, an infant experiencing consistently delayed needs gratification develops a sense of uncertainty, leading to mistrust of caregivers and the environment. An infant commonly seeks comfort from a security blanket or other object such as a favorite stuffed animal.

Psychosexual Development (Freud)

In the *oral stage* of development, from birth to 18 months, the erogenous zone is the mouth, and sexual activity takes the form of sucking, swallowing, chewing, and biting. In this stage, the infant meets the world by crying, tasting, eating, and early vocalization; biting, to gain a sense of having a hold on and having greater control of the environment; and grasping and touching to explore texture variations in the environment.

Figure 30-2 Growth and development of the infant. **(A)** At 4 weeks, this infant turns head when lying in a prone position. **(B)** At 12 weeks, this infant pushes up from a prone position. **(C)** At 21 weeks, this infant sits up but tilts forward for balance. **(D)** At 30 weeks, this infant is crawling around and on the go. **(E)** At 43 weeks, this infant is getting ready to walk.

Lifestyle and Health Practices

Normal Nutritional Requirements

Breast milk is the most desirable complete food for the first 6 months of a child's life. However, commercially prepared, iron-fortified formula is an acceptable alternative. Formula intake varies per infant. Most infants take 100 cal/kg body weight/day. This amount of formula should be offered to the infant every 3 to 4 h, approximately four to six times a day. Solids are not recommended before 4 months of age due to the

Figure 30-3 A black-and-white mobile is a good visual stimulus for an infant (courtesy of S. Ludington).

Figure 30-4 The infant-caregiver relationship fosters trust.

presence of the protrusion or sucking reflexes and the immaturity of the gastrointestinal tract and the immune system. Infant rice cereal is usually the initial solid food given because it is easy to digest, contains iron, and rarely triggers allergy. Additional foods usually include other cereals followed by fruits and vegetables and finally meats. Juices may be offered at 6 months of age. Finger foods are introduced at 8 or 9 months. Weaning from breast or bottle to cup should be gradual. The desire to imitate at 8 to 9 months increases the success of weaning. Honey should be discouraged during the first year of life because it may cause infant botulism.

Normal Sleep Requirements and Patterns

Sleep patterns vary among infants. During the first month, most infants sleep when not eating. By 3 to 4 months, most infants sleep 9 to 11 hours at night. By 12 months, most infants take morning and afternoon naps. Bedtime rituals should begin in infancy to prepare the infant for sleep and prevent future sleep problems. Because of the possibility of SIDS (sudden infant death syndrome), it is suggested that young infants sleep in the supine or side-lying position.

COLLECTING OBJECTIVE DATA: PHYSICAL EXAMINATION

Preparing the Client

Make sure the caregiver understands the examination process. Describe what will be performed and how it will be performed. Explain that the Denver Development Examination assesses normal development milestones. Encourage the caregiver to ask questions during the examination. For most of the examination, the child should be unclothed.

Equipment

- Denver Development Kit
- Measuring tape
- Ophthalmoscope
- Otoscope
- Scale
- Stethoscope
- Thermometer

Physical Assessment

Initial Assessment

Immediately after birth, the newborn should be evaluated while the infant is supine under a radiant warmer.

Subsequent Assessment

After the initial newborn assessment, the child will be assessed using the following physical assessment guide.

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INITIAL NEWBORN ASSESSMENT

Assessment Procedure	Normal Findings	Abnormal Findings
Apgar Score		
Assign Apgar scores at 1 and at 5 minutes after delivery. The Apgar Score is an assessment of infant's ability to adapt to extrauterine life. Assess the following:	The score is 8 to 10. See Table 30-1 for Apgar scoring.	A score of less than 8 may indicate poor transition from intrauterine to extrauterine life.
Auscultate apical pulse.	The pulse is less than 100 bpm.	Pulse is greater the 100 bpm, indicating bradycardia. Absent heartbeat indicates fetal demise.
Inspect chest and abdomen for respiratory effort.	The newborn is crying.	The newborn has absent, slow, or irregular respirations.
Inspect muscle tone by extending legs and arms. Observe degree of flexion and resistance in extremities.	The extremities are flexed, and you note active movement.	Delayed neurologic function may be seen in grimace, no response.
Inspect body and extremities for skin color.	The full body should be pink (acrocyanosis).	The newborn is cyanotic, pale.
Vital signs		
Monitor axillary temperature (Fig. 30-5).	Temperature is 97.5 to 99°F (36.4 to 37.2°C).	A temperature of less than 97.5°F (36.4°C) indicates hypothermia, which may suggest sepsis. A temperature of greater than 99°F (37.2°C) indicates hyperthermia. (Consider infection or improper monitoring of temperature probe).
Inspect and auscultate lung sounds.	Breathing is easy and nonlabored. The lungs are clear bilaterally.	Abnormal findings include labored breathing, nasal flaring, rhonchi, rales, retractions or grunting.
Monitor respiratory rate.	Rate is 30 to 60 breaths/min.	A rate less than 30 or greater than 60 breaths/min is seen with respiratory distress.

Table 30-1 APGAR Scoring

	Scores 0	Scores 1	Scores 2
Heart rate	Absent	<100 bpm	>100 bpm
Respiratory rate	Absent	Slow, irregular	Good lusty cry
Reflex irritability	No response	Grimace, some motion	Cry, cough
Muscle tone	Flaccid, limp	Flexion of extremities	Active flexion
Color	Cyanotic, pale	Pink body, acrocyanosis	Pink body, pink extremities

continued

Assessment Procedure	Normal Findings	Abnormal Findings
Auscultate apical pulse.	Pulse is regular and within a range of 120 to 140 beats/min while at rest. The rate may rise to 180 beats/min when crying or or fall to 100 beats/min when sleeping.	Pulse is irregular or the rate is above 180 beats/min while crying; below 100 beats/min while sleeping may indicate cardiac abnormalities.
Measurements		
Weigh the newborn using a newborn scale (Fig. 30-6). The child should be unclothed.	The newborn weighs between 2500 to 4000 g.	Weight is less than 2500 g or greater than 4000 g.
Measure length (Fig. 30-7).	The newborn is 44 to 55 cm.	Length is less than 44 or greater than 55 cm.
Measure head circumference (Fig. 30-8). (See instructions below under Subsequent Assessment.)	Circumference is 33 to 35.5 cm.	Circumference is less than 33 cm or greater than 35.5 cm. This may indicate microcephaly, improper brain growth, premature closing of the sutures, intrauterine infection, or chromosomal defect.
Measure chest circumference. Place tape measure at nipple line and wrap around infant.	Circumference is 30 to 33 cm (1 to 2 cm less than head).	Circumference is less than 29 cm or greater than 34 cm.

Figure 30-5 Measuring the newborn's axillary temperature.

Figure 30-6 Weighing the newborn.

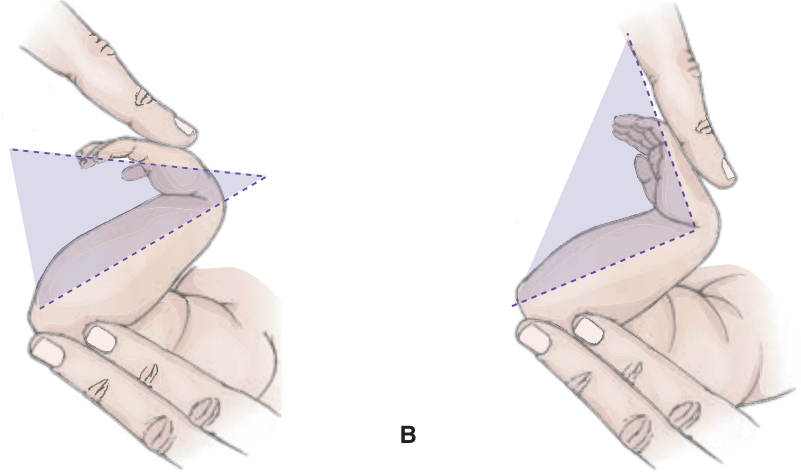
Figure 30-7 Measuring the length of the newborn.

Figure 30-8 Measuring the circumference of an infant's head (© B. Proud).

continued

INITIAL NEWBORN ASSESSMENT *Continued*

Assessment Procedure	Normal Findings	Abnormal Findings
Gestational Age		
Assess gestational age within four hours after birth to identify any potential age-related problems that may occur within the next few hours. This exam requires assessing the newborn's neuromuscular and physical maturity. Use the Ballard Scale to rate.		
To assess neuromuscular maturity (with the newborn in supine position):		
Inspect posture (with the newborn undisturbed).	Arms and legs are flexed.	In premature children, the newborn's arms and legs may be limp and extend away from the body.
Assess for square window sign. Bend wrist toward ventral forearm until resistance is met. Measure angle.	Angle is 0 to 30° (Fig. 30-9).	Premature newborns may have a square window measurement of less than 30°.
Test arm recoil. Bilaterally flex elbows up.	Elbow angle is less than 90° and the arm rapidly recoils to a flexed state.	In premature children, elbow angle may be greater than 110° and delayed recoil may be seen.
Assess popliteal angle. Flex thigh on top of the abdomen; push behind the ankle and extend the lower leg up towards the head until resistance is met. Measure the angle behind the knee.	The angle should be less than 100°.	Premature children may have a popliteal angle of greater than 100°.
Assess for Scarf sign. Lift the arm across the chest toward the opposite shoulder until resistance is met; note location of elbow in relation to midline of chest.	Elbow position is less than midline of chest (Fig. 30-10).	In premature children, elbow position is at midline of chest or greater (toward opposite shoulder) (Fig. 30-10).
Perform heel to ear test. Keeping buttocks flat on the bed, pull leg toward ear on same side of the body; inspect popliteal angle and proximity of heel to ear.	Popliteal angle is less than 90°; heel is distal from ear.	In premature infants, popliteal angle may be greater than 90°, and the heel may be proximal to ear.



