

## M03: Pediatrics - Respiratory Emergencies

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### Introduction

The respiratory system is responsible for the exchange of oxygen and carbon dioxide in the body. It consists of organs and structures that work together to facilitate breathing and ensure the body receives the oxygen it needs while eliminating waste carbon dioxide.

Respiratory conditions in children can be categorized into upper airway obstructions, lower airway obstructions, lower airway restrictive pathology, and disordered control of breathing.

Upper airway obstructions occur when there is an increased work of breathing due to an obstruction above the thorax. This is demonstrated in croup and epiglottitis. Lower airway obstructions, by contrast, result from obstructive problems below the thorax such as increased swelling, or bronchospasm. Obstructions can originate from multiple causes, a few common ones being foreign bodies, infections, or anaphylaxis.

Restrictions in the lower airways can be a result of "stiffening" of lung tissue, caused by increased fluid accumulation, toxic exposure, allergic reactions, infiltration, or inflammation. These situations can be best managed with a staged approach of oxygenation and/or ventilation strategies.

Dysfunction within the respiratory center of the brain is responsible for the development of disordered breathing. These situations typically stem from neurological disfunction and secondarily affect respiratory patterns. This can include problems such as increased intracranial pressure, neuromuscular disease, and some poisonings and overdoses.

Respiratory failure occurs when a patient's breathing becomes inadequate and results in ineffective oxygenation and/or ventilation.

### Essentials

- The PAT is designed to be a quick and efficient assessment tool. In emergency situations, where time is crucial, healthcare providers can rapidly observe a child's appearance, breathing, and circulation to gather essential primary assessment information about the patient's condition in a short amount of time.
- The PAT relies on visual observation and doesn't require any specialized equipment or extensive medical knowledge
- The component of appearance can be assessed utilizing the mnemonic TICLS, which stands for **Tone, Interactiveness, Consolability, Look and Speech**.
- Upper airway obstruction can be an uncomfortable call to attend as many patients may look ill or unwell, but require purely comfort levels for treatment.
  - See [→ B04: Croup and Epiglottitis](#) for additional information on the management of upper airway obstructions
- Lower airway obstruction results in an inability for the patient to get air out of the chest. This is usually due to excessive swelling or bronchospasm.
- Lower airway restrictive pathologies consist of numerous conditions that result in decreasing lung compliance or stiffening of the lung. The general management of these conditions concern correcting oxygenation and ventilation utilizing an escalation pathway of increasing FiO<sub>2</sub> via nasal cannula, face mask, heated HiFlow nasal cannula (2 L/min to a max of 60 L/min), NIV therapy, then intubation. Bronchospasm can be treated with a B<sub>2</sub> agonist.
- Disordered Control of Breathing are a series of conditions affecting the respiratory control center in the brain or neuromuscular diseases.

### Additional Treatment Information

Refer to the additional clinical practice guidelines for symptom-specific treatment planning:

- [→ B01: Airway Management](#)

- [→ B02: Airway Obstruction](#)
- [→ B03: Asthma and Bronchospasm](#)
- [→ B04: Croup and Epiglottitis](#)

## General Information

- Continuous salbutamol can decrease serum potassium.
- Ventilating the lower airway restrictive disease patient may require high peak inspired pressure of up to 32 cmH<sub>2</sub>O and high PEEP of up to 10-15 cmH<sub>2</sub>O. Diligent monitoring for the development of a pneumothorax is required.
- Succinylcholine should be avoided in the patient with neuromuscular disease due to the possibility of triggering hyperkalemia or malignant hyperthermia.

## Interventions

### First Responder

- Provide reassurance and a calming environment
- Keep the patient warm and protect from further heat loss
- Place the patient in a position of comfort, as permitted by clinical condition. In general, limit patient movement.
- Provide supplemental oxygen as required to maintain oxygen saturation  $\geq 97\%$ 
  - [→ A07: Oxygen Administration](#)
- Conduct ongoing assessment and gather collateral information, such as medications and identification documents
- Establish ingress and egress routes from the patient's location
- Communicate patient deterioration to follow-on responders
- Manual airway maneuvers as required
  - [→ B01: Airway Management](#)
  - Most pediatric airways can be effectively managed with proper positioning and an OPA/NPA (as per license level) and BVM without any requirements for further airway interventions. The gold standard for airway management is a self-maintained airway. Bag-valve mask is the preferred technique for airway management in pediatric respiratory emergencies and is reasonable compared with advanced airway interventions (endotracheal intubation or supraglottic airway).

