University of Mosul / College of Nursing

Pediatric Nursing

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Nursing care of the Newborn Baby

Learning Objectives

• Describe the normal characteristics of a term newborn.

• Assess a newborn for normal growth and development.

• Implement nursing care for a normal newborn, such as instructing parents on the care of their newborn.

• Identify expected outcomes for a newborn and family during the first 4 weeks of life to help them manage seamless transitions across different healthcare settings.

Newborns undergo profound physiologic changes at the moment of birth (and, probably, psychological changes as well) as they are released from a warm, snug, dark, liquid-filled environment that has met all of their basic needs into a chilly, unbounded, brightly lit, gravity-based, outside world. Within minutes after being plunged into this strange environment, a newborn has to initiate respirations and adapt a circulatory system to extrauterine oxygenation. Within 24 hours, neurologic, renal, endocrine, gastro intestinal, and metabolic functions must be operating competently for life to be sustained. How well a newborn makes these major adjustments depends on his or her genetic composition, the competency of the recent intrauterine environment, gestational duration, presence of fetal anomalies, the care receives during labor and birth, and the care received during the newborn or neonatal period (the time from birth through the first 28 days of life). One half of all deaths that occur during the first year of life occur in the neonatal period and more than one million babies die every year in the first 24 hours after birth-an indication of how hazardous a time this is for an infant.

It is not unusual to hear the comment "all newborns look alike" from people viewing a nursery full of babies. In actuality, every child is born with individual physical and personality characteristics that make him or her unique right from the start.

VITAL STATISTICS:

Vital statistics measured for a newborn usually consist of the baby's weight, length, and head and chest circumferences.

WEIGHT:

As long as newborns are breathing well, they are weighed nude and without a blanket soon after birth in the birthing room. Measurements such as body length and head, chest, and abdominal circumferences are also done but can be obtained later because performing these measurements while an infant is still damp exposes the newborn unnecessarily to chilling. A newborn's weight is important because it helps to determine maturity as well as establish a baseline against which all other weights can be compared. The birth weight of newborns varies depending on the racial, nutritional, intrauterine, and genetic factors that were present during conception and pregnancy.

Length:

A newborn's length at birth in relation to weight is a second important determinant used to confirm that a newborn is healthy.

- The average birth length (50th percentile) of a mature female newborn is 49 cm.
- For mature males, the average birth length is 50 cm.
- The lower limit of expected birth length is arbitrarily set at46 cm.

- Although rare, babies with lengths as great as 57.5 cm have been reported.

Head Circumference:

Head circumference is measured with a tape measure drawn across the center of the forehead and then around the most prominent portion of the posterior head (the occiput).

• In a mature newborn, the head circumference is usually 34 to 35 cm.

• A mature newborn with a head circumference greater than 37 cm or less than 33 cm should be carefully assessed for neurologic involvement, although some well newborns have these measurements.

Chest Circumference:

Chest circumference is measured at the level of the nipples. If a large amount of breast tissue or edema of the breasts is present, this measurement will not be accurate until the edema has subsided. The chest circumference in a term newborn is about 2 cm less than head circumference.

VITAL SIGNS:

Temperature:

The temperature of newborns is about 99°F (37.2°C) at birth because they have been confined in their mother's warm and supportive uterus. Temperature will fall almost immediately to below normal because of heat loss, the temperature of birthing rooms (approximately 68° to 72°F [21° to 22°C]), and the infant's immature temperature regulating mechanisms if the baby is not protected from heat loss at birth and in the moments after ward. The majority of heat loss occurs because of four separate mechanisms: convection, radiation, conduction, and evaporation. **Axillary temperatures** are taken because insertion of a thermometer into the rectum can potentially cause perforation of the

mucosa if performed incorrectly. Core body temperature varies according to the periods of reactivity but is usually 36.5° to 37.6° C (97.7°– 99.7° F).

Pulse:

The heart rate of a fetus in utero averages 110 to 160 beats/min. Immediately after birth, as the newborn struggles to initiate respirations, the heart rate may be as rapid as 180 beats/min. Within 1 hour after birth, as the newborn settles down to sleep, the heart rate stabilizes to an average of 120 to 140 beats/min. The heart rate of a newborn often remains slightly irregular because of immaturity of the cardiac regulatory center in the medulla, and transient murmurs may result from the incomplete closure of fetal circulation shunts. You should be able to palpate femoral pulses in a newborn. Radial and temporal pulses are more difficult to palpate accurately. Therefore, a newborn's heart rate is best determined by listening for an apical heartbeat for a full minute rather than assessing a pulse in an extremity or over the carotid artery. Always palpate for femoral pulses and document that they are present because their absence suggests possible coarctation (narrowing) of the aorta, which is a cardiovascular abnormality.