A B

Figure 30-9 Square window sign: (A) term infant (B) preterm infant.

continued

Assessment Procedure	Normal Findings	Abnormal Findings
To assess for physical maturity:		
Inspect skin.	Inspection reveals parchment, few or no vessels on the abdomen, and crackling, especially in the ankle area.	Inspection reveals translucent, visible veins; rash; leathery, wrinkled skin that is seen in most postmature children.
Inspect for lanugo.	Normally there is thinning and balding on the back, shoulders, and knees.	In premature children, abundant amounts of fine hair may be seen on the face.
Inspect the plantar surface of the feet for creases.	There are creases on the anterior two thirds or entire sole.	Transverse crease on sole only, no creases, or fewer creases indicate prematurity.
Inspect and palpate breast bud tissue with middle finger and forefinger; measure bud in millimeters.	The areola is raised and full.	In premature infants, there may be an absence of breast tissue and a bud less than 3 mm.
Observe ear cartilage in upper pinna for curving. Fold pinna down toward side of the head and release; note recoil of the ear.	Normally you find a well-curved pinna, well-formed cartilage, and instant recoil.	With prematurity, you may find a slightly curved pinna and slow recoil.
Inspect the genitals. *Male:* Assess scrotum for rugae and palpate position of testes.	*Male:* There are deep rugae; testes are positioned down in scrotal sac.	*Male:* There is decreased presence of rugae; testes are positioned in upper inguinal canal.
Female: Inspect labia majora, labia minora, and clitoris.	*Female:* Labia majora cover labia minora and clitoris.	*Female:* In prematurity, labia majora and labia minora are equally prominent and clitoris is prominent.
Determine score rating: Use Figure 30-11. Mark the boxes that most closely represent each observation.	Score totals 35 to 45.	Score totals less than 35 or greater than 45.

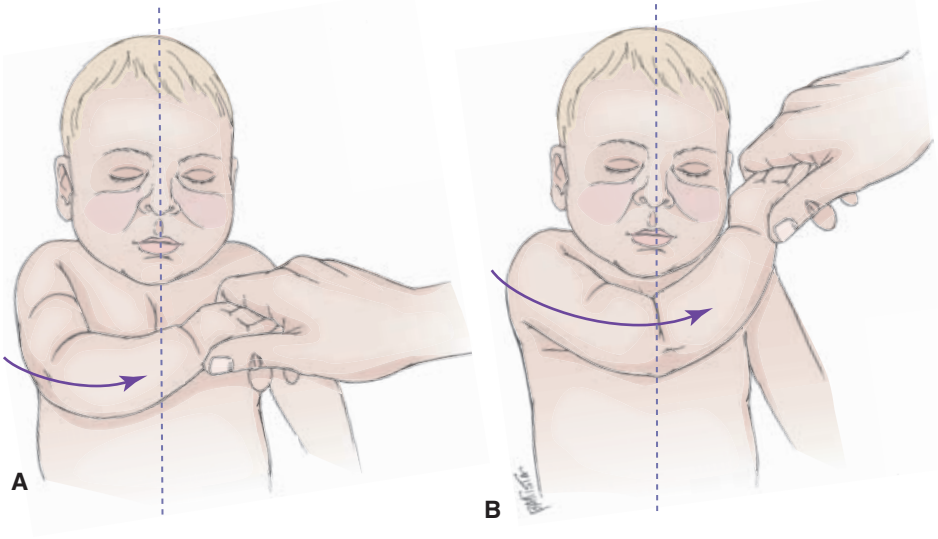


Figure 30-10 Scarf sign: (A) term infant; (B) preterm infant.

continued

INITIAL NEWBORN ASSESSMENT *Continued*

Assessment Procedure	Normal Findings	Abnormal Findings
Newborn Reflexes		
Assess newborn reflexes. See Display 30-1 for techniques.	See Display 30-1.	See Display 30-1.

NEUROMUSCULAR MATURITY

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

PHYSICAL MATURITY

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

SCORE
Neuromuscular ____
Physical ____
Total ____

MATURITY RATING

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

GESTATIONAL AGE (weeks)
By dates ____
By ultrasound ____
By exam ____

Figure 30-11 New Ballard scale. Used to rate neuromuscular and physical maturity of gestational age.

DISPLAY 30-1 Newborn Reflexes: Differentiating Normal and Abnormal Findings

The reflexes illustrated and described below are the most commonly tested newborn reflexes. These reflexes are present in all normal newborns, and most disappear within a few months after birth. Therefore, absence of a reflex at birth or persistence of a reflex past a certain age may indicate a problem with central nervous system function.

Rooting Reflex

To elicit the rooting reflex, touch the newborn's upper or lower lip or cheek with a gloved finger or sterile nipple. The newborn will move the head toward the stimulated area and open the mouth.

Disappearance of Reflex

The rooting reflex disappears by 3 to 4 months.

Abnormal Findings

Absence of a rooting indicates serious CNS disease.

Sucking Reflex

Place a gloved finger or nipple in the newborn's mouth, and note the strength of the sucking response. (A diminished response is normal in a recently fed newborn.)

Disappearance of Reflex

This reflex disappears at 10 to 12 months.

Abnormal Findings

A weak or absent sucking reflex may indicate a neurologic disorder, prematurity, or CNS depression caused by maternal drug use or medication during pregnancy.

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DISPLAY 30-1 Newborn Reflexes: Differentiating Normal and Abnormal Findings *Continued*

Palmar Grasp Reflex

Press your fingers against the palmar surface of the newborn's hand from the ulnar side. The grasp should be strong—you may even be able to pull the newborn to a sitting position.

Disappearance of Reflex

This reflex disappears at 3 to 4 months.

Abnormal Findings

A diminished response usually indicates prematurity; no response suggests neurologic deficit; asymmetric grasp suggests fracture of the humerus or peripheral nerve damage. If this reflex persists past 4 months, cerebral dysfunction may be present.

Plantar Grasp Reflex

Touch the ball of the newborn's foot. The toes should curl downward tightly.

Disappearance of Reflex

This reflex disappears at 8 to 10 months.

Abnormal Findings

A diminished response usually indicates prematurity; no response suggests neurologic deficit.

continued

DISPLAY 30-1 Newborn Reflexes: Differentiating Normal and Abnormal Findings *Continued*

Tonic Neck Reflex

The newborn should be supine. Turn the head to one side with newborn's jaw at the shoulder. The tonic neck reflex is present when the arm and leg on the side to which the head is turned extend and the opposite arm and leg flex. This reflex usually does not appear until 2 months of age.

Disappearance of Reflex

This reflex disappears by 4 to 6 months. The reflex may not occur every time that the examiner tries to elicit it, in which case, repeat stimulus of turning head to one side to re-elicit the response.

Abnormal Findings

If this reflex persists until later in infancy, brain damage is usually present.

Moro (or Startle) Reflex

The Moro reflex is a response to sudden stimulation or an abrupt change in position. This reflex can be elicited by using either one of the following two methods:

1. Hold the infant with the head supported and rapidly lower the whole body a few inches.
2. Place the infant in the supine position on a flat, soft surface. Hit the surface with your hand or startle the infant in some way.

The reflex is manifested by the infant slightly flexing and abducting the legs, laterally extending and abducting the arms, forming a "C" with thumb and forefinger, and fanning the other fingers. This is immediately followed by anterior flexion and adduction of the arms. All movements should be symmetric.

Disappearance of Reflex

This reflex disappears by 3 months.

Abnormal Findings

An asymmetric response suggests injury of the part that responds more slowly. Absence of a response suggests CNS injury. If the reflex was elicited at birth and disappears later, cerebral edema or intracranial hemorrhage is suspected. Persistence of the response after 4 months suggests CNS injury.

continued on page 662

DISPLAY 30-1 Newborn Reflexes: Differentiating Normal and Abnormal Findings *Continued*

Babinski Reflex

Hold the newborn's foot and stroke up the lateral edge and across the ball. A positive Babinski reflex is fanning of the toes. Many normal newborns will not exhibit a positive Babinski reflex; instead, they will exhibit the normal adult response, which is flexion of the toes. Response should always be symmetric bilaterally.

Disappearance of Reflex

This reflex disappears within 2 years.

Abnormal Findings

A positive response after 2 years suggests pyramidal tract disease.

Stepping Reflex

Hold the newborn upright from behind, provide support under the arms, and let the newborn's feet touch a surface. The reflex response is manifested by the newborn stepping with one foot and then the other in a walking motion.

Disappearance of Reflex

This reflex usually disappears within 2 months.

Abnormal Findings

An asymmetric response may indicate injury of the leg, CNS damage, or peripheral nerve injury.

