Care of the Premature, Postmature, and Sick Infant

Terminology
Assessment
Nursing Interventions
Neonatal Resuscitation
Objectives

- Define premature, postmature, SGA, LGA, low birth weight infants.
- Assess the premature and postmature infant.
- Examine the steps of the Neonatal Resuscitation Program
- Review nursing interventions for delivery care, hypothermia, respiratory distress, and hypoglycemia
Terminology

- Premature infant: < 38 weeks gestation
- Low birth weight: < 2500 Gm regardless of gestational age
- Moderately low birth weight: 1501-2500 Gm
- Very low birth weight: < 1500 Gm
- Extremely low birth weight: < 1000 Gm
Terminology

- Postmature infant: 42 weeks gestation or greater
- Small for gestation age: <10% on growth chart
- Large for gestation age: above 90% on growth chart
Premature Infant

- Infant born < 38 weeks gestation

- Factors contributing to premature birth are:
  - Incompetent cervix
  - Multiple gestation
  - Premature rupture of membranes
  - Adolescent pregnancy
  - Maternal hypertension (preeclampsia)
  - Maternal infection or disease
  - History of premature deliveries
Premature Infant

- Problems of premature infant:
  - Hypoglycemia
  - Hypothermia
  - Respiratory distress syndrome
  - Infection
  - Neurological problems (intraventricular hemorrhage)
  - Necrotizing enterocolitis
  - Problems related to immaturity of every body system
Premature Infant

Assessment:

- Thin, gelatinous skin < 26 weeks, bright pink in color
- Presence or absence of lanugo, plantar creases, breast tissue, ear cartilage
- Eyes fused < 24 weeks
- Soft cranium, hair is fine
- Lack subcutaneous fat
- Head large in proportion to body
- Female – prominent clitoris and labia
- Male – nondescended testes, few rugae
- Immature reflexes
Premature Infant

FIGURE 30–6  A 6-day-old, 28-week gestational age, 960-g preterm infant.

- Pictures courtesy of Yahoo!
Postmature Infant

- Infant born > 42 weeks gestation

- Placenta has lost ability to provide sufficient nutrients and oxygen and to eliminate waste products.

- Problems of postmature infant are:
  - Meconium aspiration
  - Malnutrition, hypoglycemia
  - Hypothermia
  - Asphyxia, Death
Postmature Infant

Assessment:

- Dry, cracking skin
- Absence of vernix and lanugo
- Extremities may be long and thin
- Long fingernails
- Skin may be deep yellow or green from meconium
- Abundant scalp hair
- Thin appearance due to loss of subcutaneous fat
FIGURE 30–5 Postterm infant demonstrates deep cracking and peeling of skin.
Nursing Interventions with the Preterm, Postterm, and Sick Infant

Delivery $\rightarrow$ NRP $\rightarrow$ Admission to Nursery/NICU
Nursing Interventions at Delivery and Admission to Nursery/NICU

- Place under radiant warmer at 36.5°C
- Dry and stimulate with warm blankets
- Obtain vital signs
- Apply O2 – bag & mask, ventilate
- Suction as needed
- Obtain 1 minute, 5 minute, 10 minute APGAR scores
- Assess umbilical cord – 3 vessels
Nursing Interventions at Delivery and Admission to Nursery/NICU

- Place ID bands on
- Obtain footprint
- Allow mother to see newborn
- Transport to Nursery or NICU
- Obtain weight & length
- Complete physical and gestational age assessments
- Administer erythromycin ointment and vitamin K
Neonatal Resuscitation Program (NRP)

- At delivery, ask 4 questions:
  - Term gestation?
  - Clear amniotic fluid?
  - Breathing or crying?
  - Good muscle tone?

