A guide to newborn assessment

Nurses who work in areas with infants need to be comfortable with conducting a newborn exam because they may be the first to identify a risk or condition that requires intervention.

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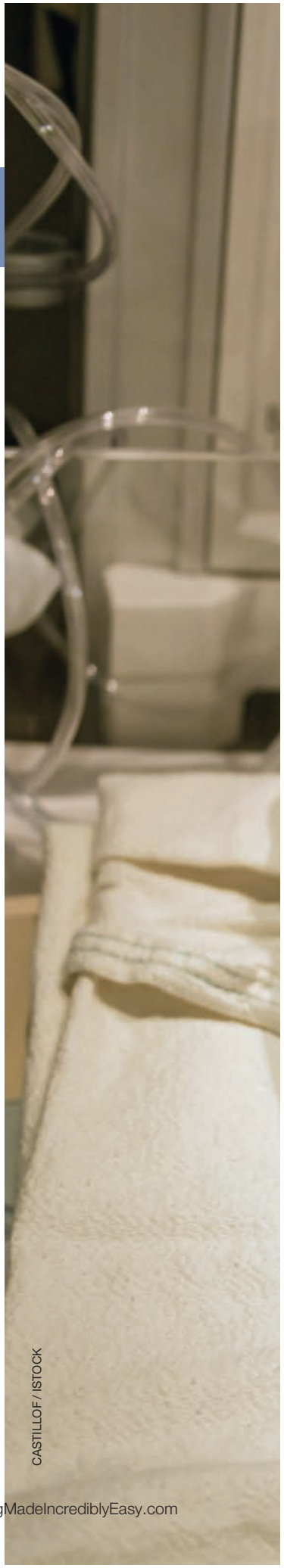

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Assessment is a fundamental skill for nurses working with the newborn population. Newborn assessment should be done immediately at birth, followed by a full assessment within 24 hours of birth, and before being discharged home. In this article, we describe the essential aspects of a newborn exam and potential abnormal deviations that warrant further evaluation.

Patient history

All newborn assessments begin with a chart review, including blood type, APGAR scoring, feeding type, vital signs, glucose, passage of meconium, voiding, and if any resuscitative interventions were required. Then review the mother's medical history to glean necessary information that will guide the assessment.

Prenatal information gathered from the mother includes the estimated due date, gravidity (number of pregnancies) and parity (number of births), date of last menstrual period, blood type and Rh factor, Group B *streptococcus* infection status, and medical complications/high-risk pregnancy factors. A maternal medical history should also include exposures to radiation or teratogenic substances during pregnancy and use of tobacco; alcohol; and over-the-counter, prescription, or illicit drugs.

An intrapartum history includes information about how labor started (spontaneous or induced), duration of each labor stage, any maternal complications and treatments during labor and delivery, use of analgesia, presence of meconium in the amniotic fluid, and type of delivery if any complications

occurred. Also review lab and monitoring data collected during labor.

Head-to-toe

The newborn assessment should follow the head-to-toe method and include inspection, auscultation, percussion, and palpation. Document findings as you go along because there may be too much information to remember, especially if you're conducting numerous newborn exams.

All newborns are at risk for hypothermia due to the lack of internal thermoregulation, limited amount of fat, and the thin integumentary system where heat loss can occur more easily. The newborn should be dried after birth to prevent heat loss. Examine the undressed newborn in a warm environment with an external heat source, such as an overhead radiant warmer, and warm your hands and stethoscope. Newborns have a limited supply of brown fat that generates heat. A newborn who's hypothermic can easily become hypoglycemic and at risk for seizures and acidosis.

APGAR

One of the very first assessments done is APGAR scoring, which rates the following on a scale of 0 to 2: appearance, pulse, grimace, activity, and respirations (see *APGAR scoring*). Because some infants take time to transition to the extrauterine environment, the scoring is done at 1 minute and then 5 minutes after birth. Scores of 7 and above are considered normal and require no intervention; scores below 6 require close observation, possible interventions/resuscitation, and admission to a neonatal ICU. Scores of 6 and below are associated with neonatal morbidity and mortality.