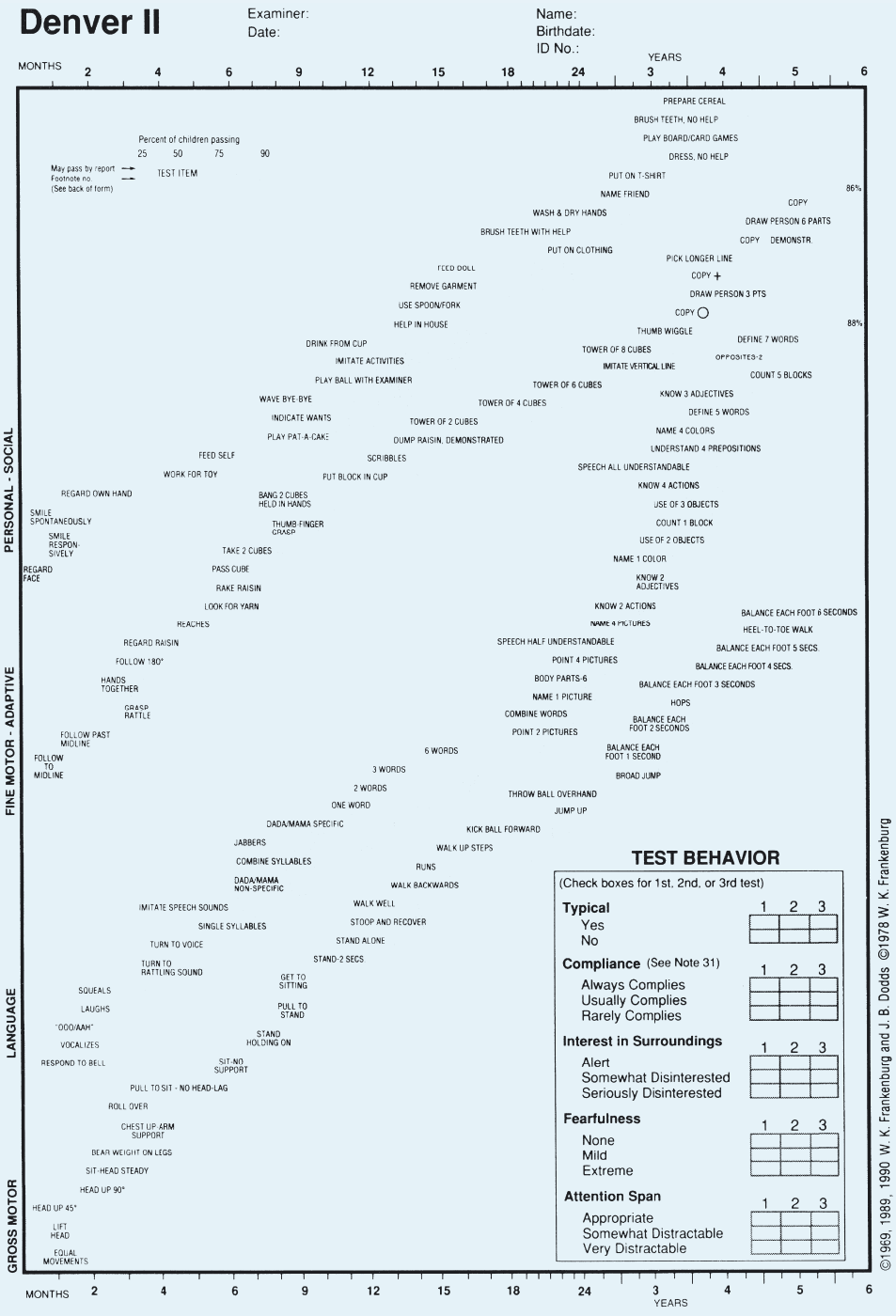
SUBSEQUENT PHYSICAL ASSESSMENT

Assessment Procedure	Normal Findings	Abnormal Findings
General Appearance and Behavior		
Observe general appearance. Observe hygiene. Note interaction with parents and yourself (and siblings if present). Note also facies (facial expressions) and posture.	Child appears stated age; is clean, has no unusual body odor, and clothing is in good condition and appropriate for climate. Child is alert, active, responds appropriately to stress of the situation. Child is appropriately interactive for age, seeks comfort from parent; appears happy. Newborn's arms and legs are in flexed position.	Note any facies that indicate acute illness, respiratory distress. Flaccidity or rigidity in newborn may be from neurologic damage, sepsis, or pain. Poor hygiene and clothes may indicate neglect, poverty. Child does not appear stated age (mental retardation, abuse, neglect).
Developmental Assessment		
Screen for cognitive, language, social, and gross and fine motor developmental delays in the beginning of the physical assessment in infants. Assessment Tool 30-1 presents the DDST II and directions for its use.	Child meets normal parameters for age. See information contained in subjective data section.	Child lags in earlier stages.
Vital Signs		
Assess temperature. Use rectal, axillary, skin, or tympanic route when assessing the temperature of an infant. The rectal temperature is most accurate. To take a rectal temperature in a newborn, lay the child supine and lift lower legs up into the air, bending the legs at the hips. Insert lubricated rectal thermometer no more than 2 cm into rectum. Temperature registers in 3 to 5 min on a rectal thermometer. Axillary and/or tympanic temperature may also be used. For axillary temperature, place the thermometer under axilla, holding arm close to chest for approximately 3 to 5 minutes. For tympanic temperature, use digital tympanic thermometer as directed in manufacturer's instructions.	Temperature is 99.4°F (because of excess heat production).	Temperature may be altered by exercise, stress, crying, environment, diurnal variation (highest between 4 and 6 PM). Both hyperthermic and hypothermic conditions are noted in children.

continued on page 666

ASSESSMENT TOOL 30-1 Using the Denver Developmental Screening Test

The following is an example of the Denver Developmental Screening Test (DDST), which assesses a child's gross motor, language, fine motor, and personal social development according to the child's age. Testing kits, test forms, and reference manuals (which must be used to ensure accuracy in administering the test) may be ordered from Denver Developmental Materials Inc., P.O. Box 6919, Denver, CO 80206-0919. (Reprinted with permission from William K. Frankenburg, M.D.).



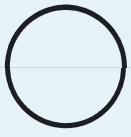
Testing kits, test forms, and reference manuals (which must be used to ensure accuracy in administration of the test) for the DDST may be ordered from Denver Developmental Materials Incorporated, P.O. Box 6919, Denver, CO 80206-0919. (Reprinted with permission from William K. Frankenburg, M.D.)

continued

ASSESSMENT TOOL 30-1 **Using the Denver Developmental Screening Test *Continued***

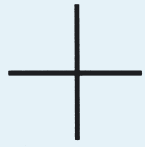
DIRECTIONS FOR ADMINISTRATION

1. Try to get child to smile by smiling, talking or waving. Do not touch him/her.
2. Child must stare at hand several seconds.
3. Parent may help guide toothbrush and put toothpaste on brush.
4. Child does not have to be able to tie shoes or button/zip in the back.
5. Move yarn slowly in an arc from one side to the other, about 8" above child's face.
6. Pass if child grasps rattle when it is touched to the backs or tips of fingers.
7. Pass if child tries to see where yarn went. Yarn should be dropped quickly from sight from tester's hand without arm movement.
8. Child must transfer cube from hand to hand without help of body, mouth, or table.
9. Pass if child picks up raisin with any part of thumb and finger.
10. Line can vary only 30 degrees or less from tester's line.
11. Make a fist with thumb pointing upward and wiggle only the thumb. Pass if child imitates and does not move any fingers other than the thumb.

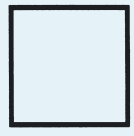


12. Pass any enclosed form. Fail continuous round motions.

13. Which line is longer? (Not bigger.) Turn paper upside down and repeat. (pass 3 of 3 or 5 of 6)



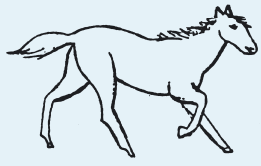
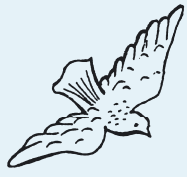
14. Pass any lines crossing near midpoint.



15. Have child copy first. If failed, demonstrate.

When giving items 12, 14, and 15, do not name the forms. Do not demonstrate 12 and 14.

16. When scoring, each pair (2 arms, 2 legs, etc.) counts as one part.
17. Place one cube in cup and shake gently near child's ear, but out of sight. Repeat for other ear.
18. Point to picture and have child name it. (No credit is given for sounds only.)
    If less than 4 pictures are named correctly, have child point to picture as each is named by tester.

19. Using doll, tell child: Show me the nose, eyes, ears, mouth, hands, feet, tummy, hair. Pass 6 of 8.
20. Using pictures, ask child: Which one flies?... says meow?... talks?... barks?... gallops? Pass 2 of 5, 4 of 5.
21. Ask child: What do you do when you are cold?... tired?... hungry? Pass 2 of 3, 3 of 3.
22. Ask child: What do you do with a cup? What is a chair used for? What is a pencil used for? Action words must be included in answers.
23. Pass if child correctly places and says how many blocks are on paper. (1, 5).
24. Tell child: Put block **on** table; **under** table; **in front of** me, **behind** me. Pass 4 of 4. (Do not help child by pointing, moving head or eyes.)
25. Ask child: What is a ball?... lake?... desk?... house?... banana?... curtain?... fence?... ceiling? Pass if defined in terms of use, shape, what it is made of, or general category (such as banana is fruit, not just yellow). Pass 5 of 8, 7 of 8.
26. Ask child: If a horse is big, a mouse is __? If fire is hot, ice is __? If the sun shines during the day, the moon shines during the __? Pass 2 of 3.
27. Child may use wall or rail only, not person. May not crawl.
28. Child must throw ball overhand 3 feet to within arm's reach of tester.
29. Child must perform standing broad jump over width of test sheet (8 1/2 inches).
30. Tell child to walk forward, → heel within 1 inch of toe. Tester may demonstrate. Child must walk 4 consecutive steps.
31. In the second year, half of normal children are non-compliant.