- If yes:
  - Routine care
    - Provide warmth
    - Clear airway
    - Dry
    - Assess color

- If no:
  - Provide warmth
  - Position, clear airway
  - Dry, stimulate, reposition
  - Evaluate respirations, heart rate, color
Neonatal Resuscitation Program (NRP)

- Evaluate respirations, heart rate, color
  - Yes
  - Breathing
  - HR > 100
  - Pink
  - Cyanotic – give supplemental oxygen
  - Apneic or PPV
  - HR < 100
  - HR < 60 – Chest compressions, epinephrine
Bag/Mask Ventilation

- Use a cushioned, anatomically shaped mask
- Mask must cover nose and mouth completely
- Bottom rim should cover the edge of the chin
- Place thumb over the nose portion of the mask
- Watch for chest rise while squeezing the bag
- If chest does not rise
  1. Recheck seal
  2. Reposition head
  3. Increase inflating pressure
Assisting with Intubation

- Hold the suction catheter close to the operator
- Provide oxygen
- Check tube cm marking at lip
Place a gastric tube to decompress the stomach
ET Tube Location on CXR

Optimal ET tube location
Carina
ET tube in acceptable position
ET tube in right mainstem bronchus

Total left lung atelectasis
Chest Compressions/Ventilation

- **3:1** ratio of compressions to ventilations
  - 90 compressions and 30 breaths = 120 events per minute

- Reassess every 30 seconds
- Discontinue resuscitation after 10 minutes of no heart beat and no respirations
Hypothermic infants

How body heat is lost

Detrimental effects of cold stress

Warming hypothermic and severely hypothermic infants
Hypothermia

- Extremely vulnerable infants include:
  - Low birth weight
  - Those requiring prolonged resuscitation
  - Preventing cold stress is a challenge.

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Heat Loss by Conduction

Contact with cold or wet objects

Pre-warm scales and x-ray plates
Cover scale with warm blanket
Cautiously use radiant heat
Heat Loss by Convection

Drafts and cold air

Move away from drafts
Raise sides on warmer
Close port holes
Raise room temperature
Heat Loss by Evaporation

Delivery, bathing, damp linens

- Dry thoroughly
- Replace wet linens
- Cautiously use radiant heat
- Do not bathe infant if showing signs of compromise

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Heat Loss by **Radiation**

**Cold windows and walls**

- Use double walled incubator
- Use ISC temperature probe on radiant warmer (not manual)
- Move away from outside walls and windows

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Detrimental Effects of Cold Stress

- Development of **Metabolic Acidosis** caused by:
  1. Brown fat metabolism causing vasoconstriction
  2. Decreased surfactant production
  3. Increased anaerobic metabolism
  4. Increased metabolic rate
FIGURE 31–6 Cold stress chain of events. The hypothermic, or cold-stressed, newborn attempts to compensate by conserving heat and increasing heat production. These physiologic compensatory mechanisms initiate a series of metabolic events that result in hypoxemia and altered surfactant production, metabolic acidosis, hypoglycemia, and hyperbilirubinemia.
Nursing Interventions to Prevent Cold Stress

- Dry quickly — remove wet linens
- Use warm blankets
- Provide radiant warmer heat
  - Place infant on ISC/servo control
- Use heated, humidified O\textsubscript{2} as soon as possible
  - \textit{Remember:} cold gas (O\textsubscript{2}) in, warm exhaled gases out
Guidelines for Re-warming

- Severely hypothermic infants — temperature < 35°C (95°F)
  - Incubator
  - Radiant warmer
- Core temperature goal — 37°C (98.6°F)
- While re-warming:
  - Monitor vital signs constantly
  - At risk for apnea, hypotension, RDS, metabolic acidosis, shock, death
Artificial/Assisted Breathing

- Evaluating respiratory distress
- Indications for endotracheal intubation and positive pressure ventilation
- Evaluating for pneumothorax, airway obstruction

Respiratory distress is the most common reason for referral to an intensive care nursery.
Assessment & Monitoring

- Temperature
- Heart rate and rhythm
- Respiratory rate and effort
- Blood pressure
- O₂ saturation
- O₂ concentration
- Skin perfusion
- Strength of pulses in arms and legs
Diagnostic Tests to Perform

- Chest x-ray
  - If respiratory distress

- Abdominal x-ray
  - If abdominal problem

- Blood gas
  - Arterial or capillary

- CBC with differential
  - Hematocrit
Respiratory Rate

- High rate: greater than 60 breaths per minute
- Low rate: less than 40 breaths per minute
  - Shallow vs. labored
- Apnea
- Gasping
  - *Ominous* pre-cardiac arrest sign!
Evaluate Respiratory Distress

- Retractions
  - Mild, moderate, severe
  - Intercostal, subcostal, substernal

- Nasal flaring present?

