COMPLICATIONS OF THE LATE PRETERM INFANT

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OBJECTIVES

• Identify complications of the late preterm infant
• Discuss best practices using continuous positive airway pressure (CPAP)
• Evaluate neonatal hematology and basic lab values
• Discuss common feeding challenges in the late preterm population

OUTLINE

• Definition
• Thermoregulation
• Feeding immaturity
• Hypoglycemia
• Hyperbilirubinemia
• Delayed Transition
• Respiratory Distress
• Sepsis
• Hematology/basic lab interpretation

THE LATE PRETERM INFANT

• 34 0/7 weeks – 36 6/7 weeks gestation
• Prone to issues related to prematurity
• Prevention

LATE PRETERM MORTALITY

• ↑ risk of neonatal mortality vs. term infants
  • 6x risk of early mortality (0-6 days of life)
  • 3x risk of late mortality (7-27 days of life)
• 2-3x risk of death due to preventable causes
• 2x risk of SIDS

CRITICAL PERIODS OF BRAIN DEVELOPMENT

3rd trimester:

• Forming sulci (grooves) and gyri (ridges)
• Higher level processing (memory, language, visual perception, reasoning, information processing)
• Neurons begin to mature, organize, and interconnect
• Myelination begins

Late preterm infants are born with only 65% of term infant brain development
NEUROPROTECTION

- Negative experiences have a greater effect on one's psychologic state and processes than do neutral or positive experiences.

WHAT IS THERMOREGULATION?

- A balance of heat loss, heat gain, and heat production
- Maintaining a neutral thermal environment (NTE)
  - Infant’s metabolic rate and oxygen consumption are at a minimum while normal body temperature is maintained

THERMOREGULATION

At risk for hypothermia
- Less subcutaneous fat, thin epidermis
- Decreased brown fat for thermogenesis
- Disproportionate body mass to surface area ratio
- Less tone than term infant (more extended posture)
- Decreased vasomotor control

WHY IS THERMOREGULATION SO IMPORTANT?

- Reduces the effects of cold stress on the infant
- Infants have a physiologic response to cold stress
- Infants experience increased metabolic rate and oxygen consumption
- Hypothermia is preventable!

MECHANISMS OF HEAT PRODUCTION

- Metabolic processes
- Voluntary muscle activity
- Non-shivering thermogenesis

BROWN FAT METABOLISM

- Energy generation
- Heat production
- “Non-shivering thermogenesis”
COLD STRESS
- Related to infant's attempt to increase core temperature
- Altered neuro status
- Lower heart rate
- Hypoglycemia
- Decreased interest in eating
- Respiratory distress

MODES OF HEAT LOSS
1. Evaporation
2. Conduction
3. Convection
4. Radiation

PHOTO FROM: HTTPS://NURSEKEY.COM/PHYSIOLOGIC-AND-BEHAVIORAL-ADAPTATIONS-OF-NEWBORN

SYMPTOMS OF HYPOTHERMIA
- A/B's
- Hypoglycemia
- Hypotonia
- Hypoxemia
- Feeding intolerance
- Increased metabolic rate
- Metabolic acidosis
- Poor weight gain
- Pulmonary vasoconstriction (PPHN)
- Respiratory distress
- Weak cry or suck

INTERVENTIONS FOR HYPOTHERMIA
- Skin to skin
- Neutral thermal environment
- Keep infant under radiant warmer for initial resuscitation
- Dry well, apply hat
- Keep infant dressed and swaddled
- Delay bath
- Swaddle bath

BATHING
- Newborns are the most vulnerable in the first 24 hours after birth
  - Must be able to quickly adapt to extraterrestrial life through thermoregulation and energy metabolism
  - Early initiation of a newborn bath can increase this vulnerability resulting in:
    - Hypothermia
    - Hypoglycemia
    - Increased infection rates
    - Interrupted breastfeeding

FEEDING IMMATURE
Potential Problems:
- Immature suck, swallow, breath
- Longer feeding times, shorter feeding intervals
- Immature musculature
- Weak suck
LPi's should not be compared to full term infants in mature sucking behaviors or sufficient milk transfer until at least 40 weeks corrected gestational age
INTERVENTIONS FOR IMMATURE FEEDERS