OBSERVATIONS:

SUBSEQUENT PHYSICAL ASSESSMENT *Continued*

Assessment Procedure	Normal Findings	Abnormal Findings
Note apical pulse rate. Count the pulse for a full minute (Fig. 30-12).	Awake and resting rates vary with the age of the child. For a newborn to 1 month-old child it should be 120 to 160 beats/minute. Rate decrease gradually with age. At 6 months to 1 year, rate is approximately 110 beats/minute.	Pulse may be altered by medications, activity, and pain as well as pathologic conditions. Bradycardia (<100 beats/min) in an infant is usually an ominous finding.
Assess respiratory rate. Measure respiratory rate and character in infants by observing abdominal movements.	Neonates: Rate is 30 to 60 breaths/minute. Breathing is unlabored; lung sounds clear. Newborns are obligatory nose breathers.	Respiratory rate and character may be altered by medications, positioning, fever, activity as well as pathologic conditions.
Evaluate blood pressure. Newborn blood pressure: A Doppler stethoscope should be used or an electronic Dynamap machine may be used to record blood pressure readings in the newborn. ➤ ***Clinical Tip*** • *The child should not be crying as this can elevate blood pressure.*	Specific to age and size.	➤ ***Clinical Tip*** • *If the blood pressure reading is too high for age, the cuff may be too small; it should cover two-thirds of the child's upper arm. If the blood pressure reading is too low for age, the cuff may be too large. Chapter 8 explains how to take a blood pressure reading.*

Figure 30-12 Auscultating apical pulse rate in the infant (© B. Proud).

continued

Assessment Procedure	Normal Findings	Abnormal Findings
Measurements		
Measure height. Determine height by measuring the recumbent length. Fully extend the body, holding the head in midline and gently grasping the knees and pushing them downward until the legs are fully extended and touching the table (Fig. 30-13). If using a measuring board, place the head at the top of the board and the heels firmly at the bottom. Without a board, use paper under the child and mark the paper at the top of the head and bottom of the heels. Then measure the distance between the two points. Plot height measurement on an age- and gender-appropriate growth chart.	See Appendix F for growth charts. Asian and black newborns are smaller than Caucasian newborns. Asian children are smaller at all ages.	Significant deviation from normal in the growth charts would be considered abnormal.
Measure weight. Measure weight on an appropriately sized beam scale with nondetectable weights. Weigh an infant lying or sitting on a scale that measures to the nearest 0.5 oz or 10 g (Fig. 30-14). Weigh an infant naked. Plot weight measurement on age- and gender-appropriate growth chart.	See the growth charts in Appendix F for normal findings.	Deviation from the wide range of normal weights is abnormal. See Appendix F and compare differences.

Figure 30-13 Positioning for measuring an infant.

Figure 30-14 Weighing an infant (© B. Proud).

continued

SUBSEQUENT PHYSICAL ASSESSMENT *Continued*

Assessment Procedure	Normal Findings	Abnormal Findings
Determine head circumference. Measure head circumference (HC) or occipital frontal circumference (OFC) at every physical examination for infants and toddlers younger than 2 years and older children when conditions warrant. Plot the measurement on standardized growth charts specific for gender from birth to 36 months.	HC (OFC) measurement should fall between the 5th and 95th percentiles and should be comparable to the child's height and weight percentiles.	HC (OFC) not within the normal percentiles may indicate pathology. Those greater than 95% may indicate macrocephaly. Those under the 5th percentile may indicate microcephaly.
Skin, Hair, and Nails		
Assess for skin color, odor, and lesions.	Skin color ranges from pale white with pink, yellow, brown, or olive tones to dark brown or black. No strong odor should be evident, and the skin should be lesion free. Skin should be soft, warm, slightly moist with good turgor and without edema or lesions. Common newborn skin variations include • Physiologic jaundice • Birthmarks • Milia (Fig. 30-15) • Erythema toxicum (Fig. 30-15) • Telangiectatic nevi (stork bites) (Fig. 30-15) Another common variation is harlequin sign (one side of the body turns red; the other side is pale). There is a distinct color line separation at midline. The cause is unknown.  Dark-skinned newborns have lighter skin color than their parents. Their color darkens with age. Bluish pigmented areas called Mongolian spots (Fig. 30-15) may be noted on the sacral areas of Asian, black, Native American, and Mexican-American infants.	Yellow skin may indicate jaundice or passage of meconium in utero secondary to fetal distress. Jaundice within 24 hours after birth is pathologic and may indicate hemolytic disease of the newborn. Blue skin suggests cyanosis, pallor suggests anemia, and redness suggests fever, irritation.

continued

Assessment Procedure	Normal Findings	Abnormal Findings
Palpate for texture, temperature, moisture, turgor, and edema.	Skin is warm and slightly moist. Vernix caseosa (cheesy, white substance that is found on the skin, especially in skin folds) is a common finding; it eventually absorbs into the skin.	Ecchymoses in various stages or in unusual locations or circular burn areas suggest child abuse although bruising or burning may also be from cultural practices such as *cupping* or *coining*. Petechiae, lesions, or rashes may indicate serious disorders.
Inspect and palpate hair. Observe for distribution, characteristics, and presence of any unusual hair on body.	Hair is normally lustrous, silky, strong, and elastic. Fine, downy hair covers the body. African-American children usually have hair that is curlier and coarser than white children.	Dirty, matted hair may indicate neglect. Tufts of hair over spine may indicate spina bifida occulta.
Inspect and palpate nails. Note color, texture, shape, and condition of nails.	Dark-skinned children have deeper nail pigment. Nails extend to end of fingers or beyond; are well-formed.	Blue nailbeds indicate cyanosis. Yellow nailbeds indicate jaundice. Blue-black nailbeds suggest a nailbed hemorrhage.

Figure 30-15 Common skin variations found in newborns: (A) milia; (B) erythema toxicum; (C) telangiectatic nevi; (D) Mongolian spot.

continued

SUBSEQUENT PHYSICAL ASSESSMENT *Continued*

Assessment Procedure	Normal Findings	Abnormal Findings
Head, Neck, and Cervical Lymph Nodes		
Inspect and palpate the head. Note shape and symmetry. In newborns, inspect and palpate the condition of fontanelles and sutures (Fig. 30-16).	Head is normocephalic and symmetric. In newborns, the head may be oddly shaped from molding (overriding of the sutures) during vaginal birth. The diamond-shaped anterior fontanelle measures about 4 to 5 cm at its widest part; it usually closes by 12 to 18 months. The triangular posterior fontanelle measures about 0.5 to 1 cm at its widest part and it should close at 2 months of age.	A very large head is found with hydrocephalus. An oddly shaped head is found with premature closure of sutures (possibly genetic). One-sided flattening of the head suggests prolonged positioning on one side. A third fontanelle between the anterior and posterior fontanelle is seen with Down's syndrome. Premature closure of sutures (craniosynostosis) may result in caput succedaneum (edema from trauma), which crosses the suture line, and cephalohematoma (bleeding into the periosteal space), which does not extend across the suture line (Fig. 30-17). Craniotabes may result from osteoporosis of the outer skull bone. Palpating too firmly with the thumb or forefinger over the temporoparietal area will leave an indentation of the bone. Bulging fontanelle indicates increased cranial pressure. Microcephaly is seen with infants who have been exposed to congenital infections.

Figure 30-16 Palpating the anterior fontanel (© B. Proud).

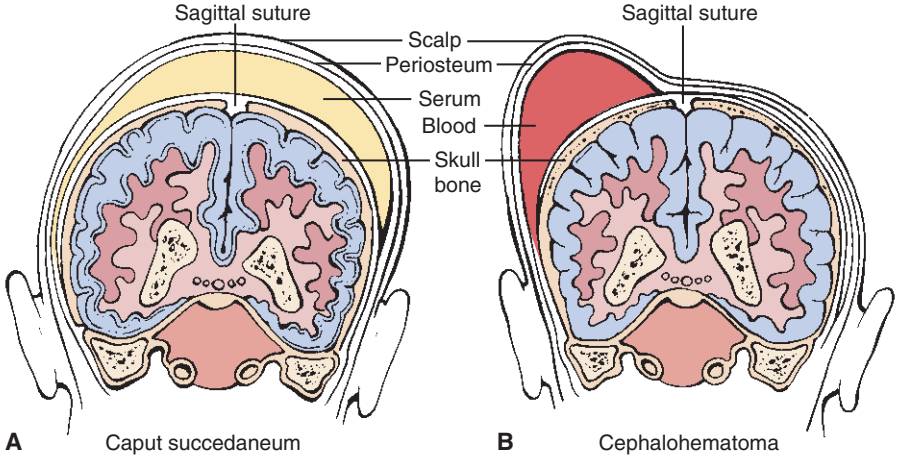


Figure 30-17 Premature suture closure may result in (A) caput succedaneum and (B) cephalohematoma.