APGAR scoring

	0	1	2
Appearance	Completely pale/blue	Blue extremities, perfused face and trunk	Completely perfused
Pulse	Absent	Below 100 beats/minute	Above 100 beats/minute
Grimace	No response to stimulation	Weak/slow response to stimulation	Strong, prompt response to stimulation
Activity	Absent	Flexion of the arms and legs	Active motion
Respiration	Absent	Weak/irregular	Vigorous cry

Normal newborn vital signs

Temperature
97.7° F (36.5° C) to 98.6° F (37° C)

Heart rate
120 to 140 beats/minute

Respiratory rate
30 to 60 breaths/minute

BP
Not routinely assessed; should only be done with special equipment

Oxygen saturation
Greater than 95%; often assessed via coloration and respiration

Vital signs

Vital signs assessment is conducted at birth and every 4 hours for the first 24 hours of life, then every 8 hours. Vital signs should be taken more frequently if there's a concern or an abnormal finding that warrants further evaluation or closer observation (see *Normal newborn vital signs*). Abnormal vital signs are an indicator of serious complications, such as sepsis, respiratory failure or distress, or a compromised cardiovascular system.

Skin

Careful assessment of the newborn's skin is essential for early identification of any abnormalities. Newborn skin has important functions, such as regulating temperature and fluid and electrolyte balance and protecting against bacteria.

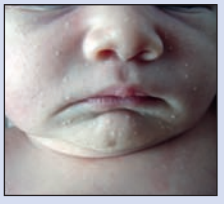
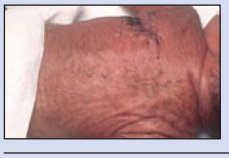
There are many normal and common newborn skin conditions; knowing the difference between normal and abnormal is important (see *Common newborn skin conditions*).

Observe the newborn's skin for color. Acrocyanosis is a normal condition occurring up to 24 hours in which the hands and feet take on a bluish appearance compared with the rest of the body. Jaundice can also occur, giving the skin a yellowish tone. Jaundice at the time of delivery is often related to a pathologic condition, whereas jaundice occurring 24 hours after birth is often physiologic and treatment with high levels of bilirubin may be warranted. Harlequin sign is a temporary change in coloring when the newborn is lying on one side in which the inferior side becomes red and the superior side becomes pale. The color change disappears within 30 minutes when the newborn is positioned prone or supine and doesn't persist beyond the first 3 weeks of life. Also assess for rashes, which may indicate a possible maternal-infant transmitted infection.

Head

Assess the shape, size, symmetry, sutures, and fontanelles of the newborn's head. One of your first assessments is general appearance. The head should be round with the absence of injury. Then assess for swelling and edema. Caput succedaneum (scalp edema) and molding can occur during cephalic birth, giving the newborn the appearance of an asymmetrical or cone-shaped head. This is seen immediately after birth and generally resolves within the first 24 hours of life. Cephalohematoma is a collection of blood over one of the skull plates characterized by bruising and a swollen compartment that doesn't cross suture lines with palpation. This can occur due to trauma during birth or instrumental delivery and should be monitored for expansion.

Common newborn skin conditions

Skin condition	Description and cause
	**Milia**[1] Small epidermal cysts caused by immature sebaceous glands that commonly appear on the face and mucosa of the newborn. When found in the midline of the palate, they're referred to as Epstein pearls. Milia should resolve spontaneously 2 to 3 weeks after birth.
	**Congenital dermal melanocytosis (Mongolian spot)**[2] Patches of melanocytes most commonly found on the buttocks, flanks, or shoulders of newborns; may be mistaken for bruises. They fade gradually over the first 3 years of life and generally disappear by puberty.
	**Erythema toxicum**[3] A benign rash that presents as small, white papules most commonly seen on the face, trunk, and extremities within the first 3 months of life. It typically appears within the first 14 days of life and lasts for several hours to 3 days.
	**Hemangioma**[1] Bright red, raised, compressible masses with sharply demarcated margins. They may appear at birth or within the first 6 months of life and spontaneously grow and regress over the course of several years.
	**Vernix caseosa**[4] A thick, greasy, white substance that coats and protects the fetal skin in utero. It decreases as the fetus approaches 40 weeks' gestation but is still present at birth. Vernix shouldn't be vigorously scrubbed off at birth.
	**Lanugo**[3] Fine, downy hair that covers the fetus in utero between 20 and 40 weeks' gestation. Lanugo may still be present at birth and will disappear spontaneously within the first 14 days of life.
	**Desquamation**[5] The drying and peeling of the newborn's skin during the first 24 hours of life. This is a normal reaction to the newborn's transition to extrauterine life and doesn't require treatment. Skin that's cracked or leathery in appearance requires further evaluation.