- Grunting
  - Audible without a stethoscope?
Areas to Assess for Retractions

- Substernal
- Subcostal
- Intercostal
- Suprasternal
Evaluate Perfusion

- Capillary filling time — trunk and legs
- Strength of pulses
- Heart rate and rhythm
- Temperature of extremities
- Cyanosis and/or skin mottling
- Report color differences — upper versus lower body - Harlequin
Color and Oxygen Requirement

- Degree of cyanosis
  - Peripheral versus central

- Amount of O\(_2\) to keep saturation > 88%

- Rapidly increasing O\(_2\) concentration

- Arterial PO\(_2\) < 50 in more than 50% oxygen?
Is the pH normal? Is the PCO₂ normal? Is the HCO₃ normal?
Acidosis

- pH < 7.30 is *abnormal*

- pH < 7.25 is *concerning* — especially if in combination with poor perfusion, tachycardia and/or low BP

- pH < 7.20 indicates *severe illness* and need for immediate intervention

- pH < 7.15 indicates the infant is in *severe crisis*
Causes of Respiratory Acidosis

Inadequate ventilation → ↑ in CO₂

- Lung disease
  - Pneumonia, aspiration, RDS
- Pneumothorax
- Airway obstruction, Diaphragmatic Hernia
- Decreased respiratory drive
  - Prematurity, apnea
- Neurologic impairment, asphyxia
Causes of Metabolic Acidosis

↑ Lactic acid production → ↓ in HCO₃⁻

- Shock
  - Poor perfusion
  - Inadequate tissue oxygenation

- Cardiac disease - congenital heart defects

- Brain disorders – hemorrhage, meningitis

- Inborn errors of metabolism
Pneumothorax

- Sudden deterioration
  - Bradycardia
  - Cyanosis
  - Signs of respiratory distress

- Evaluate for
  - Chest asymmetry
  - Shift in point of maximum impulse (PMI)
  - Hypotension
  - Poor peripheral pulses
Pneumothorax

Note:
ET tube in right mainstem bronchus

Right pneumothorax
Pneumothorax

Right pneumothorax with left lung atelectasis

- ET tube T1
- UAC tip T6-T7
- UVC tip T8-T9
Pneumothorax • Subpulmonic

- ET tube in good position
- UAC tip T8
- UVC tip right atrium

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Pneumothorax • Bilateral
Pneumothorax • Massive Tension

Note:
Mediastinal shift

Complete right lung collapse
Pneumopericardium
Airway Obstruction

- Main symptoms
  - Stridor
  - Retractions

- Airway obstruction may occur at:
  - Nose
  - Mouth and jaw
  - Larynx or trachea
  - Bronchi
Airway Obstruction

**Choanal Atresia**

- Nasal obstruction
- Baby is cyanotic at rest
- "Pinks up" with crying
- If bilateral, may need oral airway or endotracheal intubation
- Oral airway sizes:
  - 00 for small infants
  - 0 for term or large infants
Airway Obstruction Challenges - Pierre-Robin Sequence

Note small jaw

Note cleft palate
Intubation and PPV

Strongly consider intubation if:

- Unable to or prolonged ventilation and/or oxygenation with bag/mask ventilation
- Is cyanotic or marginally oxygenated in 80% oxygen (O2 saturation < 88%)
- PCO₂ is > 55, especially if pH < 7.25
- Diaphragmatic hernia, choanal atresia present
- Apnea or gasping
Infants at Risk for Hypoglycemia

- SGA
  Small for gestational age
  \[ \downarrow \text{Glycogen stores} \]

- LGA
  Large for gestational age
  \[ \text{Hyperinsulinism} \]

- IDM
  Infant of the diabetic mother
  \[ \text{Hyperinsulinism} \]

- Premature
  \[ \downarrow \text{Glycogen stores} \]

- Stressed or sick
  \[ \uparrow \text{Glucose utilization} \]
Symptoms of Hypoglycemia

- Jitteriness
- Hypothermia
- Temperature instability
- Lethargy, hypotonia
- Apnea, irregular respirations
- Poor suck or refusal to eat
- Vomiting
- Cyanosis
- High-pitched or weak cry
- Seizures
Avoid enteral feedings (PO or NG)
- Increased risk of aspiration with respiratory rate > 60 breaths per minute
  - Gastroesophageal reflux
- Impaired bowel blood flow
  - Necrotizing enterocolitis