continued

Assessment Procedure	Normal Findings	Abnormal Findings
Test head control, head posture, range of motion.	Full range of motion—up, down, and sideways—is normal. **Infant should have head control at 4 months.**	Hyperextension is seen with opisthotonos or significant meningeal irritation. Limited range of motion may indicate torticollis (wryneck).
Inspect and palpate the face. Note appearance, symmetry, and movement. Palpate the parotid glands for swelling.	Face is normally proportionate and symmetric. Movements are equal bilaterally. Parotid glands are normal size.	Unusual proportions (short palpebral fissures, thin lips, and wide and flat philtrum, which is the groove above the upper lip) may be hereditary or they may indicate specific syndromes such as Down's syndrome and fetal alcohol syndrome. Unequal movement may indicate facial nerve paralysis. Abnormal facies may indicate chromosomal anomaly.
Inspect and palpate the neck. Palpate the thyroid gland and the trachea. Also inspect and palpate the cervical lymph nodes for swelling, mobility, temperature, and tenderness. ➤ ***Clinical Tip*** • *The thyroid is very difficult to palpate in an infant because of the short, thick neck.*	The neck is usually short with skin folds between the head and shoulder during infancy. The isthmus is the only portion of the thyroid that should be palpable. The trachea is midline. Lymph nodes are usually nonpalpable in infants. Clavicles are symmetrical and intact.	Implications of some abnormal findings include the following: Short, webbed neck suggests anomalies or syndromes such as Down's syndrome. Distended neck veins may indicate difficulty breathing. Enlarged thyroid or palpable masses suggest a pathologic process. Shift in tracheal position from midline suggests a serious lung problem (e.g., foreign body or tumor). Crepitus when clavicle palpated along with decreased movement in arm of that side may indicate fractured clavicle.
Eyes		
Inspect the external eye. Note the position, slant, and epicanthal folds of the external eye.	Inner canthus distance approximately 2.5 cm, horizontal slant, no epicanthal folds. Outer canthus aligns with tips of the pinnas.  Epicanthal folds (excess of skin extending from roof of nose that partially or completely covers the inner canthus) are normal findings in Asian children, whose eyes also slant upward.	Wide-set position (hypertelorism), upward slant, and thick epicanthal folds suggest Down syndrome. "Sun-setting" appearance (upper lid covers part of the iris) suggests hydrocephalus.
Observe eyelid placement, swelling, discharge, and lesions.	Eyelids have transient edema, absence of tears.	Eyelid inflammation may result from infection. Swelling, erythema, or purulent discharge may indicate infection or blocked tear ducts.

continued

SUBSEQUENT PHYSICAL ASSESSMENT *Continued*

Assessment Procedure	Normal Findings	Abnormal Findings
		Purulent discharge seen with sexually transmitted infections (gonorrhea, chlamydia).
Inspect the sclera and conjunctiva for color, discharge, lesions, redness, and lacerations.	Sclera and conjunctiva are clear and free of discharge, lesions, redness, or lacerations. Small subconjunctival hemorrhages may be seen in newborns.	Yellow sclera suggests jaundice, blue sclera may indicate osteogenesis imperfecta ("brittle bone disease").
Observe the iris and the pupils.	Typically the iris is blue in light-skinned infants and brown in dark-skinned infants; permanent color develops within 9 months. Brushfield's spots (white flecks on the periphery of the iris) may be normal in some infants. Pupils are equal, round, and reactive to light and accommodation (PERRLA).	Brushfield's spots may indicate Down syndrome. Sluggish pupils indicate a neurologic problem. Miosis (constriction) indicates iritis or narcotic use or abuse. Mydriasis (pupillary dilation) indicates emotional factors (fear), trauma, or certain drug use.
Finally inspect the eyebrows and eyelashes.	Eyebrows should be symmetric in shape and movement. They should not meet midline. Eyelashes should be evenly distributed and curled outward.	Sparseness of eyebrows or lashes could indicate skin disease.
Perform visual acuity tests. Assess visual acuity by observing infants inability to gaze at object.	Visual acuity is difficult to test in infants; it is usually tested by observing the infant's ability to fix on and follow objects. Normal visual acuity is as follows: Birth: 20/100 to 20/400 1 year: 20/200 By 4 weeks of age, child should be able to fixate on objects. By 6 to 8 weeks, eyes should follow a moving object. By 3 months, the child is able to follow and reach for an object.	Children with a one-line difference between eyes should be referred. Abnormal findings include congenital defects such as cataracts.
Perform extraocular muscle tests. Hirschberg test: Shine light directly at the cornea while the child looks straight ahead.	In the Hirschberg test, the light reflects symmetrically in the center of both pupils. Light causes pupils to vasoconstrict bilaterally and blink reflex occurs. Blink reflex also occurs as an object is brought towards the eyes.	Unequal alignment of light on the pupils in the Hirschberg test signals strabismus.
Perform ophthalmoscopic examination. The procedure is the same as for adults. Distraction is preferred over the use of restraint, which is likely to result in crying and closed eyes. Careful ophthalmoscopic examination of newborns is difficult without the use of mydriatic medications.	Red reflex is present. This reflex rules out most serious defects of the cornea, aqueous chamber, lens, and vitreous humor. When visualized, the optic disc appears similar to an adult's. A newborn's optic discs are pale; peripheral vessels are not well developed.	Absence of the red reflex indicates cataracts. Papilledema is unusual in children of this age owing to the ability of the fontanelles and sutures to open during increased intracranial pressure. Disc blurring and hemorrhages should be reported immediately.

continued

Assessment Procedure	Normal Findings	Abnormal Findings
Ears		
Inspect external ears. Note placement, discharge, or lesions of the ears.	Top of pinna should cross the eye-occiput line and be within a 10-degree angle of a perpendicular line drawn from the eye-occiput line to the lobe. No unusual structure or markings should appear on the pinna.	Low-set ears with an alignment greater than a 10-degree angle (Fig. 30-18) suggest retardation or congenital syndromes. Abnormal shape may suggest renal disease process, which may be hereditary. Preauricular skin tags or sinuses suggest other anomalies of ears or the renal system.
Inspect internal ear. The internal ear examination requires using an otoscope. The nurse should always hold the otoscope in a manner that allows for rapid removal if the child moves. Have the caregiver hold and restrain the child. Because an infant's external canal is short and straight, pull the pinna down and back (Fig. 30-19).	No excessive cerumen, discharge, lesions, excoriations, or foreign body in external canal. Amniotic fluid/vernix may be present in canal of ear of newborn. Tympanic membrane is pearly gray to light pink with normal landmarks. Tympanic membranes redden bilaterally when child is crying or febrile.	Presence of foreign bodies or cerumen impaction. Purulent discharge may indicate otitis externa or presence of foreign body. Purulent, serous discharge suggests otitis media. Bloody discharge suggests trauma, and clear discharge may indicate cerebrospinal fluid leak. Perforated tympanic membrane may also be noted.
Assess the mobility of the tympanic membrane by pneumatic otoscopy. This consists of creating pressure against the tympanic membrane using air. To do this, you need to create a seal in the external canal and direct a puff of air against the tympanic membrane. Create the seal by using the largest speculum that will comfortably insert into the ear canal. Cover the tip with rubber for a better and more comfortable seal. Attach a pneumatic bulb to the otoscope and squeeze the bulb lightly to direct air against the tympanic membrane.	Tympanic membrane is mobile; moves inward with positive pressure (squeeze of bulb) and outward with negative pressure (release of bulb).	Immobility indicates fluid behind tympanic membrane.

Figure 30-18 Low-set ears with alignment greater than 10-degree angle.

Figure 30-19 To examine the ears of an infant, restrain the child and pull the pinna down and back (© B. Proud).

continued

SUBSEQUENT PHYSICAL ASSESSMENT *Continued*

Assessment Procedure	Normal Findings	Abnormal Findings
Hearing acuity. In the infant, test hearing acuity by noting the reaction to noise. Stand approximately 12 inches from the infant and create a loud noise (e.g., clap hands, shake/squeeze a noisy toy). Routine newborn hearing screening is performed in most newborn nurseries 24 to 48 hours after birth or prior to discharge.	A newborn will exhibit the startle (Moro) reflex and blink eyes (acoustic blink reflex) in response to noise. Older infant will turn head.	No reactions to noise may indicate a hearing deficit. Audiometry results outside normal range suggest hearing deficit.
Mouth, Throat, Nose, and Sinuses		
Inspection		
Inspect mouth and throat. Note the condition of the lips, palates, tongue, and buccal mucosa.	Epstein's pearls, small yellow-white retention cysts on the hard palate and gums, are common in newborns and usually disappear in the first weeks of life. In infants, a sucking tubercle (pad) from the friction of sucking may be evident in the middle of the upper lip.	Cleft lip and/or palate are congenital abnormalities.
Observe the condition of the gums. When teeth appear, count teeth and note location.	Gums appear pink and moist. Teeth may begin erupting at 4 to 6 months. Teeth develop in sequential order. By 10 months, most infants have two upper and two lower central incisors.	Abnormal findings include lesion and edema.
Note the condition of the throat and tonsils. Also observe the insertion and ending point of the frenulum.	Tonsils are not visible in newborns. As the infant gets older, it is possible but still difficult to see tonsils.	Extension of the frenulum to the tip of tongue may interfere with extension of the tongue, which causes speech difficulties.
Inspect nose and sinuses. To inspect the nose and sinuses, avoid using the nasal speculum in infants and young children. Instead push up the tip of the nose and shine the light into each nostril. Observe the structure and patency of the nares, discharge, tenderness, and any color or swelling of the turbinates. ➤ ***Clinical Tip*** • *Infants are obligatory nose breathers. Consequently obstructed nasal passages may precipitate serious health conditions, making it very important to assess the patency of the nares in the newborn. If, after suctioning fluid and mucus from the nares, you suspect obstruction, insert a small-lumen catheter into each nostril to assess patency.*	Nose is midline in face, septum is straight, and nares are patent. No discharge or tenderness is present. Turbinates are pink and free of edema. Milia are small, white papules found on the nose, forehead and chin. They develop from retention of sebum in sebaceous pores. They usually resolve spontaneously within a few weeks.	Choanal atresia is blockage of the posterior nares in the newborn. If the blockage is bilateral, the newborn is at risk for acute respiratory distress. Immediate referral is necessary. Deviated septum may be congenital or caused by injury. Foul discharge from one nostril may indicate a foreign body.

