

Respiratory Distress in the Newborn

Definitions

- respiratory distress refers to the signs and symptoms associated with impaired oxygenation of blood
- respiratory failure describes any impairment in oxygenation or ventilation in which the arterial oxygen tension falls below 60 mm Hg (acute hypoxemia), the carbon dioxide tension rises above 50 mm Hg (acute hypercarbia, hypercapnia) and the pH drops below 7.35, or both

Most Common Causes

- Respiratory Distress syndrome
 - risk factors: low GA, maternal DM, hypothyroidism, male sex
 - caused by _____ and, therefore, is primarily a disease of prematurity
 - The absence of _____ causes an increase in surface tension and alveolar collapse.
 - confirmed by ground glass appearance on CXR
- Retained Fetal Lung Liquid Syndrome/Transient Tachypnea of the Newborn
 - risk factors: c section, delivery before 38 weeks, male sex
 - believed to be transient pulmonary edema that results from _____
 - usually is a benign and self-limited disease
- Aspiration – Inc. Meconium Aspiration Syndrome
 - MAS is defined as respiratory distress in an infant born through meconium-stained amniotic fluid whose symptoms cannot otherwise be explained.
 - the bile salts and pancreatic enzymes, along with some of the other components, can cause _____
 - meconium inactivates surfactant and activates the complement system resulting in inflammation and vasoconstriction of pulmonary veins
- Pneumonia/Sepsis/Bacteremia
 - Pneumonia is the _____
 - prenatal and antenatal infections more often result from TORCH infections, GBS; post natal infections most often result from respiratory viruses, gram positive and gram negative bacteria
 - any infant with respiratory distress for more than a few hours should be evaluated for the possibility of infection
- Congenital Heart Disease
 - Cyanotic: Tetralogy of fallot, Transposition, Persistent Truncus Arteriosus, Pulmonary stenosis, Patent ductus arteriosus
 - Acyanotic: ASD, VSD, Coarctation

Table 2. **Differentiation of Cyanotic Heart Disease from Pulmonary Disease in Respiratory Distress***

	Cyanotic Heart Disease (CHD)	Pulmonary Disease
History	<ul style="list-style-type: none"> • Previous sibling having CHD • CHD diagnosed on prenatal ultrasonography 	<ul style="list-style-type: none"> • Cesarean section without labor • Preterm birth • Meconium-stained amniotic fluid • Maternal fever
Physical Examination	<ul style="list-style-type: none"> • Cyanosis • Single second heart sound • Gallop rhythm • Weak lower extremity pulses • Quiet tachypnea 	<ul style="list-style-type: none"> • Cyanosis • Split second heart sound • Retractions • Temperature instability • Crackles (rales), rhonchi
Chest Radiograph	<ul style="list-style-type: none"> • Increased heart size • Abnormal heart shape • Abnormal pulmonary vasculature 	<ul style="list-style-type: none"> • Normal heart size • Abnormal pulmonary parenchyma
Arterial Blood Gases	<ul style="list-style-type: none"> • Normal or decreased PaCO₂ • Decreased Pao₂ 	<ul style="list-style-type: none"> • Increased PaCO₂ • Decreased Pao₂
Hyperoxia Test	<ul style="list-style-type: none"> • Pao₂ 50 to 150 mm Hg 	<ul style="list-style-type: none"> • Pao₂ > 150 mm Hg
Echocardiography	<ul style="list-style-type: none"> • Abnormal heart and vessels 	<ul style="list-style-type: none"> • Normal heart and vessels

- Other
 - hypoglycemia
 - hypovolemia
 - Persistent pulmonary hypertension of the newborn (PPHN) occurs when the normal cardiopulmonary transition of the delivered infant fails
 - spontaneous pneumothorax

Signs and Symptoms

- tachypnea (RR > _____)
- _____
 - sound made on expiration against a partially closed glottis, produces elevated transpulmonary pressures and facilitates maintenance of functional residual capacity
- _____
 - causes reduction in nasal resistance, which can reduce total lung resistance and decrease the work of breathing
- cyanosis
 - Central cyanosis becomes clinically apparent when at least 5 g/100 mL of hemoglobin becomes unsaturated
- _____
 - suggestive of upper airway obstruction

