# B01: Airway Management

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## Introduction

Airway management is a core component of effective patient care in the pre-hospital setting. All patients, regardless of their emergency, require a structured airway assessment during their initial evaluation.

## Essentials

1. **Oxygenation and ventilation are the ultimate goals of airway management.** Effective oxygenation depends on the fraction of inspired oxygen (FiO2), the capacity for gas to diffuse across the alveolar membrane, the ability (and availability) of hemoglobin to transport oxygen through the body, and the propensity of oxygen to diffuse into tissues. Effective ventilation depends on sufficient tidal volume and respiratory rate.
2. **The effectiveness of airway management is measured by a variety of clinical endpoints.** Oxygenation is most readily measured by SPO2. Ventilation is quantitatively measured by EtCO2. Chest rise, breath sounds, and consciousness are all important clinical assessments of effective ventilation.
3. **A thorough assessment and reassessment of the respiratory system should be undertaken with all patients.** Airway patency and respiratory mechanics should be continuously reconsidered and documented. Ominous airway sounds include stridor, snoring, stertorous, or wet characteristics.
4. **Airway interventions progress from minimally to maximally invasive.** The simplest and safest form of respiration is spontaneous ventilation by the patient themselves. With each necessary tier of airway intervention, there are progressively more harmful effects of intervention (such as the effects of positive pressure ventilation on the cardiopulmonary system and medications used for induction).
5. **Field intubations are high risk invasive procedures.** Although they may be clinically necessary, the goals of airway management should be attained by less invasive means whenever possible.

## General Information

- **Functional airway obstruction** is the displacement of the airway anatomy into the passageway due to loss of airway tone, secondary to impaired consciousness from various means.
- **Jaw thrust** is the most effective manual maneuver to open an airway when airway muscle tone is lost. The jaw thrust moves the tongue and epiglottis away from the posterior oropharynx, maximizing space for air passage.
- **Jaw thrust** and **head-tilt chin-lift** are not mutually exclusive maneuvers. In the absence of cervical spinal injury, the two maneuvers should occur in tandem to maximize airway patency.
- The **oropharyngeal airway (OPA)** and **nasopharyngeal airway (NPA)** are equally effective at creating an air passage and should be used in conjunction with manual maneuvers where appropriate. Ease and speed of OPA insertion is advantageous, whereas the ability of the NPA to bypass the gag reflex may be more appropriate depending on circumstances.
- **Bag-valve mask (BVM) ventilation** is a difficult skill that requires positive feedback (chest rise) to determine efficacy with the chest appropriately exposed. Optimal BVM ventilation is performed by two providers. Only a slight (but definite) amount of chest rise is necessary to achieve safe ventilation.
- Application of a **nasal cannula** at 10-15L/min from a second oxygen source may be appropriate underneath a BVM to increase available FiO2 in critically ill hypoxic patients (referred to as high-flow nasal cannula, or NO DESAT)
- **Positive end-expiratory pressure (PEEP)** valves enhance alveolar recruitment and are an effective means of improving oxygenation. The application of PEEP is generally safe at low levels (starting at 5cmH2O) but can be harmful at any level, particularly in patients experiencing shock physiology and those experiencing dynamic hyperinflation.
- Paramedics should have a low threshold to apply a PEEP valve in the management hypoxic patients.
- **Continuous positive airway pressure (CPAP)** is not a means of airway management. In dyspnea, CPAP is an effective means of recruiting alveoli and improving oxygenation. BCEHS utilizes fixed flow-dependent CPAP

devices that pair oxygen flow rates to CPAP. This means that we may see a transient drop in SPO2 on the initiation of CPAP before alveoli are recruited, as we often deliver a lower FiO2 than we may have previously been providing via non-rebreather (NRB). Supplemental oxygen can be applied where appropriate.

- CPAP is not capable of providing forced ventilation and should not be used for patients who have questionable airway integrity or lack the ability to spontaneously trigger ventilation.
- **Indications for Intubation include:**
  - **Oxygenation and ventilation** when unable to achieve with maximal supraglottic airway management.
  - **Protection** of airway patency when not adequately managed with suction and severely soiled by fluid
  - Rapid **progression** of airway compromise from inflammation due to burns or angioedema with prolonged transport time.

## Interventions

### First Responder

- Optimize position (head extension and sitting upright where appropriate)
- Functional airway obstruction present:
  - Jaw thrust
  - Head-tilt chin-lift
  - Oropharyngeal airway
- Bag-valve mask ventilation
- Supplemental oxygen
  - A07: Oxygen Administration

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

- Functional airway obstruction present:
  - PR07: Nasopharyngeal Airway
- Supplemental oxygen to maintain SPO2 > 93% where appropriate.