You should be able to palpate brachial and femoral pulses in a newborn, but the radial and temporal pulses are more difficult to palpate with any degree of accuracy. Therefore, a newborn's heart rate is always determined by listening for an apical heartbeat for a full minute, rather than assessing a pulse in an extremity. Always palpate for femoral pulses, however, because their absence suggests possible coarctation (narrowing) of the aorta, a common cardiovascular abnormality.

Respiration:

The respiratory rate of a newborn in the first few minutes of life may be as high as 90 breaths/min. As respiratory activity is established and maintained over the next hour, this rate will settle to an average of 30 to 60 breaths/min. Respiratory depth, rate, and

rhythm are likely to be irregular, and short periods of apnea (without cyanosis), sometimes called *periodic respirations*, are also common and normal during this time. Respiratory rate can be observed most easily by watching the movement of a newborn's abdomen because breathing primarily involves the use of the diaphragm and abdominal muscles. Coughing and sneezing reflexes are present at birth and help clear the airway. Newborns are obligate nose breathers and show signs of distress if their nostrils become obstructed.

The respiratory system does not reach adult levels of maturity until about 7 years of age. The lack of immunoglobulin A (IgA) in the mucosal lining of the upper respiratory tract also contributes to the frequent infections that occur in infancy.

PHYSIOLOGIC FUNCTIONS:

Just as changes occur in vital signs after birth, so do changes in all major body systems.

Cardiovascular System:

Changes in the cardiovascular system are necessary after birth because now, the lungs are responsible for oxygenating blood that was formerly oxygenated by the placenta. As soon as the umbilical cord is clamped, which stimulates a neonate to take in oxygen through the lungs, fetal cardiovascular shunts begin to close. With the first breath, blood pressure decreases in the pulmonary artery (the artery leading from the heart to the lungs). As this pressure decreases, the ductus arteriosus, the fetal shunt between the pulmonary artery and aorta, begins to close. At the same time, increased blood flow to the left side of the heart causes the foramen ovale (the opening between the right and left atria) to close because of the pressure against the lip of the structure (permanent closure does not occur for weeks). With the remaining fetal circulatory structures (umbilical vein, two umbilical arteries, and

ductus venosus) no longer receiving blood from the placenta, the blood within them clots and closes them, and the vessels atrophy over the next few weeks.

Blood Values:

Capillary heel sticks may reveal a falsely high hematocrit or hemoglobin value because of sluggish peripheral circulation. Before obtaining a blood specimen from a heel, warm the foot by wrapping it in a warm cloth to increase circulation and improve the accuracy of this value.

A newborn's blood volume is 80 to 110 ml/kg of body weight or about 300 ml total. Because a newborn has more red blood cells than the average adult, the hemoglobin level averages 17 to 18 g/100 ml of blood (the average for an adult is 11 to 12 g/ml). A newborn's hematocrit is between 45% and 50% (for an adult, 36% to 45%). A newborn's red blood cell count is about 6 million cells/mm^3(for an adult, 3.5 to 5.5 million cells/mm^3).

The Respiratory System:

A first breath is a major undertaking because it requires a tremendous amount of pressure (about 40 to 70 cm H_2O) for a newborn to be able to inflate alveoli for the first time. The reflex to breathe is initiated by a combination of **cold receptors**; a lowered partial pressure of oxygen (PO_2), which falls from 80 mmHg to as low as 15mmHg before a first breath; and an increased partial carbon dioxide pressure (PCO_2), which rises as high as 70 mmHg before a first breath.

Chemical factors: in the blood (low oxygen, high carbon dioxide, and low pH). The primary thermal stimulus: is the sudden chilling of the infant, who leaves a warm environment and enters a relatively cooler atmosphere. Tactile stimulation: tapping or flicking the soles of the feet or gently rubbing the newborn's back, trunk, or extremities. Prolonged tactile stimulation causes hypoxia.

