

# M10: Neonatal Respiratory

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Reviewed:

## Introduction

Respiratory distress in the newborn is defined as an impairment of the lungs to exchange gas at the alveolar level. Multiple pathophysiologic processes can produce respiratory distress in the neonatal period and careful monitoring of the trend of disease progression can assist in identifying the cause.

Paramedic management of the neonate in respiratory distress should focus on maintaining appropriate oxygenation and ventilation based on gestational age and days/hours of life. Differential diagnoses to consider in the just born neonate differ than the differential diagnoses for a neonate on day of life 2 or more.

In neonates the differential diagnoses can be:

- Respiratory distress syndrome (RDS): Primarily a surfactant deficiency that will progressively worsen until 72 hours of life and then slowly get better if no treatment is initiated. Normal in the preterm infant and higher risk of in the neonate born to a mother with poorly controlled diabetes.
- Transient tachypnea of the newborn (TTN): Fluid retention in the lungs that will gradually resolve over 24-72 hours. Common in C-section and precipitous deliveries.
- Congenital pneumonia/sepsis: Similar physical presentation to RDS but with differing radiological evidence and can progress to sepsis quickly if not recognized.
- Pneumothorax: The neonate requires an opening pressure of up to 50 cmH<sub>2</sub>O to push out the fluid filling the lung and can cause spontaneous pneumothoraxes.

The term neonate with an uncomplicated antenatal history that develops respiratory complications is unlikely to be RDS, and is most likely to have an infection or undiagnosed congenital problems.

## Essentials

- The Neonatal respiratory assessment consists of lung auscultation, evidence of nasal flaring, grunting of the neonate, accessory muscle use (begins in the subcostal and works up the chest as severity increases) and symmetry of the chest. A chest x-ray and blood gas should be performed to gauge severity and initiate a baseline for trend monitoring.
- Establish ABCs and support ventilations if required.
- Support of the neonate's respirations follows staged approach. The FiO<sub>2</sub> is titrated to maintain a preductal SpO<sub>2</sub> of 88-95% in the preterm neonate and 92-95% in the term neonate. Escalation along the respiratory treatment pathway is based on clinical assessment, radiological evidence and blood gas analysis.
- Pre-ductal SpO<sub>2</sub> is performed on the right hand and post-ductal on a lower appendage (right or left foot). A pre-ductal less than 90% or a difference greater than 3% should prompt more investigations.
- Increased work of breathing with associated decreased air entry should be investigated for pneumothorax.

## Additional Treatment Information

- Options for supporting neonatal respirations include:
  - Blow by oxygen: titrate to patient's SpO<sub>2</sub> if no increased work of breathing.
  - High flow O<sub>2</sub>: 2-3 lpm/kg of heated humidified gas. Titrate FiO<sub>2</sub> to appropriate SpO<sub>2</sub>.
  - nCPAP: 5 cmH<sub>2</sub>O-8 cmH<sub>2</sub>O. Titrate FiO<sub>2</sub> to appropriate SpO<sub>2</sub>.
  - Bi-Level Support (non-triggered BiPAP): initial setting of 9/6 (delta P can be as large as 10 mmHg) Ti 0.5-1.0 RR 30. Titrate FiO<sub>2</sub> to appropriate SpO<sub>2</sub>.
  - Intubation and mechanical ventilation
- Once a neonate is intubated, bLES should be considered. If the FiO<sub>2</sub> is greater than 30% and there is radiological evidence of surfactant deficiency, bLES is administered (5 ml/kg administered via a 6 fr OG tube down the ET

tube).

- If patient is showing signs of tension pneumothorax – tracheal deviation, increased work of breathing, absent air entry, hemodynamic compromise – needle decompression should be performed while equipment is gathered for a chest tube insertion.
  - In a neonate a 26-gauge butterfly needle attached to a 3 way stop cock and 10 cc syringe is used to access the 2<sup>nd</sup> intercostal space mid-clavicular line to aspirate air. In an older neonate, a 20 gauge needle connected to a 3-way stop cock and 10 cc syringe may be required
- Due to the rapid progression of sepsis in the neonatal period all neonates with signs of respiratory distress will have a blood culture done and be started on antibiotics: Ampicillin (50 mg/Kg) and Gentamycin
  - Gentamycin:
    - DOL 0-7: < 30 weeks gestation 5 mg/kg
    - 30-34 weeks gestation 4 mg/kg q 36 hrs
    - > 35 weeks gestation 4 mg/kg q 24 hrs
    - DOL > 7: < 30 weeks gestation 5 mg/kg
    - > 30 weeks gestation 4 mg/kg q 24 hours
- Common initial ventilation settings are RR 50 Ti 0.4 TV 4-5.5 ml/kg FiO<sub>2</sub> as required, PEEP 5 cmH<sub>2</sub>O. Neonates require I:E ratios approaching 1:1. The normal range of Ti is 0.35-0.5 with most patients requiring 0.35-0.4. If a large tube leak is detected, then PCV ventilation should be considered (starting settings may be 20/5 and then are titrated to effect).
- Neonates require an uncuffed ET tube due to the possibility of subglottic damage from an ET cuff and prolonged intubation, resulting in subglottic stenosis as the neonate grows.
- Sedation in the neonate should only be initiated if there are signs of pain or discomfort based on the BIIP scale as there is evidence of increased morbidity and mortality when sedation is given to neonates with no signs of pain or discomfort. If sedation is to be initiated the preferred analgesics are:
  - Morphine: 50 mcg/kg bolus with an infusion of 10-20 mcg/kg/hr
  - Fentanyl: 1-2 mcg/kg bolus with an infusion of 0.5-2 mcg/kg/hr
  - Midazolam: 50 mcg/kg as a bolus for the labile neonate.
- Maintenance fluids for the first 24 hours should be D10W and after 24 hours D10W with NaCl (20 mmol/L)
  - DOL 0 – 60-80 ml/kg/day
  - DOL 1 – 80-100 ml/kg/day
  - DOL 2 – 100-120 ml/kg/day
  - DOL 3 – 120-140 ml/kg/day
  - DOL 4 – 140-150 ml/kg/day
  - DOL 5 – 150 ml/kg/day

## General Information

- Neonates that have been in the community are at an increased risk of an infective origin to their increased work of breathing and need to be considered during the differential diagnosis.
  - Bronchiolitis
  - Pneumonia
  - Croup
  - Pertussis

## Interventions

### First Responder

- Maintain thermal stability
- Provide supplemental oxygen as required
  - → [A07: Oxygen and Medication Administration](#)
- Manual airway maneuvers
- Positive pressure ventilation via bag-valve mask

- → [B01: Airway Management](#)

**Emergency Medical Responder – All FR interventions, plus:**

- Transport to closest facility with notification
- Consider ACP intercept

