

- Chapter 13

Preterm and Postterm Newborns

- The Preterm Newborn
- Preterm birth is the cause of more deaths during the first year of life than any other single factor
- Higher percentage of birth defects
- The less the preterm weighs at birth, the greater the risks to life during delivery and immediately thereafter
- Gestational Age
 - Actual time from conception to birth that the fetus remains in the uterus
 - Preterm is less than 38 weeks
 - Term is 38 to 42 weeks
 - Postterm is greater than 42 weeks
 - Standardized method used to determine gestational age is Ballard score
 - Uses external characteristics and neurological development
- Level of Maturation
 - How well-developed the infant is at birth
 - Ability of organs to function outside of uterus
- Causes of Preterm Birth
 - Multiple births
 - Maternal illness
 - Hazards of actual pregnancy (e.g., GH)

- Placental abnormalities
 - Placenta previa
 - Premature separation of the placenta from uterine wall
- Possible Physical Characteristics of a Preterm Infant
- Skin transparent or loose
- Superficial veins visible on abdomen and scalp
- Lack of subcutaneous fat
- Lanugo covering forehead, shoulders, and arms
- Vernix caseosa abundant
- Extremities appear short
- Soles of feet have few creases
- Abdomen protrudes
- Nails are short
- Genitalia are small
- In the female, the labia majora may be open
- Related Problems of Preterm Births
- Inadequate Respiratory Function
- During second half of pregnancy, structural changes occur in the fetal lungs
 - Alveoli (air sacs) enlarge
 - Closer to capillaries in the lungs
- If born prematurely, the muscles that move the chest are not fully developed
- Abdomen is distended, increasing pressure on diaphragm

- Stimulation of the respiratory center in the brain is immature
- Gag and cough reflexes are weak due to immature nerve supply
- Respiratory Distress Syndrome (RDS) Type 1
- Also called *hyaline membrane disease*
- Result of immature lungs, leads to decreased gas exchange
- Surfactant is a fatty protein that is high in lecithin, its presence is necessary for the lungs to absorb oxygen
 - Begins to form at 24 weeks gestation and by 34 weeks, if fetus is delivered, should be able to breathe adequately
 - If infant is premature, the surfactant level is insufficient
- Manifestations of RDS
- Can take up to several hours after birth to be manifested
- Respirations increase to 60 breaths/min or higher (tachypnea)
- The tachypnea may be accompanied by gruntlike sounds, nasal flaring, cyanosis, as well as intercostal and sternal retractions
- Edema, lassitude, and apnea occur as the condition worsens
- Mechanical ventilation may be necessary
- Treatment for RDS
- If amniocentesis of mother while fetus is still in utero shows a low L/S ratio, the mother may be given corticosteroids to stimulate lung maturity 1 to 2 days before delivery
- In preterm infants, surfactant can be administered via ET tube at birth or when symptoms of RDS occur
- Improvement in the neonate's lung function is generally seen within 72 hours after administration
- Surfactant Production

- Can be altered
 - During cold stress
 - Hypoxia
 - Poor tissue perfusion
- Nursing Care of Infant with RDS
- Monitor vital signs
- Minimal handling of infant to help conserve energy
- Intravenous fluids are prescribed
 - Observe for signs of under- or overhydration
- Oxygen therapy
 - Monitor pulse oximetry
 - Infant on supplemental oxygen is at high risk for oxygen toxicity
- Bronchopulmonary Dysplasia (BPD)
- Toxic response of lungs to oxygen therapy
- Risks
 - Atelectasis
 - Edema
 - Thickening of membranes, interferes with ventilation
- Often a result of prolonged dependence on supplemental oxygen and ventilators
- Often has long-term complications

- Apnea in the Preterm Infant
- Cessation of breathing for 20 seconds or longer
- Not uncommon in preterms
- Believed related to immaturity of nervous system
- May be accompanied by
 - Bradycardia (heart rate <100 beats/min)
 - Cyanosis
- Neonatal Hypoxia
- Inadequate oxygenation at the cellular level
- Degree can be measured via pulse oximetry
 - $\text{Oxygen on Hgb in circulating blood} \div \text{the oxygen capacity of the hemoglobin}$
- Saturation levels 92% or above is normal
- Severely anemic infant may have severe hypoxia and not manifest clinical symptoms
- Abnormal fetal Hgb can also cause hypoxia because fetal Hgb does not readily release oxygen to the tissues and end organs
- Sepsis in the Preterm Infant
- Generalized infection of the bloodstream
- At risk due to immaturity of many body systems
- Liver is immature, poor formation of antibodies
- Body enzymes are inefficient
- Some symptoms include
 - Low temperature