continued

Assessment Procedure	Normal Findings	Abnormal Findings
Thorax		
Inspection		
Inspect the shape of the thorax.	Infant's thorax is smooth, rounded, and symmetric.	Abnormal shapes of the thorax include pectus excavatum and pectus corinatum.
Observe respiratory effort, keeping in mind newborns and young infants are obligatory nose breathers.	Respirations should be unlabored and regular in all ages except for immediate newborn period when respirations are irregular (see "Vital Signs" section). Some newborns, especially the premature, have periodic irregular breathing, sometimes with apnea (episodes when breathing stops) lasting a few seconds. This is a normal finding if bradycardia does not accompany irregular breathing.	Retractions (suprasternal, sternal, substernal, intercostal) and grunting suggest increased inspiratory effort, which may be due to airway obstruction. Periods of apnea that last longer than 20 s and are accompanied by bradycardia may be a sign of a cardiovascular or CNS disease. Nasal flaring, tachypnea, seesaw movement of chest indicate respiratory distress.
Percussion and Auscultation		
Percuss the chest. During percussion of the lungs, note tone elicited.	Hyperresonance is the normal tone elicited in infants because of thinness of the chest wall.	A dull tone may indicate a mass, fluid, or consolidation.
Auscultate for breath sounds and adventitious sounds. If a newborn lung sounds seem noisy, auscultate the upper nostrils.	Breath sounds may seem louder and harsher in young children because of their thin chest walls. No adventitious sounds should be heard although transmitted upper airway sounds may be heard on auscultation of thorax.	Diminished breath sounds suggest respiratory disorders such as pneumonia or atelectasis. Stridor (inspiratory wheeze) is a high-pitched, piercing sound that indicates a narrowing of the upper tracheobronchial tree. Expiratory wheezes indicate narrowing in the lower tracheobronchial tree. Rhonchi and rales (crackles) may indicate a number of respiratory diseases such as pneumonia, bronchitis, or bronchiolitis.
Breasts		
Inspection and Palpation		
Inspect and palpate breasts. Note shape, symmetry, color, tenderness, discharge, lesions, and masses.	Newborns may have enlarged and engorged breasts with a white liquid discharge resulting from the influence of maternal hormones (Fig. 30-20). This condition resolves spontaneously within days.	A palpable mass of the breast in abnormal. The newborn or infant may have extra nipples noted on the chest or abdomen called supernumerary nipples.

Figure 30-20 The enlarged breasts of this newborn are normal and result from the influence of maternal hormones (© 1994 Science Photo Library/CMSP).

continued

SUBSEQUENT PHYSICAL ASSESSMENT *Continued*

Assessment Procedure	Normal Findings	Abnormal Findings
Heart		
Inspection and Palpation **Inspect and palpate the precordium.** Note lifts, heaves, apical impulse (Fig. 30-21).	The apical pulse is at the 4th intercostal space (ICS) until the age of 7 years, when it drops to the 5th. It is to the left of the midclavicular line (MCL) until age 4.	A systolic heave may indicate right ventricular enlargement. Apical impulse that is not in proper location for age may indicate cardiomyopathy, pneumothorax, or diaphragmatic hernia.
Auscultation **Auscultate heart sounds.** Listen to the heart. Note rate and rhythm of apical impulse, S_1, S_2, extra heart sounds, and murmurs. Keep in mind that sinus arrhythmia is normal in infants. Heart sounds are louder, higher pitched, and of shorter duration in infants. A split S_2 at the apex occurs normally in some infants and S_3 is a normal heart sound in some children. A venous hum also may be normally heard in children.	Normal heart rates are cited in the "Vital Signs" section above. Innocent murmurs, which are common throughout childhood, are classified as systolic; short duration; no transmission to other areas; grade III or less; loudest in pulmonic area (base of heart); low-pitched, musical, or groaning quality that varies in intensity in relation to position, respiration, activity, fever, and anemia. No other associated signs of heart disease should be found.	Murmurs that do not fit the criteria for innocent murmurs may indicate a disease or disorder. Extra heart sounds and variations in pulse rate and rhythm also suggest pathologic processes.
Abdomen		
Inspection **Inspect the shape of the abdomen.**	In infants, the abdomen is prominent in supine position.	A scaphoid (boat-shaped; i.e., sunken with prominent rib cage) abdomen may result from malnutrition or dehydration. Distended abdomen may indicate pyloric stenosis.

Figure 30-21 Palpate the infant's chest for lifts and heaves (© B. Proud).

continued

Assessment Procedure	Normal Findings	Abnormal Findings
Inspect umbilicus. Note color, discharge, evident herniation of the umbilicus.	Umbilicus is pink, no discharge, odor, redness, or herniation. Cord should demonstrate three vessels (two arteries and one vein). Remnant of cord should appear dried 24 to 48 hours after birth.	Inflammation, discharge, and redness of umbilicus suggest infection. Diastasis recti (separation of the abdominal muscles) is seen as midline protrusion from the xiphoid to the umbilicus or pubis symphysis. This condition is secondary to immature musculature of abdominal muscles and usually has little significance. As the muscles strengthen, the separation resolves on its own. A bulge at the umbilicus suggests an umbilical hernia (Fig. 30-22), which may be seen in newborns; many disappear by the age of 1 year. Abnormal insertion of cord, discolored cord, or two-vessel cord could indicate genetic abnormalities; however, these are also seen in newborns without abnormalities. Umbilical hernias are seen more frequently in African American children.
Auscultation **Auscultate bowel sounds.** Follow auscultation guidelines for adult clients provided in Chapter 22.	Normal bowel sounds occur every 10 to 30 s. They sound like clicks, gurgles, or growls.	Marked peristaltic waves almost always indicate a pathologic process such as pyloric stenosis.

Figure 30-22 Umbilical hernia.

continued

SUBSEQUENT PHYSICAL ASSESSMENT *Continued*

Assessment Procedure	Normal Findings	Abnormal Findings
Palpation		
Palpate for masses and tenderness. Palpate abdomen for softness or hardness.	Abdomen is soft to palpation and without masses or tenderness.	A rigid abdomen is almost always an emergent problem. Masses or tenderness warrants further investigation. Hirschsprung's disease could also be considered, especially with suprapubic mass palpable.
Palpate liver. Palpate the liver the same as you would for adults (see Chapter 22).	Liver is usually palpable 1 to 2 cm below the right costal margin in young children. The liver is hard to palpate in the newborn.	An enlarged liver with a firm edge that is palpated more than 2 cm below the right costal margin usually indicates a pathologic process.
Palpate spleen. Palpate the spleen the same as you would for adults.	Spleen tip may be palpable during inspiration. The spleen is difficult to palpate in the newborn.	Enlarged spleen is usually indicative of a pathologic process.
Palpate kidneys. Palpate the kidneys the same as you would for adults.	The tip of the right kidney may be palpable during inspiration.	Enlarged kidneys are usually indicative of a pathologic process.
Palpate bladder. Palpate the bladder the same as you would for adults.	Bladder may be slightly palpable in infants and small children.	An enlarged bladder is usually due to urinary retention but may be due to a mass.
Male Genitalia		
Inspection and Palpation		
Inspect penis and urinary meatus. Inspect the genitalia, observing size for age and any lesions.	Penis is normal size for age, and no lesions are seen. Diaper rash, however, is a common finding in infants (Fig. 30-23). The foreskin is retractable in uncircumcised child. Urinary meatus is at tip of glans penis and has no discharge or redness. Penis may appear small in large for gestational age (LGA) boys because of overlapping skin folds. For circumcised boys, the site is dry with minimal swelling and drainage.	An unretractable foreskin in a child older than 3 months suggests phimosis. Paraphimosis is indicated when the foreskin is tightened around the glans penis in a retracted position. Hypospadias, urinary meatus on ventral surface of glans, and epispadias, urinary meatus on dorsal surface of glans, are congenital disorders (see Chapter 24).
Inspect and palpate scrotum and testes. To rule out cryptorchidism, it is important to palpate for testes in the scrotum in infants. ➤ ***Clinical Tip*** • *When palpating the testicles in the infant, you must keep the cremasteric reflex in mind. This reflex pulls the testicles up into the inguinal canal and abdomen and is elicited in response to touch, cold, or emotional factors.*	Scrotum is free of lesions. Testes are palpable in scrotum with the left testicle usually lower than the right. Testes are equal in size, smooth, mobile, and free of masses. If a testicle is missing from the scrotal sac but the scrotal sac appears well developed, suspect physiologic cryptorchidism. The testis has originally descended into the scrotum but has moved back up into the inguinal canal because of the cremasteric reflex and the small size of the testis. You should be able to milk the testis down	Absent testicle(s) and atrophic scrotum suggest true cryptorchidism (undescended testicles). This suggests that the testicle(s) never descended. This condition occurs more frequently in preterm than term infants because testes descend at 8 months of gestation. It can lead to testicular atrophy and infertility, and increases the risk for testicular cancer. Hydroceles are common in infants. They are fluid-filled masses that can be transilluminated (see Chapter 24, Abnormal Findings 24-2). They usually