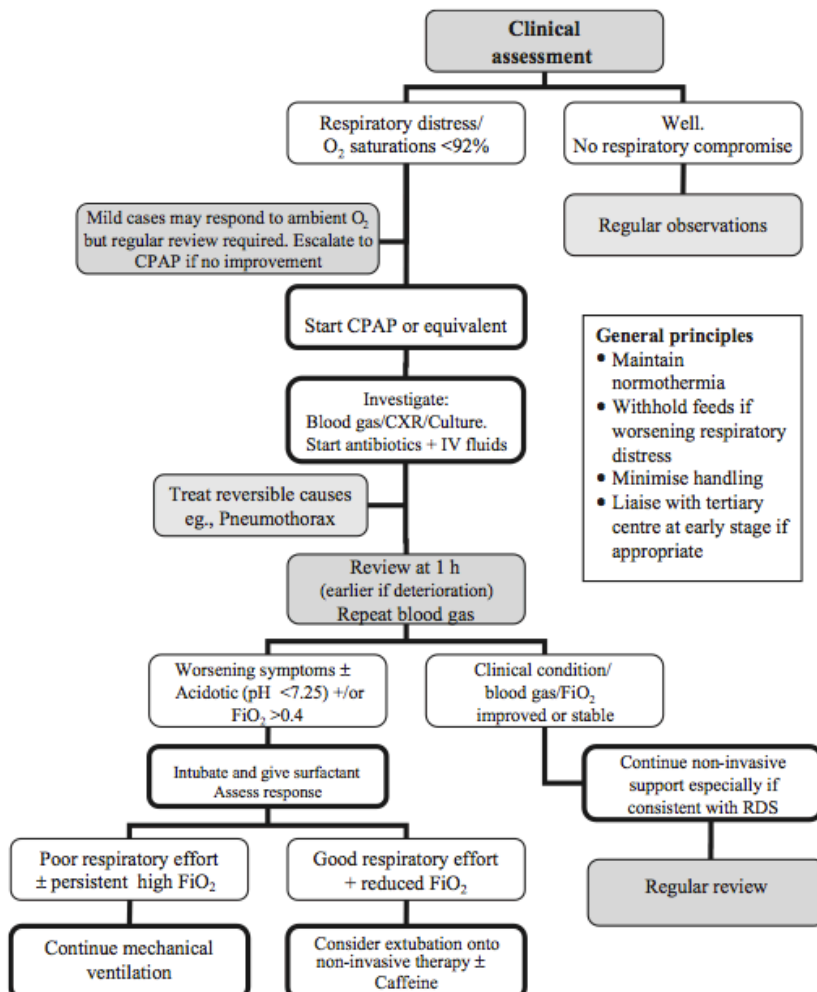
Investigations

- Initial Investigations :
 - SaO₂
 - ABG
 - CXR
 - CBC + Diff
 - blood culture
 - CRP
- Additional Investigations to Consider:
 - Echo
 - hyperoxia test
 - HUS

Management

- treatment should be aimed at the underlying cause!
- Ongoing signs of distress in a baby requiring more than 7 cm H₂O of PEEP, an oxygen requirement >40% or a pH < 7.25 are generally accepted as triggers for escalation of treatment.

- consider Abx treatment for 48 hrs until blood culture comes back



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- respiratory distress refers to the signs and symptoms associated with impaired oxygenation of blood
- respiratory failure describes any impairment in oxygenation or ventilation in which the arterial oxygen tension falls below 60 mm Hg (acute hypoxemia), the carbon dioxide tension rises above 50 mm Hg (acute hypercarbia, hypercapnia) and the pH drops below 7.35, or both
- general stat: ~ 30 % of babies of GA 34-46 develop respiratory problems; frequency of respiratory support at 32 weeks is approx. 40% and at 31 weeks is 60%; overall, ¼ to 1/3 of babies born at 32-34 weeks require respiratory support