The Gastrointestinal System:

Although the gastrointestinal tract is usually sterile at birth, bacteria may be cultured from the tract in most babies within 5 hours after birth and from all babies at 24 hours of life. Most of these bacteria enter the tract through the newborn's mouth from airborne sources. Others may come from vaginal secretions at birth, from hospital bedding, and from contact at the breast. The accumulation of bacteria is helpful because bacteria in the gastrointestinal tract are necessary for digestion through probiotics and for the synthesis of vitamin K. Although a newborn stomach holds about 60 to 90 ml, a newborn has limited ability to digest everything taken in, especially fat and starch because the pancreatic enzymes, lipase and amylase, remain deficient for the first few months of life. Also, because the cardiac sphincter between the stomach and esophagus is immature, a newborn tends to regurgitate easily. Immature liver function can lead to a tendency toward lowered glucose and protein serum levels. In the duodenum, three enzymes in particular are important for digestion. Trypsin is available in sufficient quantities for protein digestion after birth. Amylase (needed for complex carbohydrate digestion) and lipase (essential for appropriate fat digestion) are both deficient in the infant and do not reach adult levels until about 5 months of age.

Stools:

The first stool of a newborn is usually passed within 24 hours after birth. It consists of **meconium**, a sticky, tar-like, blackish-green, odorless material formed from mucus, vernix, lanugo, hormones, and carbohydrates that accumulated in the bowel during intrauterine life. If a newborn does not pass a meconium stool by 24 to 48 hours after birth, the possibility of some problem such as meconium ileus, imperforate anus, or volvulus should be suspected. About the second or third day of life, newborn stool changes in color and consistency. Termed a **transitional stool**, bowel contents appear both loose and

green; they may resemble diarrhea at to the untrained eye.

• **By the fourth day of life,** breastfed babies pass three or four light yellow stools per day that have a soft consistency. They are not foul smelling because breast milk is high in lactic acid, which reduces the number of putrefactive organisms in the stool.

• A newborn who receives formula usually passes two or three bright yellow stools a day of soft consistency. These have a more noticeable odor, compared with those of breastfed babies.

Occasionally, a newborn has swallowed some maternal blood during birth and either vomits fresh blood immediately after birth or passes a black tarry stool after two or more days. IF stools remain black or tarry, this suggests newborn intestinal bleeding rather than swallowed blood. IF mucus is mixed with stool or the stool is watery and loose, a milk allergy, lactose intolerance, or some other condition interfering with digestion or absorption is suspected.

Renal System:

Total volume of urine per 24 hours is about 200 to 300 ml by the end of the first week. However, the bladder voluntarily empties when stretched by a volume of 15 ml, resulting in as many as 20 voiding's per day. The first voiding should occur within 24 hours. The urine is colorless and odorless and has a specific gravity of about 1.020.

The Immune System:

Newborns have limited immunologic protection at birth because they are not able to produce antibodies until about 2 months (the reason most immunizations are not administered until 2 months of age). Newborns are, however, born with passive antibodies (immunoglobulin G) passed to them from their mother that crossed the placenta. In most instances, these include antibodies against poliomyelitis, measles, diphtheria, pertussis,

chickenpox, rubella, and tetanus. Newborns are routinely administered a hepatitis B vaccine before they leave their birth setting to promote antibody formation against this disease

Nursing Care of The Newborn and Family

Assessment:

Newborns require thorough skilled observation to ensure a satisfactory adjustment to extra uterine life. Physical assessment after delivery can be divided into four phases:

1. The initial assessment, which includes the Apgar scoring system
2. Transitional assessment during the periods of reactivity
3. Assessment of gestational age
4. Systematic physical examination

Initial Assessment: Apgar Scoring: The most frequently used method to assess newborns' immediate adjustment to extra uterine life is the **Apgar** scoring system, which is based on newborn heart rate, respiratory effort, muscle tone, reflex irritability, and color.

INFANT EVALUATION AT BIRTH—APGAR SCORING SYSTEM

SIGN	0	1	2
Heart rate	Absent	Slow, <100 beats/min	>100 beats/min
Respiratory effort	Absent	Irregular, slow, weak cry	Good, strong cry
Muscle tone	Limp	Some flexion of extremities	Well flexed
Reflex irritability	No response	Grimace	Cry, sneeze
Color	Blue, pale	Body pink, extremities blue	Completely pink

Assessment of Gestational Age

The infant's birth weight, length, and head circumference are plotted on standardized graphs that identify normal values for gestational age (for birth weight. Infants whose weight is **appropriate for gestational age (AGA)**

NURSING PROCESS

Every newborn is born slightly acidotic. Any new buildup of acid may lead to severe, life–threatening acidosis.

