Doug Gruenbacher MD

Family Physician, Quinter KS, Gove County Medical Center

No conflicts of interests to disclose
Objectives

- Discuss and Understand Current Guidelines for Respiratory Care of the Neonate
- Understand Normal Variants in the Neonatal Period
- Recognize Urgent and Developing Problems of the Neonatal Period
Physiology of Transition to Fetal Life

- Replacement of alveolar fluid with air
- Onset of regular breathing
- Increase in pulmonary blood flow as a result of increased systemic vascular resistance and decreased pulmonary vascular resistance
- 10 percent of neonates will have difficulty with Transition and require Resuscitation
25 year old female who is 38 weeks gestation presents with SROM, progresses to complete, dystocia occurs, heart tones non reassuring, General Anesthesia with C-Section delivery of male infant.

- No spontaneous respirations, poor tone, HR 110
- Dx?
- Intervention?
Case #1

- Infant pinks up with Positive Pressure Ventilation
- HR, Color, and tone improve
- Spontaneous respirations begin and blow by oxygen administered.
- 15 minutes later, respiration rate increases to 60, grunting, flaring, and tracheal deviation to the left occur
- Dx?
Needle in 2nd intercostal space, mid clavicular space, chest tube placed, intubated and shipped to tertiary care center.
Vaginal Deliveries

- Infant descent through pelvis presents a high amount of pressure to the infant which causes a high amount of reabsorption of the alveolar fluid.
- Decreased incidence of transient tachypnea of newborn
C-Sections

- Higher incidence of TTN
- Higher incidence of Respiratory Distress
Meconium Delivery

- Meconium: sterile mixture of debris, released with stress or due to post-dates, causes irritation of lung tissue, but poor outcomes are probably more due to the cause of the meconium, i.e. stress/infection.

- Associated with higher incidence of TTN, Post-dates, non-reassuring fetal tones, and infection.

- Previous recommendations were to directly visualize cords and perform suction.

- Current recommendation: supportive measures.
- Bulb suctioning on perineum
- Suction to clear the airway
- Avoid deep suction which can cause a vagal response, causing apnea and/or bradycardia
- No benefit to aspirate on meconium deliveries except if infant is nonvigorous or in distress
Stimulation

- Tactile Stimulation after birth
  - Drying
  - Flicking the soles of the feet
  - Rubbing the infant’s back

- If after several attempts of stimulation, the infant is still apneic, then positive pressure ventilation should be initiated
Neonatal Normal SpO₂ levels

- 1 minute: 60-65%
- 2 minute: 65-70%
- 3 minute: 70-75%
- 4 minute: 75-80%
- 5 minute: 80-85%
- 10 minute: 85-95%
Neonatal Resp Distress Etiologies

- TTN
- RDS
- PPHN
- Pneumonia
- Congenital Heart Disease
- Pneumothorax
- Congenital Diaphragmatic Hernia
- Tracheoesophageal Fistula
Transient Tachypnea of the Newborn

- Failure of adequate lung fluid clearance at birth.

- Liquid fills the air spaces and moves into the extra-alveolar interstitium, where it pools in perivascular tissues and interlobar fissures until it is cleared by lymphatic or vascular circulation.

- Precise pathology unknown, but it is thought to be caused by impairment of two mechanisms:
  - Sodium reabsorption which develops late in fetal life and creates an osmotic gradient for water uptake across the pulmonary epithelium.
  - Lung inflation that generates a hydrostatic pressure gradient, which promotes fluid movement of liquid from the airway.
Transient Tachypnea of the Newborn

- Onset is at birth and within two hours after delivery.
- Diagnosed by tachypnea, cyanosis, nasal flaring, mild intercostal and subcostal retractions and expiratory grunting.
- Breath sounds are typically clear, without rales or rhonchi.
- Duration can last for 12-24 hours.
Transient Tachypnea of the Newborn

- **Differential Diagnosis**
  - Pneumonia, Cardiac Disease, Sepsis
  - CBC, CXR, Blood Cultures

- **Management**
  - Supportive
    - Supplemental Oxygen
    - CPAP if increased work of breathing.
    - Neutral Thermal Environment and Provide Nutrition
Respiratory Distress Syndrome

- RDS is caused by deficiency of surfactant.
  - Phospholipids that reduce alvolar surface tension, which decreases the pressure needed to keep the alveoli inflated and maintains stability.
  - Infants have difficulty generating the inspiratory pressure needed to inflate alveolar units, resulting in atelectasis.
  - Atelectasis results in hypoxia and right to left shunting through the PDA and foramen ovale due to increased pulmonary vascular resistance.
Persistent Pulmonary Hypertension

- PPHN occurs primarily in term or late pre-term infants
- Underdevelopment, Maldevelopment, and Maladaption underlie the disorder.
  - Injury to the developing circulation may disrupt vascular endothelial growth factor leading to PPHN
  - Occurs in conjunction with meconium aspiration, pneumonia, RDS
  - Echocardiography used to diagnose
  - Treated with supportive measures and possibly inhaled nitric oxide
Anticipating Respiratory Distress

- History can assist in predicting distress!
- Gestational Age
- Method of Delivery
- Risk of Infection
- Meconium
- Poor Intrauterine Growth
- Non reassuring fetal heart rate patterns
Chest X-Rays in Respiratory Distress
RDS Pre-surfactant
Chest X-Rays in Respiratory Distress
RDS Post-surfactant
Chest X-Rays in Respiratory Distress

TTNB
Neonatal Respiratory Distress
Chest X-Ray
Administer supplemental oxygen, warmed and humidified, to relieve respiratory distress or cyanosis

- Target O2 sat between 90 and 95
- Normal newborn values reach or exceed 80 within 10 minutes of birth without supplemental oxygen
- Congenital Heart Disease and Preterm infants have lower target O2 sats
- Primary goal is to achieve good Tissue Oxygenation
- Excessive oxygenation may cause bronchopulmonary dysplasia or retinopathy of prematurity.
- Optimal O2 sat may vary from patient to patient
Neonatal Respiratory Distress
Initial Management

- Assisted Ventilation via continuous positive airway pressure if apneic or HR less than 100
- If needed, intubation for respiratory failure
- CXR, Fluids, Thermal Management
- CBC, ABX, Blood Cx if sepsis risk
Neonatal Respiratory Distress Subsequent Management

- TTN
  - Oxygen as needed, consider CPAP if needed
- Preterm Infant with RDS
  - Oxygen, Surfactant and CPAP, Ventilation if needed
- Term or Postterm Infant with Hypoxia
  - Echo to differentiate between primary cardiac and persistent pulmonary hypertension
Summary

- 3 main causes of Neonatal Respiratory Failure
  - TTN
    - Late pre-term or Term, C-Section
  - RDS
    - Pre-Term, Lack of Surfactant
  - PPHN
    - Term or Late pre-term, Not improving as expected

- Treatment based primarily on Tissue Oxygenation and Overall Patient Condition