• Assess entire feeding, every time
• Breast feeding support for mothers
  * Lactation nurse if available
• Supplementation prn
• Daily weights

FEEDING CHALLENGES

Breastfeeding challenges:
• breastfeeding non-initiation rates
• breastfeeding initiation within first hour after birth
• exclusive breastfeeding rates at discharge
• continued breastfeeding rates >10 weeks

Poor feedings result in:
• Poor weight gain
• Dehydration
• Inadequate breast stimulation and maternal milk supply
• Hyperbilirubinemia
• Hypoglycemia
• Hospital readmission

BREASTFEEDING SUPPORT

• Immediate and uninterrupted skin to skin until after 1st breastfeeding
• Hand expression w/in 1st hour of delivery
• Monitor and document feeding frequency
• Limit attempts at breast to 10 minutes
• Lactation consult within 24 HAO
• Nipple shield if ineffective latch or milk transfer
• Pre/post weights PRN

BREASTFEEDING SUPPORT

• Mom to pump after each breastfeeding - Q3H
  * Until the infant is mature enough to take entire feeding from breast
  * May take several weeks - months
• Utilize hospital grade electric pump
• Pump Early and Often
  * Within 1 hour is ideal
  * < 2 hours after vaginal delivery
  * < 4 hours after cesarean section
• Hands on pumping
• Hand expression after pumping

FEEDING NURSING MANAGEMENT

• Observe every feeding Q3H
• Observe and document feeding cues Q3H
• Supplement PRN (if medically indicated) by breast or bottle
• Paced feedings
• Ongoing monitoring and documentation of voids and stools
• Daily weights
• Avoid excessive weight loss

HYPOGLYCEMIA

• AAP definition: <40 mg/dL
• Transient asymptomatic neonatal hypoglycemia (TANH)
  * <48 hrs of age
• 15% all newborns require specialized tx for hypoglycemia
• IV glucose and NICU admission
  * 90% all infants with identified risk factors
  * 60% preterms infants
HYPOGLYCEMIA

Occurs more often in late preterm infants r/t:
- Reduced glycogen stores
- Delayed gluconeogenesis
- Insufficient metabolic response to abrupt loss of maternal glucose supply
- Increased energy demands
- Immature GI system
- Feeding issues & inadequate enteral intake

HYPOGLYCEMIA PREVENTION

- Identify at-risk infants
- Maternal risk factors
- Infant risk factors
- Promote thermoregulation
- Feed within 1 hour of birth
- POC glucose 30 minutes after initial feeding
- Feed at least Q3H
- Monitor each feeding to ensure effectiveness
- AC POC Glucose Q3H for duration of 24 hours
- Observe for S/S of hypoglycemia

HYPOGLYCEMIA NURSING MANAGEMENT

Glucose <40: TREAT!
- Follow hypoglycemia algorithm
- Glucose gel
- Supplement immediately with minimum 15mL via bottle/gavage
- If bottle, remaining volume not taken by infant should be gavaged
- Supplement for remainder of hospitalization – 1st outpatient visit
- Stress for 10 minutes
- Bottle after every feeding
- Blood sugar <40 – Infants
- Blood sugar >40 – Infant driven
- May go back to breast after supplementing

S/S OF HYPOGLYCEMIA

- Lethargy
- Jitteriness
- Apnea
- Cyanosis
- Low tone
- Poor feeding
- Seizures
- Hypothermia
- Tachycardia
- Tachypnea/respiratory distress
- Abnormal cry

INTERVENTIONS FOR HYPOGLYCEMIA

- Keep warm!
- Feed at least every 2-3 hours
- AC glucose levels for 24 hours or until stable
- Supplementation
- Glucose gel
- May need IV glucose bolus/infusion

HYPERBILIRUBINEMIA

- By-product from breakdown of RBCs via hemolysis after birth
- Normal process in all infants
- Exacerbated with dehydration/poor feeding
- Can be pathologic if Rh/ABO incompatibility present
- Infection can cause destruction of RBC
S/S OF HYPERBILIRUBINEMIA