— Lethargy or irritability

— Poor feeding

— Respiratory distress

- Treatment of Sepsis
- Administration of intravenous antimicrobials
- Maintenance of warmth and nutrition
- Close monitoring of vital signs
- Care should be organized to help infant conserve as much energy as possible
- Following Standard Precautions, including strict hand hygiene, is essential
- Poor Control of Body Temperature
- Lack of brown fat (body's own "insulation")
- Radiation from a surface area that is large in proportion to body weight
- Heat-regulating center of brain is immature
- Sweat glands are not functioning to capacity
- Preterm is inactive, has muscles that are weak/less resistant to cold; unable to shiver
- Preterm body position is one of leg extension
- High metabolism, prone to low blood glucose levels
- Can result in cold stress
- Safety Alert
- Signs and symptoms of cold stress
 - Decreased skin temperature
 - Increased respiratory rate with periods of apnea

- Bradycardia
- Mottling of skin
- Lethargy
- Hypoglycemia
- Plasma glucose levels <40 mg/dL in a term infant and <30 mg/dl in preterm infant
- Preterm infants have not remained in utero long enough to build up stores of glycogen and fat
 - Aggravated by increased need for glycogen in the brain, heart, and other tissues
- Any condition that increases metabolism increases glucose needs
- Energy requirements place more stress on the already deficient stores
- Hypocalcemia
- Calcium transported across placenta in higher quantities in third trimester
- *Early* hypocalcemia occurs when the parathyroid fails to respond to the preterm infant's low calcium levels
- *Late* hypocalcemia occurs about 1 week in infants who are fed cow's milk, as it increases serum phosphate levels causing serum calcium levels to fall
- Increased Tendency to Bleed
- Blood is deficient in prothrombin
- Fragile capillaries of the head are susceptible to injury during birth, which can lead to intracranial hemorrhage
- Nursing care includes
 - Monitoring neurological status
 - Report bulging fontanel, lethargy, poor feeding, seizures
 - Slight Fowler's position

— Unnecessary stimulation can increase intracerebral pressure

- Retinopathy of Prematurity (ROP)
- Separation and fibrosis of the retina, can lead to blindness
- Damage to immature retinal blood vessels thought to be caused by high oxygen levels in arterial blood
- Leading cause of blindness in infants weighing <1500 grams
- Has several stages
- Maintaining sufficient levels of vitamin E and avoiding excessively high concentrations of oxygen may help prevent ROP from occurring
- Cryosurgery may reduce long-term complications
- Poor Nutrition
- Stomach capacity is small
- Sphincters at either end of stomach are immature
- Increased risk of regurgitation and vomiting
- Sucking and swallowing reflexes are immature
- Ability to absorb fat is poor
- Increased need for glucose and other nutrients to promote growth and prevent brain damage are contributing factors
- Parenteral or gavage feedings may be needed until infant's systems are more mature
- Necrotizing Enterocolitis (NEC)
- Acute inflammation of the bowel that leads to bowel necrosis
- Factors include
 - Diminished blood supply to bowel lining
 - Leads to hypoxia or sepsis

- Causes a decrease in protective mucus
- Results in bacterial invasion
- Source of bacterial growth if receiving milk formula or hypertonic gavage feedings
- Signs of NEC
- Abdominal distention
- Bloody stools
- Diarrhea
- Bilious vomitus
- Nursing Care of Infant with NEC
- Observing vital signs
- Measuring abdomen
- Auscultating for bowel sounds
- Carefully resuming fluids as ordered
- Maintaining infection prevention and control techniques
- Surgical removal of the necrosed bowel may be indicated
- Immature Kidneys
- Cannot eliminate body wastes effectively
- Contributes to electrolyte imbalance and disturbed acid-base relationships
- Dehydration occurs easily
- Tolerance to salt is limited
- Susceptibility to edema is increased

- Nursing Care of Infant with Immature Kidneys
- Accurate measurement of intake and output
- Weigh diapers per hospital procedures
- Urine output should be between 1 and 3 mL/kg/hr
- Observe for signs of dehydration or overhydration
- Document status of fontanelles, tissue turgor, weight, and urinary output
- Jaundice
- Immature liver, contributes to condition called *icterus*
- Causes skin and whites of eyes to assume a yellow-orange cast
- Liver unable to clear blood of bile pigments which result from the normal postnatal destruction of RBCs
- The higher the serum bilirubin level, the higher the jaundice and the greater the risk for neurological damage
- Jaundice (*cont.*)
- An increase of >5 mg/dl in 24 hours or a bilirubin level above 12.9 mg/dl requires careful investigation
- Pathological jaundice
 - If occurs within 24 hours of birth, may be related to an abnormal condition such as ABO incompatibility
- Breastfed infants can show signs of jaundice about 4 days after birth
- Total serum bilirubin levels typically peak about 3 to 5 days after birth
- Goals of Treating Jaundice
- Prevent kernicterus by preventing the rising bilirubin levels from staining the basal nuclei of the brain