Most Common Causes

• Respiratory Distress syndrome

- risk factors: low GA, maternal DM, hypothyroidism, male sex
- caused by surfactant deficiency and, therefore, is primarily a disease of prematurity
- The absence of surfactant in the liquid film lining of the alveoli causes an increase in surface tension and alveolar collapse.
- confirmed by ground glass appearance on CXR
- SURFACTANT: made by type II alveolar cells.
 - composed of consisting of about 85% to 90% lipids and 10% to 15% proteins.
 - not produced by the fetal lung until 24-25 weeks, and it may not be fully functional until 36-37 weeks
 - The water molecules in the walls of alveoli are more attracted to each other than to air, creating surface tension which causes water molecules come closer together making it more difficult to 're-expand' the alveoli BUT , surfactant acts to reduce this surface tension and thus allow better lung compliance
- 60% in infants < 30 weeks' gestation (no antenatal steroids), 35% with steroids; 25% in infants of 30 to 34 weeks' gestation (no steroids), 10%with steroids; 5% in infants of more than 34 weeks' gestation
- Most common problem seen in the neonatal intensive care unit; Accounts for 20% of all neonatal deaths
- The initial response to a deficiency of surfactant is for the smaller alveoli to collapse while the larger ones hyperinflate. The lungs become stiff and increased respiratory effort is needed to inflate the lungs. The lung tissue becomes progressively traumatized and there is exudation of plasma from the pulmonary capillaries into the alveolar space.
- worsens during the first 18–24 h of life, with gradual improvement generally starting by the third day.
- prevention is with antenatal corticosteroids

• Retained Fetal Lung Liquid Syndrome/Transient Tachypnea of the Newborn

- risk factors: c section, delivery before 38 weeks, male sex
- believed to be transient pulmonary edema that results from delayed clearance of fetal lung fluid – normally, fetal epi during labour reduces lung fluid production and increases re-absorption by activation sodium channels
- usually is a benign and self-limited disease
- particularly common in the infant who is delivered by cesarean section without labor.
- The symptoms are present from birth and can persist for up to 72 hours
- most common cause of tachypnea in the term newborn
- diagnosis of exclusion

• Aspiration – Inc. Meconium Aspiration Syndrome

- MAS is defined as respiratory distress in an infant born through meconium-stained amniotic fluid whose symptoms cannot otherwise be explained.
- the bile salts and pancreatic enzymes, along with some of the other components, can cause a chemical pneumonitis
- meconium inactivates surfactant and activates the complement system resulting in inflammation and vasoconstriction of pulmonary veins

• Pneumonia/Sepsis/Bacteremia

- Pneumonia is the most common infection in the neonate
 - Infections usually ascend from the genital tract before or during labor, with the vaginal or rectal flora the most likely agents (group B streptococci and *Escherichia coli*)
- prenatal and antenatal infections more often result from TORCH infections, GBS; post natal infections most often result from respiratory viruses, gram positive and gram negative bacteria
- any infant with respiratory distress for more than a few hours should be evaluated for the possibility of infection

• Congenital Heart Disease

- Cyanotic: Tetralogy of fallot, Transposition, Persistent Truncus Arteriosus, Pulmonary stenosis, Patent ductus arteriosus

- Acyanotic: ASD, VSD, Coarctation
- important to perform a thorough cardiac exam and to look for organomegaly to help rule in/out the possibility of these

causes

- Other
 - hypoglycemia
 - hypovolemia
 - pneumothorax

Signs and Symptoms

- tachypnea (RR>60)
- grunting
 - sound made on expiration against a partially closed glottis, produces elevated transpulmonary pressures and facilitates maintenance of functional residual capacity
- nasal flaring
 - causes reduction in nasal resistance, which can reduce total lung resistance and decrease the work of breathing
- retractions
- cyanosis
 - Central cyanosis becomes clinically apparent when at least 5 g/100 mL of hemoglobin becomes unsaturated
- stridor
 - suggestive of upper airway obstruction

Investigations

- Initial Investigations :
 - SaO₂
 - **CBC + Diff**
 - ABG
 - **blood culture**
 - CXR
 - **CRP**
- Additional Investigations to Consider:
 - Echo
 - hyperoxia test
 - HUS

Management

- **full perinatal history including any admin of steroids, maternal infection, mode of delivery, PROM, length of ROM**
- treatment should be aimed at the underlying cause!
 - Ongoing signs of distress in a baby requiring more than 7 cm H₂O of PEEP, an oxygen requirement >40% or a pH<7.25 are generally accepted as triggers for escalation of treatment.
 - PPV may improve ventilation by maintaining patency of the upper airway and by promotion triggering respiratory reflexes
 - consider Abx treatment for 48 hrs until blood culture comes back (**article I read said it is mandatory in any preterm with respiratory illness**)