Sources:
1. Gru AA, Wick M. *Pediatric Dermatopathology and Dermatology*. Philadelphia, PA: Lippincott Williams & Wilkins; 2018.
2. Chung EK, Atkinson-McEvoy LR, Boom JA, Matz S. *Visual Diagnosis and Treatment in Pediatrics*. 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2010.
3. Bowden V, Greenberg CS. *Children and Their Families: The Continuum of Nursing Care*. 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2013.
4. Hatfield NT. *Introductory Maternity and Pediatric Nursing*. 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2013.
5. Airdone/Shutterstock

Mean length and head circumference for term newborns

Males

Gestational age	Length		Head circumference	
37 weeks	44 cm	51 cm	31 cm	35 cm
38 weeks	45 cm	52 cm	31 cm	36 cm
39 weeks	46 cm	53 cm	32 cm	36 cm
40 weeks	47 cm	53 cm	32 cm	37 cm
41 weeks	47 cm	54 cm	33 cm	37 cm

Females

Gestational age	Length		Head circumference	
37 weeks	44 cm	50 cm	30 cm	35 cm
38 weeks	45 cm	51 cm	31 cm	35 cm
39 weeks	45 cm	52 cm	31 cm	36 cm
40 weeks	46 cm	52 cm	32 cm	36 cm
41 weeks	47 cm	53 cm	32 cm	36 cm

Source: Villar J, Cheikh Ismail L, Victora CG, et al. International standards for newborn weight, length, and head circumference by gestational age and sex: the Newborn Cross-Sectional Study of the INTERGROWTH-21st Project. *Lancet.* 2014;384(9946):857-868.

Assess the fontanelles and bone sutures. Overriding bone sutures may occur during delivery due to pressure but should resolve within the first 48 hours of life. Widely separated bone suture lines indicate increased intracranial pressure and require further evaluation. The anterior fontanelle should be palpable as a diamond-shaped "soft spot" at the junction of the parietal and frontal bones of the skull. The posterior fontanelle is triangle-shaped and located at the junction of the parietal bones and occipital bone but may not be palpable. The fontanelles should appear flat; bulging fontanelles may indicate trauma or neural tube abnormalities and indented fontanelles can signal dehydration or malnutrition.

Measure head circumference with a tape measure placed on the newborn's forehead and around to the back. Obtaining a baseline head circumference is important to determine brain growth (see *Mean length and head circumference for term newborns*).

Face: Eyes, ears, nose, and mouth

First, assess the general appearance of the face. There should be facial symmetry and the absence of birth injuries. In cases of instrumental deliveries, there may be head and facial injuries; these should be clearly noted in the chart.

The newborn's eyes should appear symmetrical and open spontaneously. The cornea and pupil of each eye should be round, and the pupils dark. The sclera of the eyes should appear white. The pressure of a cephalic birth may cause bruising and edema of the eyelids, which may last for 2 to 3 days, and subconjunctival hemorrhage, which may last for 2 to 3 weeks. When a light is flashed in the newborn's eyes, you should be able to detect red reflex (symmetrical red color without any opacities or white spots). Assess the eyelids for epicanthal folds. In some Asian ethnicities, epicanthal folds may be a normal variant; in non-Asian ethnicities, the presence of epicanthal folds may indicate a genetic abnormality.

Assess the ears for size, shape, and position. The top of the ear should fall in line with the canthus of the eye; ear position lower or higher may indicate a genetic condition. Assess the pinna and around the ear for skin tags.

The nares of the nose should be patent. Assessment includes observing for nasal flaring, which may indicate respiratory distress.

The newborn's mouth should open evenly with crying. There may be small, white cysts (Epstein pearls) on the palate, which will resolve spontaneously within 7 days. Epstein pearls must be distinguished from thrush, which appears as white patches on the tongue and cheeks and requires antifungal treatment. Assess for cleft palate, cleft lip, restricted tongue movement, and the presence of teeth.