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

- Provide supplemental oxygen to maintain SpO<sub>2</sub>  $\geq 97\%$ 
  - [→ A07: Oxygen Administration](#)
- If functional airway obstruction present
  - [→ B02: Airway Obstruction](#)
  - [→ PR07: Nasopharyngeal Airway](#)
- Convey with notification
- Consider intercept with additional resources

### Primary Care Paramedic – All FR and EMR interventions, plus:

- Supraglottic airway devices may be used to support oxygenation and ventilation in a staged approach, following confirmation of the ability to ventilate the patient with a bag-valve mask and oropharyngeal airway:
  - [→ PR08: Supraglottic Airway](#)
- For bronchospasm, reactive airway disease, and asthma:
  - [Salbutamol](#) via MDI
  - ☐ **Requires completion of PCP scope expansion education:**
    - Consider nebulized [Salbutamol](#) and [ipratropium](#)
  - Consider intramuscular [EPINEPHrine](#); epinephrine via intramuscular injection should be considered for a patient with

SpO<sub>2</sub> < 90% and moderate to severe symptoms of asthma that are unresolved with the use of salbutamol administered by MDIs

- See → [B03: Asthma and Bronchospasm](#) for additional information
- For croup and epiglottitis
  - Croup: consider nebulized [EPINEPHrine](#) (NOT for epiglottitis)
  - See → [B04: Croup and Epiglottitis](#) for additional information
- Consider vascular access and fluid administration (in patients ≥ 12 years of age)
  - → [D03: Vascular Access and Fluid Administration](#)

#### Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- Consider addition of [ipratropium](#) to supplement salbutamol
- Consider [magnesium sulfate](#) for significant and protracted bronchospasm
- Consider intraosseous cannulation if peripheral access is unavailable
  - → [PR12: Intraosseous Cannulation](#)
- Consider procedural sedation to facilitate airway management. Where SGAs and/or bag-valve mask ventilation fail to provide adequate oxygenation, tracheal intubation may be permissible in cases where paramedics are otherwise unable to obtain and maintain a patent airway. To be clear, this is for actual or immediately impending failure of airway patency unable to be managed by any other means other than intubation. [On-Call consultation required](#) prior to attempting intubation.
  - → [PR17: Procedural Sedation](#)
- Consider intubation in patients whose airways cannot be managed through less invasive means
  - → [PR18: Anesthesia Induction](#)
- Decompress suspected tension pneumothorax
  - Out-of-hospital needle thoracentesis should be considered AGMP. Although this is a low occurrence procedure, it does potentially expose the paramedic to an increased risk of exposure. If this procedure is needed, crews are directed to proceed with airborne PPE including face-shield, EHFR/N95 mask, gown, and gloves.
  - → [PR21: Needle Thoracentesis](#)

#### Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- Mechanical ventilation (NIV and invasive)
- Chest tube maintenance
- Osmotic agents
- 3% Saline
- Infusion medication
- Antibiotic therapy
- Steroid therapy
- Nonselective adenosine receptor antagonist and phosphodiesterase inhibitor

## Evidence Based Practice

Pediatric Wheeze/Bronchospasm

### Supportive

- [Anticholinergic](#)
- [Beta Agonist-MDI](#)
- [Beta Agonist-Nebulized](#)
- [Beta Agonist-Parenteral](#)
- [Epinephrine-Nebulized](#)
- [Epinephrine-Parenteral](#)
- [Hypertonic Saline-Nebulized](#)
- [Oxymetry Monitoring](#)

- [Steroids-Parenteral](#)
- [High flow nasal canula](#)
- [Ketamine](#)

#### Neutral

- [Magnesium Sulfate-IV](#)
- [Magnesium Sulfate-nebulized](#)
- [Oxygen-Humidified](#)
- [PEEP](#)
- [Steroids-Inhaled](#)
- [Steroids-Oral](#)
- [NiPPV](#)
- [ETCO2](#)
- [Temperature Monitoring](#)

#### Against

Pediatric Stridor

#### Supportive

- [Epinephrine-Nebulized](#)
- [Oxygen-Humidified](#)
- [Steroids-Oral](#)

#### Neutral

#### Against