continued

Assessment Procedure	Normal Findings	Abnormal Findings
	into the scrotum from the inguinal canal. This normal condition subsides at puberty.	resolve spontaneously. A scrotal hernia is usually caused by an indirect inguinal hernia that has descended into the scrotum. It can usually be pushed back into the inguinal canal. This mass will not transilluminate.
Inspect and palpate inguinal area for hernias. Observe for any bulge in the inguinal area. Using your pinky finger, palpate up the inguinal canal to the external inguinal ring if a hernia is suspected.	No inguinal hernias are present.	A bulge in the inguinal area or palpation of a mass in the inguinal canal suggests an inguinal hernia. Indirect inguinal hernias occur most frequently in children (see Chapter 24).
Female Genitalia		
Inspection **Inspect external genitalia.** Note labia majora, labia minora, vaginal orifice, urinary meatus, and clitoris.	Labia majora and minora are pink and moist. Newborn's genitalia may appear prominent because of influence of maternal hormones. Bruises and swelling may be caused by breech vaginal delivery.	Enlarged clitoris in newborn combined with fusion of the posterior labia majora suggests ambiguous genitalia.
Anus and Rectum		
Inspection **Inspect the anus.** The anus should be inspected in infants. Spread the buttocks with gloved hands; note patency of anal opening, presence of any lesions and fissures, and condition and color of perianal skin.	The anal opening should be visible, moist. Perianal skin should be smooth and free of lesions. Perianal skin tags may be noted. Meconium passed within 24 to 48 hours after birth.	Imperforate anus (no anal opening) should be referred. Pustules may indicate secondary infection of diaper rash. No passage of stool could indicate no patency of anus or cystic fibrosis.
Palpation Palpate rectum. This internal examination is not routinely performed in infants.		

Figure 30-23 Diaper rash, a common finding in infants (© Princess Margaret Rose Orthopedic Hospital/Science Photo Library/CMSP).

continued

SUBSEQUENT PHYSICAL ASSESSMENT *Continued*

Assessment Procedure	Normal Findings	Abnormal Findings
Musculoskeletal		
Inspection **Assess arms, hands, feet and legs.** Note symmetry, shape, movement, and positioning of the feet and legs. Perform neurovascular assessment. ➤ ***Clinical Tip*** • *If the client is a newborn, keep in mind that the feet may retain their intrauterine position and appear deformed (positioned outward or inward from normal right angle to the leg). This is normal if the foot easily returns to its normal position with manipulation (either scratch along the lateral edge of the affected foot or gently push the forefoot into its normal position).*	Feet and legs are symmetric in size, shape, and movement. Extremities should be warm and mobile with adequate capillary refill. All pulses (radial, brachial, femoral, popliteal, pedal) should be strong and equal bilaterally. This is an inward (pointing toward center of the body) positioning of the forefoot with the heel in normal straight position; it resolves spontaneously. Tibial torsion, also common in infants and toddlers, consists of twisting of the tibia inward or outward on its long axis, and is usually caused by intrauterine positioning; this typically corrects itself by the time the child is 2 years old.	Short, broad extremities, hyperextensible joints, and palmar simian crease may indicate Down's syndrome. Polydactyly (extra digits) and syndactyly (webbing) are sometimes found in children with mental retardation. Absent femoral pulses may indicate coarctation of the aorta. Neurovascular deficit in children is usually secondary to trauma (e.g., fracture). Fixed-position (true) deformities do not return to normal position with manipulation. Metatarsus varus is inversion (a turning inward that elevates the medial margin) and adduction of the forefoot. Talipes varus is adduction of the forefoot and inversion of the entire foot. Talipes equinovarus (clubfoot) is indicated if foot is fixed in the following position: adduction of forefoot, inversion of entire foot, and equinus (pointing downward) position of entire foot.
Assess for congenital hip dysplasia. Assessing for hip dysplasia is an important aspect of the physical examination for infants. The assessment should be performed at each visit until the child is about 1 year old. (Several tests are described below.) Begin by assessing the symmetry of the gluteal folds. Also assess hip abduction using the maneuvers below.	Equal gluteal folds and full hip abduction are normal findings.	Unequal gluteal folds and limited hip abduction are signs of congenital hip dysplasia.
Perform Ortolani's maneuver to test for congenital hip dysplasia (Fig. 30-24). With the infant supine, flex infant's knees while holding your thumbs on midthigh and your fingers over the greater trochanters; abduct the legs, moving the knees outward and down toward the table.	Negative Ortolani's sign is normal.	Positive Ortolani's sign: A click heard along with feeling the head of the femur slip in or out of the hip.
Perform Barlow's maneuvers (Fig. 30-25). With the infant supine, flex the infant's knees while holding your thumbs on midthigh and your fingers over the greater trochanters; adduct legs until thumbs touch.	Negative Barlow's sign is normal.	Positive Barlow's sign: A feeling of the head of the femur slipping out of the hip socket (acetabulum).

continued

Assessment Procedure	Normal Findings	Abnormal Findings
Assess spinal alignment. Observe spine and posture.	In newborns, the spine is flexible with convex dorsal and sacral curves. In infants younger than 3 months, the spine is rounded (Fig. 30-26). The newborn's spine is flexed.	In newborns, flaccid or rigid posture is considered abnormal. In older infants and children, abnormal posture suggests neuromuscular disorders such as cerebral palsy.

Figure 30-24 Performing Ortolani's maneuver.

Figure 30-25 Performing Barlow's maneuver.

Figure 30-26 The spine is rounded in infants under 3 months old.

continued

SUBSEQUENT PHYSICAL ASSESSMENT *Continued*

Assessment Procedure	Normal Findings	Abnormal Findings
Assess joints. Note range of motion, swelling, redness, and tenderness.	Full range of motion and no swelling, redness, or tenderness.	Limited range of motion, swelling, redness, and tenderness indicate problems ranging from mild injuries to serious disorders.
Assess muscles. Note size and strength. (For example, can the infant bear weight on her legs?)	Muscle size and strength should be adequate for the particular age and should be equal bilaterally.	Inadequate muscle size and strength for the particular age indicate neuromuscular disorders such as muscular dystrophy.
Neurologic System		
Assess the newborn's cry, responsiveness, and adaptation.	The newborn cries are lusty and strong; responds appropriately to stimuli and quiets to soothing when held in the *en face* position (Fig. 30-27). Infantile reflexes are present when appropriate and are symmetric.	Inappropriate response to stimuli suggests CNS disorders or problems. An inability to quiet to soothing and gaze aversion is seen in "cocaine babies." Infantile reflexes present when inappropriate, absent, or asymmetric may indicate a CNS problem.
Test deep tendon and superficial reflexes.	The Babinski response is normal in children younger than 2 years (this response usually disappears between 2 and 24 months), and triceps reflex is absent until age 6. Ankle clonus (rapid, rhythmic plantar flexion) in response to eliciting ankle reflex is common in newborns.	Absence or marked intensity of these reflexes, asymmetry, and presence of Babinski response after age 2 years may demonstrate pathology.
Test motor function. See Denver Developmental Screening Tool for exam (Assessment Tool 30-1).	Gross and fine motor skills should be appropriate for the child's developmental age. Head control should be acquired by 4 months of age. Hand preference is developed during the preschool years.	Gross and fine motor skills that are inappropriate for developmental age and lack of head control by age 6 months may indicate cerebral palsy. Hand preference that is not developed during preschool years may indicate paresis on opposite side.

Figure 30-27 The newborn quiets to soothing when held *en face*.

VALIDATING AND DOCUMENTING FINDINGS

Validate the assessment data you have collected. This is necessary to verify that the data are reliable and accurate. Document the assessment data following the health care facility or agency policy.

Sample of Subjective Data

J.M. is a 4-month-old male in for well-child visit. Primary caregiver is mother. Father works in sales. Mother remains at home with child. She reports the child is healthy and happy. Child pushes himself up when in prone position. Responds to mother's voice. Sleeps through the night. Child breast feeds. Mother reports no problems with feeding. Stools normal and regular. Immunizations are up-to-date.

Sample of Objective Data

Child weighs 15 lbs 2 oz and is 63 cm long. Temp 99.5°F. Pulse, normal and regular. HC 42 cm. Skin, soft and warm; no lesions present. Head symmetric. Child holds head erect and midline. Mouth free of lesions. Nose free of obstruction. Eye placement normal. Infant follows object with eyes. Red reflex present. Ears aligned and symmetrical. Internal ears free of discharge or lesions. Respirations even and unlabored. Breath sounds clear bilaterally. S_1 and S_2 auscultated and normal. No herniation of umbilicus. Bowel sounds normal. Genitalia appropriate size for age; no lesions. Testes palpable, equal in size, smooth, and mobile. Anus free of lesions and hemorrhoids. Negative Ortolani's sign and Barlow's maneuver. Full ROM in joints.

Analysis of Data

After collecting subjective and objective data, identify abnormal findings and client strengths. Then cluster the data to reveal any significant patterns or abnormalities. These data may then be used to make clinical judgments about the health status of the neonate or infant.

DIAGNOSTIC REASONING: POSSIBLE CONCLUSIONS

The following is a listing of selected nursing diagnoses that you may identify when analyzing data for this assessment.