Chest

Assess respirations by observing chest movements, which should be relaxed,

symmetric, diaphragmatic, and without retractions. In the first 60 minutes of life, a newborn's respirations may rise as high as 90 breaths/minute; however, as the newborn acclimates, respirations should stabilize at 30 to 60 breaths/minute. It's important to observe respirations for a full 60 seconds because there may be brief periods of apnea, which can result in an inaccurate respiratory rate if only counted for 15 seconds. Asymmetrical chest movements may indicate a collapsed lung, which can occur with trauma during the delivery process. Seesaw respirations occur when the abdominal cavity retracts on inspiration and expands on expiration. This may indicate respiratory distress and possible diaphragmatic hernia.

Auscultation of lung sounds may reveal rhonchi, which is a normal finding in the first 48 hours of life. The lungs may have crackles in the first few hours of life, indicating fluid that should be cleared by the newborn with crying and sneezing. There should be no signs of respiratory distress, such as nasal flaring, grunting, or intercostal retractions, which require immediate attention.

Assess heart tones by auscultation. The newborn's heart rate should fall between 120 and 140 beats/minute but may rise to 180 beats/minute when crying and fall to 90 beats/minute when sleeping. A murmur is a common finding in the first 24 hours of life because the foramen ovale can't close until after birth. Murmurs heard after the first 24 hours of life warrant further investigation and consultation with a pediatrician. The CDC recommends screening for critical congenital heart defects 24 hours after birth and before discharge home. A pulse oximetry reading is taken of the hand and foot; if there's greater than a 3% difference or either the hand or foot is less than 90%, then further evaluation is warranted.

Assess for the presence of supernumerary nipples, which resemble small moles along the mammary ridge between the axilla and groin region. There may be breast tissue, which can be a result of circulating maternal hormones. Palpate the clavicles to determine intactness or for crepitus, which will feel like small crackling under the skin and may indicate a fractured clavicle and punctured lung.

Abdomen

Assess the shape and movement of the newborn's abdomen, as well as the umbilical cord. The abdomen should be soft, rounded, and moving freely with respirations. Auscultate all four quadrants for bowel sounds, which should be present after 1 hour of life. Abnormal deviations, such as a scaffold appearance or extension, may indicate a diaphragmatic hernia or mass. Assess for the presence of an umbilical hernia, which should be soft and easily reducible. Umbilical hernias resolve spontaneously by age 24 months.

Assess the umbilical cord for color; moisture; and any bleeding, discharge, or odor.

The newborn exam is an opportunity to engage family members in the care of their infant and educate them on signs and symptoms that require further evaluation.

Newborn reflexes

Moro reflex
Also known as the startle reflex, it's elicited when an unexpected sound is made like a clap or a door shutting and the newborn's body shakes in a startled reaction for a few seconds.

Rooting reflex
Occurs when the newborn is hungry and moves his or her head side to side with the mouth opening and closing.

Sucking reflex
Elicited when an object, such as a nipple, bottle, or finger, is placed into the newborn's mouth; the newborn will start to suck on the object.

Grasp reflex
Elicited when something is placed in the palm of the newborn's hand, such as a finger; the newborn will grasp the object.

Stepping reflex
Elicited when the newborn is held in a horizontal position above a hard surface and then gently lowered down so that the foot touches the hard surface; the newborn will lift the foot up, appearing to take a step.

Babinski reflex
Elicited when the bottom of the newborn's foot is stroked with an object from the heel upward to the toes; the newborn will flange out his or her toes in response.

Asymmetrical tonic neck reflex
Also known as the fencing reflex, it's elicited when the newborn is in the supine position on his or her back. When the head is gently turned to look one way, the arm on the side that the head is turned to will extend with the knee flexed, giving the appearance of someone fencing.

One umbilical vein and two umbilical arteries should be visible. The clamped end of the cord may ooze some clear fluid in the hours after birth, but purulent drainage from the umbilical cord may indicate an abscess. The base of the cord should be dry, and any moisture, redness, or odor may indicate infection. Within the first 10 to 14 days of life, the cord should shrivel and break off.

Anogenital area

A male infant should have two palpable testes in the scrotal sac, which may be pigmented and covered in rough rugae (ridges). The urethral opening of the penis should be located at the tip of the glans rather than the ventral or dorsal surface. A female infant should have a prominent labia majora; whitish discharge or small amounts of blood may be present due to circulating maternal hormones. The hymen should be patent, and the urethra should be located above the hymen. In cases of ambiguous genitalia, consultation with various disciplines, such as social services, endocrinologists, urologists, and geneticists, is required to determine optimal long-term outcomes before establishing sex in conjunction with family preference.