The Healthy Newborn and Family

Assessment:

Assess the newborn according to the guidelines

Diagnosis (Problem Identification)

After a thorough assessment, several nursing diagnoses for healthy newborns include:

- Readiness for Enhanced Parenting
- Risk for Injury
- Effective Breastfeeding
- Risk for Imbalanced Body Temperature
- Readiness for Enhanced Nutrition
- Ineffective Breathing Pattern
- Risk for Infection
- Risk for Neonatal Jaundice

Planning

Expected patient outcomes include:

- Newborn airway will remain patent.
- Effective breathing pattern will be established.
- Thermoregulation will be maintained.
- Parent–infant attachment behaviors will be observed.

• Breastfeeding or bottle feeding will be established.

• Infant will exhibit no evidence of infection; immune status will be maintained.

• Newborn will remain free of injury.

• Family will demonstrate ability to care for the infant's basic needs.

• Newborn jaundice will be detected and monitored effectively.

Evaluation

The effectiveness of nursing interventions for the newborn and family is determined by continual assessment and evaluation of care based on the following guidelines:

• Monitor axillary temperature regularly; observe for signs of temperature instability such as respiratory distress.

• Eye treatment, vitamin K injection, hepatitis B vaccine, and hearing and newborn screening tests, including bilirubin screening.

• Monitor infant's feeding ability and oral intake.

• Monitor daily weight.

• Observe interactions between infant and family members; interview family regarding their feelings about the newborn.

• Observe parents' ability to provide care for infant; interview parents regarding any concerns about infant's care at home.

• Observe parents' correct use of car safety seat restraint on discharge

NURSING ALERT: To avoid aspiration of amniotic fluid or mucus, clear the pharynx first and then the nasal passages using a bulb syringe: remember, mouth before nose. Vital signs are closely monitored, and any indication of respiratory distress is immediately

Maintain A Stable Body Temperature

reported.

Conserving the newborn's body heat is an essential nursing goal. At birth, a major cause of heat loss is **evaporation**, the loss of heat through moisture. The amniotic fluid that bathes the infant's skin favors evaporation, especially when combined with the cool atmosphere of the delivery room. Heat loss through evaporation is minimized by rapidly drying the skin and hair with a warmed towel and placing the infant in a heated environment or skin-to-skin contact with the mother. In addition,

NURSING ALERT: To The cardinal signs of respiratory distress in a newborn include tachypnea, nasal flaring, grunting, intercostal retractions, and cyanosis.

drying the infant—especially the face and hair—also effectively reduces evaporation because the head, which is a large surface area in a newborn, can be responsible for a great amount of heat loss. Covering the hair with a cap after drying further reduces the possibility of evaporation cooling.

The peripheral capillaries are closer to the surface of the skin, thus making the newborn and young infant more susceptible to heat loss. Over the first year of life, thermoregulation (the body's ability to stabilize body temperature) becomes more effective: The peripheral capillaries constrict in response to a cold environment and dilate in response to heat.

Protect From Infection and Injury:

The most important practice for preventing cross-infection is thorough hand washing of all individuals involved in the infant's care. Other procedures to prevent infection include eye care, umbilical care, bathing, and care of the circumcision. Artificial nails are prohibited, and long fingernails are discouraged for health care providers because the former have been

implicated in the transmission of sepsis. Vitamin K is administered to protect against hemorrhage. In addition, several safety measures are practiced, particularly in terms of proper identification, and screening tests are used to detect various disorders.

Eye Care:

Prophylactic eye treatment against **ophthalmia neonatorum**, infectious conjunctivitis of the newborn, includes the use of (1) silver nitrate (1%) solution, (2) erythromycin (0.5%) ophthalmic ointment or drops, or (3) tetracycline (1%) ophthalmic ointment or drops (preferably in single-dose ampules or tubes). Chlamydia trachomatis is the major cause of ophthalmia neonatorum. Topical antibiotics such as tetracycline and erythromycin, silver nitrate, and a 2.5% povidone–iodine solution have not proved to be effective in the treatment of chlamydial conjunctivitis. A 14-day course of oral erythromycin or an oral sulfonamide may be given for chlamydial conjunctivitis. Administration of oral erythromycin in infants younger than 6 weeks old has been associated with infantile hypertrophic pyloric stenosis; therefore, parents should be informed of the potential risks and signs of the illness.

