



Neonatal Respiratory Care

Summary and Current Recommendations



Disclosure

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- 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

Case #1

- 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?

Case #1

- 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

Suctioning

- 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 alveolar 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 Maladaptation 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

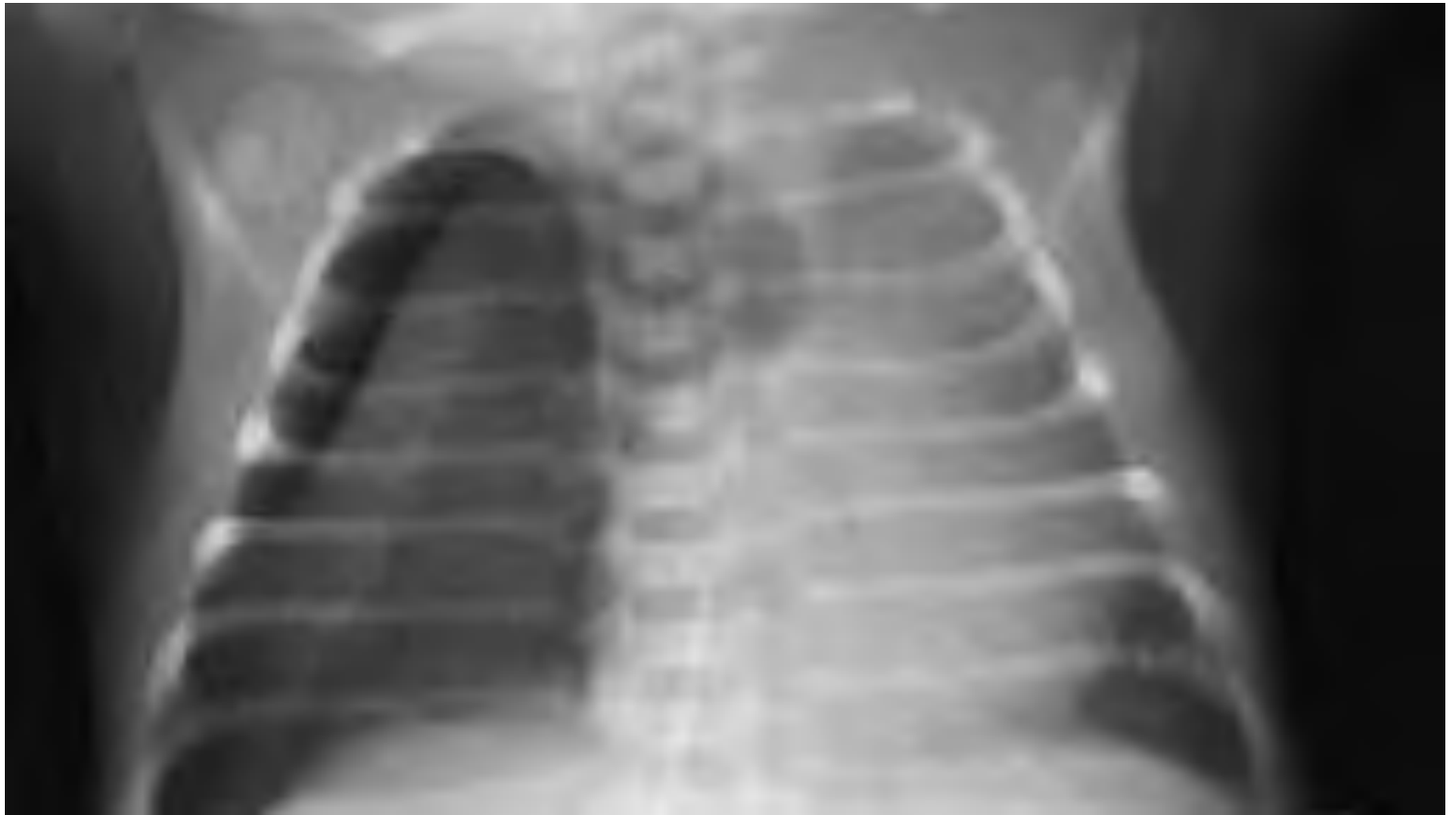


Chest X-Rays in Respiratory Distress

TTNB



Neonatal Respiratory Distress Chest X-Ray



Neonatal Respiratory Distress Initial Management

- 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 berth 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