Assess all diapers for the presence of urine. All newborns should have a patent anus and pass stool within the first 24 hours of life. Record stool characteristics; the first stool is a dark black/greenish sticky substance called meconium and will transition to tan/golden color once the newborn starts eating.

Back

The newborn's back is usually rounded due to the position in utero. The lumbar and sacral areas shouldn't yet be arched. Assess for openings or dimpling over the spine, which may indicate spinal malformation.

Extremities

Thoroughly inspect all extremities for differences in size and length, the number of digits, muscle tone, and movement. The newborn should have five digits on each hand, the fists should be loosely clenched, and the fingernails should be smooth and extend over the fingertips. When the arms are held along the newborn's sides, the fingertips should reach the middle of the thighs. The newborn's arms and legs should

move symmetrically. Assess muscle tone by observing the newborn's resistance to your efforts to extend the extremities.

Assess the legs for size and symmetry of gluteal folds. When the newborn is in a supine position, you should be able to abduct the hips until the knees touch or almost touch the surface of the exam table. Difficulty abducting the hips indicates subluxation, which can be confirmed by a "clunking" sound from the hip or observation/palpation of the femur slipping out of the hip socket. Subluxation requires corrective treatment. The newborn's feet may appear to turn in, in which case you should be able to move them to the midline position without resistance. If the feet can't be moved to the midline position, the newborn should be further assessed for clubfoot.

Neurologic

The neurologic assessment includes the newborn's overall alertness, muscle strength, and muscle tone. Carefully assess reflexes because abnormal results can be subtle and may be the first indicator of neurologic impairment or nerve damage (see *Newborn reflexes*). Some reflexes take time to appear in newborns and may only be there for a short period of time as the newborn grows. Preterm newborns may not have all the reflexes of a term newborn due to immature neurologic structures that may still be developing. Hypo- or hyperreflexes in a term newborn may mean neurologic dysfunction.

Nutrition

Breastfeeding is the preferred method of feeding due to the nutritional and immunologic properties found in breast milk. Immediately after birth, newborns are typically awake; this is an ideal time for attempting the first feed. Subsequent feedings should occur every 1 to 3 hours for breastfeeding newborns. Those feeding less frequently should be evaluated for feeding issues. All newborns should be displaying feeding cues, which are an early sign of wanting to feed. Successful breastfeeding requires the newborn to have an adequate latch and suck. Bottle-feeding newborns require 1 to 2 ounces of formula every 2 to 3 hours.

Adequate nutrition is measured with less than 10% total body weight loss from birth and adequate stool and wet diapers.

Safe and healthy families

The newborn assessment is the first defense we have in identifying a serious complication or potential issue that warrants referral. The newborn exam is also an opportunity to engage family members in the care of their infant and educate them on signs and symptoms that require further evaluation. Nurses are key agents in sharing their knowledge to help promote safe and healthy families. ■

REFERENCES

Centers for Disease Control and Prevention. Infant and toddler nutrition. 2018. www.cdc.gov/nutrition/InfantandToddlerNutrition/index.html.

Centers for Disease Control and Prevention. Screening for critical congenital heart defects. 2018. www.cdc.gov/ncbddd/heartdefects/screening.html.

King TL, Brucker MC, Kriebs JM, Fahey JO. *Varney's Midwifery*. 5th ed. Burlington, MA: Jones & Bartlett Learning; 2013.

Lewis ML. A comprehensive newborn exam: part I. General, head and neck, cardiopulmonary. *Am Fam Physician*. 2014;90(5):289-296.

Lewis ML. A comprehensive newborn exam: part II. Skin, trunk, extremities, neurologic. *Am Fam Physician*. 2014;90(5):297-302.

Tappero EP, Honeyfield ME. *Physical Assessment of the Newborn: A Comprehensive Approach to the Art of Physical Examination*. 5th ed. New York, NY: Springer Publishing Company; 2016.

Villar J, Cheikh Ismail L, Victora CG, et al. International standards for newborn weight, length, and head circumference by gestational age and sex: the Newborn Cross-Sectional Study of the INTERGROWTH-21st Project. *Lancet*. 2014;384(9946):857-868.

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