- Yellow/orange color of skin & sclera of eyes
- Progresses from head to toe as the level rises
- Increased lethargy
- Decreased interest in eating
- Not voiding/stooling adequate amounts

HYPERBILIRUBINEMIA

- Commonly occurs in newborns >24 hours of age
- PATHOLOGIC if jaundice appears < 24 hours of age or after 2 weeks of life
- Exacerbated in late-preterm population

HYPERBILIRUBINEMIA

- Coombs test (Direct Antibody Test)
- Normal hyperbilirubinemia peaks Day 3-5 of life
- Obtain 1st serum total bilirubin level or (transcutaneous level if >35 weeks) @ 24-48 hrs
- Follow AAP graph for phototherapy level (hours age versus level for gestational age/risk factors)

INTERVENTIONS FOR HYPERBILIRUBINEMIA

- Check 1st bilirubin level around 24-48 hours age
- Hydration
- Phototherapy
- In severe cases, infant may require IVIG and/or exchange transfusion to prevent Kernicterus (neurological damage)

DELAYED TRANSITION

- Not specific to late-preterm infants
- Lungs changes
- Persistence of patent ductus arteriosus
- Symptoms
  - Oxygen (O2) saturations changes
  - Respiratory distress
  - Need for supplemental oxygen
PREVENTION/INTERVENTIONS

- NRP
- Utilize CPAP
- Supplemental O2
- Maintain thermoneutral
- Prevent hypoglycemia
- Consider transfer to level III NICU
- Lab
- Consider other causes

RESPIRATORY DISTRESS

- Grunting
- Retractions
- Nasal flaring
- Interventions

WHAT IS CPAP?

Continuous Positive Airway Pressure (CPAP)

- Maintain positive end-expiratory pressure (PEEP)
- Prevent alveolar collapse

CPAP

Considerations:

- O2 blender
- Mask or prongs/cannula
- Initial setting usually a PEEP of 5 or 6
- Chest X-ray
- Blood gas

Nursing management:

- Proper fit
- Assess nasal septum
- Always use lowest O2 needed

SEPSIS

- Occurs 3 times more frequently in the late preterm infant
- Impaired cellular response
- Infection vs. sepsis
- Pathogens
EARLY ONSET SEPSIS CALCULATOR

• Tool to help determine risk of sepsis in infant born ≥34 0/7 weeks gestation
• Helps decrease unnecessary use of antibiotics
• https://neonatalsepsiscalculator.kaiserpermanente.org

S/S OF SEPSIS

• All or Nothing
• Central Nervous System (CNS)
• Cardiovascular (CV)
• Respiratory
• Gastrointestinal (GI)
• Skin

HEMATOLOGY

BASIC LAB INTERPRETATION

* CBC with differential
* Blood gas
* BMP
* CEP
* Blood cultures

CBC WITH DIFFERENTIAL

Indications

* Anemia
* Thrombocytopenia
* Evaluate for sepsis

CBC INTERPRETATION

Hematocrit – 40-65%
Hemoglobin – 14-20 g/dL

* Used to evaluate percentage of RBC in the full blood volume
* Lifespan of RBC in neonate
  * 35-50 days preterm
  * 60-70 days in term

Platelets – 150,000-400,000

* Hemostasis and clotting
* Thrombocytopenia (<150,000) is abnormal and needs investigating
  * Often late sign of infection
CBC INTERPRETATION

WBC –
* Preterm: 6,000-19,000
* Term: 10,000-26,000
* Lower WBC is often indicative of worse infection than higher WBC

• Differential
• Measures all WBC types
• Granulocytes
  * Neutrophils
  * Basophils
  * Eosinophils
• Monocytes
  * T-lymphocytes (thymus)
  * B-lymphocytes (bone marrow)

LOOKING FOR INFECTION

• CRP: Amount of protein in the blood signaling an inflammatory process
• ANC: Absolute neutrophil count
• Blood Cultures: obtained when evaluating for sepsis
• I/T Ratio: Immature/Total Neutrophil Ratio

“NORMAL” BLOOD GAS VALUES

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BASIC METABOLIC PANEL (BMP)

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REFERENCES