Selected Nursing Diagnoses

Wellness Diagnoses

- Effective Breastfeeding

Risk Diagnoses

- Risk for Impaired Parent/Infant Attachment
- Risk for Delayed Development
- Risk for Disproportionate Growth
- Risk for Disorganized Infant Behavior

Actual Diagnoses

- Ineffective Breastfeeding related to poor infant sucking reflex
- Delayed Growth and Development related to inadequate caretaking
- Disorganized Infant Behavior related to malnutrition
- Ineffective Infant Feeding Pattern

Selected Collaborative Problems

After grouping the data, it may become apparent that certain collaborative problems emerge. Remember that collaborative problems differ from nursing diagnoses in that they cannot be prevented with nursing interventions alone. However, these physiologic complications of medical conditions can be detected and monitored by the nurse. In addition, the nurse can use physician- and nurse-prescribed interventions to minimize the complications of these problems. The nurse may also have to refer the client in such situations for further treatment of the problem. Following is a list of collaborative problems seen more frequently in the newborn or infant. However, other collaborative problems seen in the adult are also seen in pediatric clients. These problems are worded as Risk for Complications (or RC) followed by the problem.

- RC: Severe malnutrition/dehydration
- RC: Delayed growth
- RC: Failure to thrive
- RC: Respiratory distress
- RC: Permanently deformed femoral head
- RC: Hydrocephalus/shunt infections

Medical Problems

After grouping the data, the client's signs and symptoms may clearly require medical diagnosis and treatment. Referral to a primary care provider is necessary.

CASE STUDY

The case study demonstrates how to analyze assessment data for a specific pediatric client. The critical thinking exercises included in the study guide/lab manual and interactive product that complement this text also offer opportunities to analyze assessment data.

Six-month old Lee Simpson has right congenital hip dysplasia. After a trial with a Pavlik harness, she has been placed in a hip spica cast. The cast has just been applied.

Following cast application, you visit with Lee and her mother. Mrs. Simpson tells you that she is anxious to bring Lee home and asks "What type of special care will she need?" Mrs. Simpson also summarizes the type of care provided to Lee while she had the Pavlik harness.

Mrs. Simpson says that her child responds well to her voice. She informs you that Lee is generally content, eats well (bottle), and sleeps through the night. You notice mother is attentive to child during the interview.

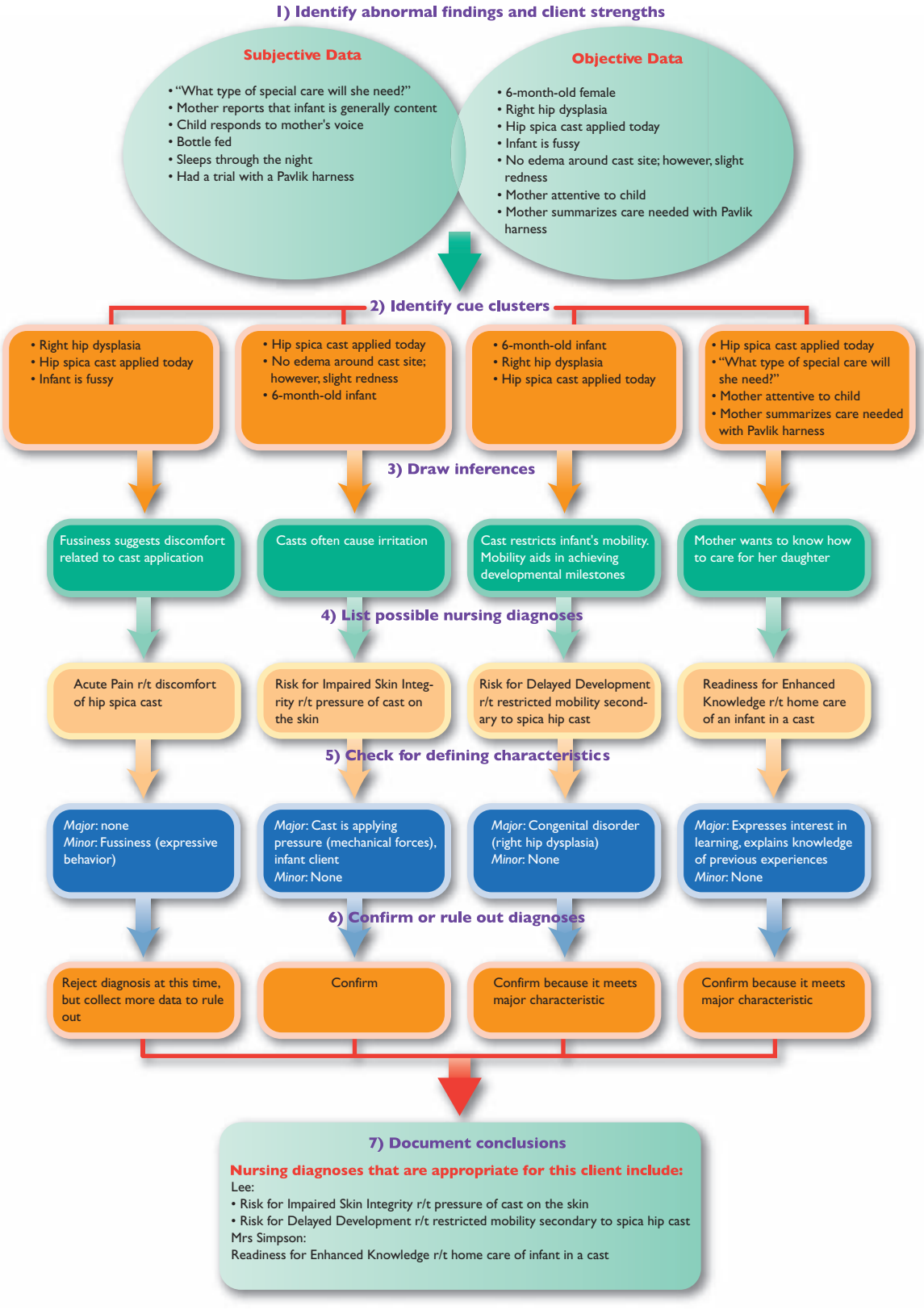
While assessing Lee, you note she is fussy and seems uncomfortable. The skin around her cast is slightly red; there is no edema.

The following concept map illustrates the diagnostic reasoning process.

Applying COLDSPA

Applying **COLDSPA** for: Six-month-old infant with right congenital hip dysplasia. Mother reports she is anxious about the special care needed while the infant is in a spica cast. Note that when assessing an infant, you are really assessing the mother and infant as a pair.

Mnemonic	*Question*	*Data Provided*	*Missing Data*
Character	Describe the sign or symptom (feeling, appearance, sound, smell, or taste if applicable).	Mother is anxious about not knowing what special care her infant with congenital hip dysplasia will need while in a spica cast.	
Onset	When did it begin?	After a trial with a Pavlik harness, the child needed a spica cast, which has just been applied. The child is now fussy and seems uncomfortable.	
Location	Where is it? Does it radiate? Does it occur anywhere else?	Skin around cast is red with no edema.	What is the extent of the redness? Is there any rash? Is the redness getting worse? Does the child have any redness anywhere else where clothing restricts the skin?
Duration	How long does it last? Does it recur?		"Has the child had skin irritations in the past? Describe. What was done to treat previous skin irritations? Did it help?"
Severity	How bad is it? or How much does it bother you?		How does the mother respond to the current fussiness of the child?
Pattern	What makes it better or worse?		"What usually helps the child to feel better when fussy?"
Associated factors/How it **A**ffects the client	What other symptoms occur with it? How does it affect you?	Mother is attentive to child and reports that the child responds to her voice, is generally content, and eats and sleeps well.	How does mother respond to directions given to her to care for her infant in the spica cast?


1) Identify abnormal findings and client strengths
Subjective Data
• "What type of special care will she need?"
• Mother reports that infant is generally content
• Child responds to mother's voice
• Bottle fed
• Sleeps through the night
• Had a trial with a Pavlik harness
Objective Data
• 6-month-old female
• Right hip dysplasia
• Hip spica cast applied today
• Infant is fussy
• No edema around cast site; however, slight redness
• Mother attentive to child
• Mother summarizes care needed with Pavlik harness
2) Identify cue clusters
• Right hip dysplasia
• Hip spica cast applied today
• Infant is fussy
• Hip spica cast applied today
• No edema around cast site; however, slight redness
• 6-month-old infant
• 6-month-old infant
• Right hip dysplasia
• Hip spica cast applied today
• Hip spica cast applied today
• "What type of special care will she need?"
• Mother attentive to child
• Mother summarizes care needed with Pavlik harness
3) Draw inferences
Fussiness suggests discomfort related to cast application
Casts often cause irritation
Cast restricts infant's mobility. Mobility aids in achieving developmental milestones
Mother wants to know how to care for her daughter
4) List possible nursing diagnoses
Acute Pain r/t discomfort of hip spica cast
Risk for Impaired Skin Integrity r/t pressure of cast on the skin
Risk for Delayed Development r/t restricted mobility secondary to spica hip cast
Readiness for Enhanced Knowledge r/t home care of an infant in a cast
5) Check for defining characteristics
Major: none
Minor: Fussiness (expressive behavior)
Major: Cast is applying pressure (mechanical forces), infant client
Minor: None
Major: Congenital disorder (right hip dysplasia)
Minor: None
Major: Expresses interest in learning, explains knowledge of previous experiences
Minor: None
6) Confirm or rule out diagnoses
Reject diagnosis at this time, but collect more data to rule out
Confirm
Confirm because it meets major characteristic
Confirm because it meets major characteristic
7) Document conclusions
Nursing diagnoses that are appropriate for this client include:
Lee:
• Risk for Impaired Skin Integrity r/t pressure of cast on the skin
• Risk for Delayed Development r/t restricted mobility secondary to spica hip cast
Mrs Simpson:
Readiness for Enhanced Knowledge r/t home care of infant in a cast

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