Establish IV access quickly to
- Normalize the blood sugar
- Provide emergency IV access
Blood Sugar Screening

- Perform frequently!
  - *q* 15-30 minutes until > 50 mg/dl (2.8 mmol/L) on two consecutive tests

- If (very) low obtain a serum blood sugar
  - But don’t delay treatment

- If > 150 mg/dl (8.3 mmol/L) on two consecutive tests — seek consultation
Treatment

Initial blood sugar < 50 (2.8 mmol/L)

- Begin IV of $D_{10}W$ at 80 ml/kg/day
- Repeat blood sugar within 30 minutes of first test
- Check blood sugar every 30 minutes until > 50 (2.8 mmol/L) on two consecutive tests
Initial IV Fluid and Rate

- D\textsubscript{10}W without electrolytes
- 80 ml/kg/day
  - Weight in kg multiplied by 80
  - Then divide by 24 (hours)
  - Equals ml per hour to run the IV (via an infusion pump)

\[
\frac{\text{kg} \times 80}{24} = \text{ml/hr}
\]
Treatment

Repeat blood sugar < 50 (2.8 mmol/L) after 1 hour of IV therapy

- Increase the IV rate to 100 ml/kg/day
- Once > 50 (2.8 mmol/L) screen every 1 to 2 hours until transported or as needed based on patient’s condition
UVC tip in good position at IVC/RA junction

UAC low line – tip in good position at L3
Umbilical Catheter Safety

- Use sterile technique
- Maintain an air-tight system
- Risk of significant blood loss with disconnection especially with UAC
- Tape securely
- Avoid thrombus by adding heparin
FIGURE 30–4  Macrosomic infant of diabetic mother.
TEMPERATURE
Minimize Cold Stress.
Maintain Skin Temp. 36.1° - 36.7°C (96.8°-97.7°F)
Continuously Monitor Temp.
Prevent Rapid Warming or Cooling.
Use A Cap To Prevent Heat Loss From Head.

FOOD & FLUIDS
Monitor For Hypoglycemia.
Assess Tolerance Of Oral Or Tube Feedings.
Monitor Hydration Closely.
Assess For Gastric Residual, Bowel Sounds, Change In Stool Pattern, Abdominal Girth.
Monitor Weight Gain Or Loss.

- HIGH RISK NEWBORN - NURSING INTERVENTIONS

RESP FUNCTION
Position ↑O₂ - Semiprone/Side Lying
Maintain Resp Tract Patency
Stimulate → Remind to Breathe
Monitor O₂ Therapy
Assess Resp Effort
  • Grunting
  • Nasal Flaring
  • Cyanosis
  • Apnea
Scenario…

29 week gestation infant precipitously delivers in the birthing room

Assessment:

- Mottled skin — axillary temp 34°C (93.2°F)
- Respiratory rate 80, grunting and retracting
- 80% O₂ by hood oxygen
- Blood gas — PCO₂ = 72
- Blood sugar 24 mg/dl (1.1 mmol/L)

What is newborn’s problem(s)?
6 hours after delivery, term infant found to be dusky and tachypneic in mother’s room

Assessment:

- Room air $O_2$ saturation — 75%
- Ashen skin color — axillary temp 35°C (95°F)
- Respiratory rate — 70
- Capillary refill = 5 seconds — BP 40/20
- Initial blood gas pH 7.06 — consistent with severe metabolic acidosis

What is newborn’s problem(s)?
The nurse notes that at 5 minute after birth, a neonate is pink with acrocyanosis, has his knees flexed and fists clenched, has a whimpering cry, has a heart rate of 128 beats/minute, and withdraws his foot to a slap on the sole. What 5-minute Apgar score should the nurse record for this neonate?
In the nursery, the nurse is performing a neurological assessment on a 1-day-old neonate. Which findings would indicate possible asphyxia in utero? Select all that apply.

1. The neonate grasps the nurse’s finger when she puts it in the palm of his hand.
2. The neonate does stepping movements when held upright with his sole touching a surface.
3. The neonate’s toes don’t curl downward when the soles are stroked.
4. The neonate doesn’t respond when the nurse claps her hands above the baby.
5. The neonate turns toward an object when the nurse touches the cheek with it.
6. The neonate displays weak, ineffective sucking.
Thank you ! Thank you ! Thank you ! Thank you ! Thank you ! Thank you ! Thank you !