- Nursing care goals should be to
 - Observe skin, sclera, and mucous membranes for signs of jaundice
 - Report the progression of jaundice from the face to the abdomen and feet
 - Monitor and report any abnormal lab results
 - Response to phototherapy
- Special Needs of the Preterm Infant
- Nursing Goals for the Preterm Newborn
- Improve respiration
- Maintain body heat
- Conserve energy
- Prevent infection
- Provide proper nutrition and hydration
- Give good skin care
- Observe infant carefully and record observations
- Support and encourage the parents
- Incubators
- It is important for the nurse to know how to use the various types of incubators available in their health care facility in order to provide safe and effective care to the infant who is in one
- Radiant Heat Warmers
- Supplies overhead heat
- Allows easier access to infant
- Kangaroo Care

- Uses skin-to-skin contact
- Infant wears only a diaper (and sometimes a cap) and is placed on the parent's naked chest
- The skin warms and calms the child
- Promotes bonding
- Providing Nutrition to the Preterm Infant
- May require
 - Parenteral feedings
 - Gavage feedings
- May use bottles for
 - Breast milk
 - Formula
- Early initiation of feedings reduces the risk of hypoglycemia, hyperbilirubinemia, and dehydration
- Nursing Care Related to Nutrition
- Observe and record bowel sounds and passage of meconium stools
- For gavage feeding, aspiration of gastric contents prior to feeding is important
- If no residual received, it's safe to start the feeding
- If a higher-than-ordered limit of gastric contents is received, feeding may need to be held and the health care provider notified
- Positioning and Nursing Care
- Preterm is placed on the side or prone with head of mattress slightly elevated
 - Decreases respiratory effort, improves oxygenation

- Promotes more organized sleep pattern and lessens physical activity that burns up energy needed for growth and development
- Should be compatible with drainage of secretions and prevention of aspiration
- Do not leave infant in one position for a long period of time, as it increases the risk of skin breakdown
- Prognosis for Preterm Infant
- Growth rate nears the term infant's about the second year of life, but very-low-birth weight infants may not catch up, especially if chronic illness, insufficient nutritional intake, or inadequate caregiving has occurred
- Growth and development of the preterm infant are based on
 - Current age minus the number of weeks before term the infant was born
 - This calculation helps prevent unrealistic expectations for the infant
- Family Reaction to a Preterm Infant
- Parents will need guidance throughout the infant's hospitalization
- May believe they are to blame for infant's condition
- May be concerned about their ability to care for such a small infant
- Parents are taught how to provide appropriate stimulation without overtiring their infant
- Discharge Planning of the Preterm Infant
- Begins at birth
- Parents will need to demonstrate and practice routine and/or specialized care
- Home nursing visits may be required to assess home, infant, and family
- The Postterm Newborn
- Born beyond 42 weeks gestation
- Placenta does not function well after a certain point

- Can result in fetal distress
- Mortality rate of later-term infants is higher than that of term newborns
 - Morbidity rates also higher
- Problems Associated with Postterm Delivery
- Asphyxia
- Meconium aspiration
- Poor nutritional status
- Increase in red blood cell production
- Difficult delivery due to increased size of fetus
- Birth defects
- Seizures
- Physical Characteristics of the Postterm Newborn
- Long and thin
 - Weight may have been lost
 - Skin is loose (especially around buttocks and thighs)
- Little lanugo or vernix caseosa
 - Skin is dry, cracks and peels
 - Nails are long and may be stained from meconium
- Thick head of hair and looks alert
- Nursing Care of the Postterm Newborn
- Careful observation for

— Respiratory distress

— Hypoglycemia

— Hyperbilirubinemia

— Cold stress

- Transporting the High-Risk Newborn
- Stabilization of the newborn prior to transport is essential
- Baseline data such as vital signs and blood work should also be obtained and provided to the transport team members
- Copies of all medical records are made, including the mother's prenatal history and how the delivery progressed
- Transporting the High-Risk Newborn (*cont.*)
- Ensure infant is properly identified and that the mother has the same identification number band
- Provide parents with name and location of the NICU the infant is being transported to, including telephone numbers
- If possible, allow parents a few moments with their infant prior to transporting
- If possible, take a picture of the baby and give to parents
- Discharge of the High-Risk Newborn
- Parents must be familiar with infant's care
- The newborn's behavioral patterns are discussed and realistic expectations are reviewed
- Communication can be maintained with the hospital through "warm lines"
- Social services may be of help in ensuring the home environment is satisfactory and special needs of the infant can be met
- Support group referrals are given

- Newborn CPR techniques are reviewed
- Question for Review
- What are the differences in the appearance of a preterm infant and a postterm infant?