Vitamin K Administration:

vitamin K (AquaMEPHYTON) is usually administered intramuscularly into the lateral anterior thigh, the preferred site for all injections in a newborn, immediately after birth.

Shortly after birth, vitamin K is administered as a single intramuscular dose of 0.5 to 1 mg to prevent hemorrhagic disease of the newborn, also called **vitamin K deficiency bleeding (VKDB).** Normally, vitamin K is synthesized by the intestinal flora. However, because infants' intestines are relatively sterile at birth and because breast milk contains low levels of vitamin K, the supply is inadequate for at least the first 3 or 4 days. The major function of

vitamin K is to catalyze the synthesis of prothrombin in the liver, which is needed for blood clotting.

Hepatitis B Vaccine Administration:

To decrease the incidence of hepatitis B virus in children and its serious consequences (cirrhosis and liver cancer) in adulthood, the first of three doses of hepatitis B vaccine are recommended soon after birth and before hospital discharge for all newborns. The injection is given in the vastus lateralis muscle because this site is associated with a better immune response than is the dorsogluteal area.

Newborn Screening for Disease:

A number of genetic disorders can be detected in the newborn period. Most states require screening for phenylketonuria (PKU), congenital hypothyroidism, galactosemia, and hemoglobin defects such as sickle cell disease. The nurse's responsibility is to educate parents regarding the importance of screening and to collect appropriate specimens at the recommended time.

Bathing:

Bath time is an opportunity for the nurse to accomplish much more than general hygiene. It is an excellent time for observing the infant's behavior, state of arousal, alertness, and muscular activity. Bathing is usually performed after the vital signs have stabilized, especially the temperature. As part of **standard precautions**, nurses should wear gloves when handling newborns until blood and amniotic fluid are removed by bathing. Studies indicate that healthy full-term newborns with a stable body temperature can be bathed as early as 1 hour of age without experiencing problems, The bath time provides an opportunity for the nurse to involve the parents in the care of their child, to teach correct hygiene procedures, and to learn about their infant's individual characteristics.

Early Newborn Discharge Criteria:

• It was a singleton birth between 38 and 42 weeks of gestation.

• Baby was delivered by uncomplicated vaginal delivery.

• Birth weight is appropriate for gestational age.

• Physical examination was normal.

• Vital signs are normal and stable as measured in an open crib with adequate clothing.

• Infant has urinated and passed at least one stool.

• Infant has completed at least two successful feedings.

• Clinical significance of jaundice, if present, has been determined and appropriate management or follow-up plans put in place.

• Appropriate maternal and infant blood tests have been performed.

• Appropriate neonatal immunizations have been administered.

• Support persons are available to assist mother and her infant after discharge.

• Continuing medical care is planned, including that infant discharged sooner than 48 hours be examined within 48 hours of discharge from the hospital.

*Newborn Home Care After Early Discharge**

Wet diapers - Minimum of one for each day of life (day 2 = 2 wets; day 3 = 3 wets) until fifth or sixth day, at which time 5 or 6 per day to 14 days, then 6 to 10 per day

Breastfeeding - Successful latch-on and feeding every 1.5 to 3 hours daily; audible swallowing

Formula feeding - Successfully taking at least 1 to 2 oz every 3 to 4 hours; voiding as above.

Circumcision - Wash with warm water only; yellow exudate forming, with no bleeding; Plastibell intact for 48 hours

Stools - At least one every 48 to 72 hours (bottle feeding), or two or three per day (breastfeeding)

Color - Pink to ruddy when crying; pink centrally when at rest or asleep.

Activity - Has four or five wakeful periods per day and alerts to environmental sounds and voices

Jaundice - Physiologic jaundice (i.e., jaundice not appearing in the first 24 hours); feeding, voiding, and stooling as noted above or practitioner notification for suspicion of pathologic jaundice (appears within 24 hours of birth; hemolysis and ABO/Rh problem suspected), decreased activity, poor feeding, or dark orange skin color persisting on the fifth day in light-skinned newborn; obtain transcutaneous (or serum) bilirubin before discharge and identify risk with an hour-specific nomogram.

Sternal retractions are a sign of respiratory distress requiring immediate intervention, such as mechanical ventilation or increased oxygen.