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

- Supraglottic airway devices may be used to maintain airway patency as necessary:
  - PR08: Supraglottic Airway
- Utilize PEEP to maintain SPO2 > 93%
  - PR10: Positive End Expiratory Pressure

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

- Intubation modality and urgency are determined by the severity of airway deterioration. *Elective* should not occur out-of-hospital. *Urgent* intubations should likely be deferred. *Emergent* and *life-threatening* intubations may be necessary prehospital.
- ☎☐ **Mandatory EPOS consultation required prior to sedation facilitated intubation decision.**
  - **Emergent intubation may occur under extraordinary clinical or logistical situations without EPOS consultation. If all EPOS resources are unavailable, SFI decision-making will be supported by PS utilizing Pre-Intubation checklist for consistency.**
- Pre-Intubation Checklist
- Post-Intubation Checklist
- PR15: Tracheal Tube Introducer
- PR18: Sedation Facilitated Intubation
- PR22: Surgical Airways
- PR23: Awake Intubation

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

- Rapid sequence intubation

- ☎☐ **Mandatory EPOS consultation required** prior to the administration of neuromuscular blocking agents (NMBAs). EPOS consultation may be deferred if not possible due to clinical or technical factors.
- **PR47: Critical Care Anesthesia Planning**

## Evidence Based Practice

Intubation

### Supportive

- Bougie
- Laryngeal Manipulation
- Oxymetry Monitoring
- Securing tube

### Neutral

- Direct Laryngoscopy (No airway reflexes)
- Direct Laryngoscopy (with airway reflexes)
- ETI via a SGA device
- Lighted Stylet
- NO DESAT/Nasal apneic oxygenation
- Optical (non-video) Visualization (e.g. Airtraq)
- Video Visualization ( e.g. Glidescope)
- Digital Intubation
- Nasotracheal intubation

### Against

- Cricoid Pressure

Alternative Rescue Airway Management

### Supportive

- BVM
- Laryngeal Tube (without AW reflexes)
- I-Gel
- Laryngeal Tube (with AW reflexes)
- Surgical Cricothyrotomy
- Bougie-assisted Cricothyrotomy
- Pressure manometer

### Neutral

- NPA
- OPA
- Pharyngeal Tracheal Lumen (PTL)
- LMA (with AW reflexes)

### Against

- Combitube (without AW reflexes)

- LMA (without AW reflexes)
- Percutaneous Cricothyrotomy
- Combitube (with AW reflexes)

Medication for Airway Management

### Supportive

- RSI (CCT)
- Sedation
- DSI (CCT)

### Neutral

- Topical anaesthetic
- RSA
- Sedation (CCT)

### Against

- Rapid Sequence Induction

Airway Confirmation

### Supportive

- Quantitative Capnography (with circulation)
- EDD
- Qualitative Capnography (with circulation)

### Neutral

- POCUS
- Oxymetry Monitoring
- Qualitative Capnography (no circulation)
- Quantitative Capnography (no circulation)

### Against

## References


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## Practice Updates

- 2025-05-01 Clarity around EPOS consultation.
- 2023-12-18: Removed COVID-related restrictions.

# B02: Airway Obstruction

**Mike Sugimoto**

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## Introduction

Airway obstructions are relatively rare, yet life-threatening conditions that require immediate recognition and intervention to avert disaster. Whether they are complete or partial, airway obstructions can result from foreign bodies entering the trachea, pathological conditions that produce a narrowing of the upper airway, or trauma to the mouth, face, head, or neck. The core treatment of an airway obstruction involves attempting to obtain or maintain a patent airway while at the same time identifying and reversing the underlying clinical problem where possible.

This guideline focuses on foreign body airway obstructions (FBAO). Paramedics and EMRs/FRs should refer to other guidelines for the management of croup, epiglottitis, or anaphylaxis as necessary.

- → B04: Croup and Epiglottitis (Stridor)
- → E09: Anaphylaxis

## Essentials

- Unconscious patients should have their breathing and circulation assessed concurrently. If the patient is found to be pulseless, immediately begin chest compressions and attach a defibrillator – do not attempt to ventilate these patients prior to beginning CPR. In cardiac arrest, the lack of a patent airway is significantly less important than the need to establish circulation.
- Chest compressions are the core management of a complete FBAO. If in doubt as to the ability to ventilate an unconscious patient, begin chest compressions. The ratio of chest compressions to ventilation attempts is unimportant, but the sequence of actions is: visualize the oropharynx; attempt to remove any foreign body that is seen; attempt to ventilate; then resume chest compressions.
- Consider the use of patient positioning while attempting to manage partial airway obstructions, especially for patients with facial or oral trauma. 'Sit up and lean forward' can be a very useful technique when combined with aggressive suction.
- Partial airway obstructions often require only supportive care and encouragement, although paramedics and EMRs/FRs must be prepared to intervene if the situation deteriorates. However, patients with a partial airway obstruction and signs of poor air exchange – stridor, weak cough, and/or cyanosis – must be treated as a complete airway obstruction.
- Rapid conveyance, with intercept of additional resources and hospital notification, is indicated for persistent airway obstruction, whether partial or complete.

## Additional Treatment Information

- Abdominal or chest thrusts are indicated for complete airway obstructions in conscious patients. Use chest thrusts in pregnant or obese patients; these can be performed with the patient supine and are identical to chest compressions in CPR. No evidence exists to support the superiority of chest thrusts over abdominal thrusts (or vice versa) in any population and controversy exists among resuscitation councils as to the effectiveness of back blows in adult populations.
- Back blows may be effective in children under one year of age and should be alternated with chest thrusts as necessary. Children over one year old should be managed with abdominal thrusts.
- When confronted with a patient who cannot be ventilated, advanced providers should begin chest compressions or abdominal thrusts while preparing for both direct laryngoscopy and a surgical airway. Under laryngoscopic visualization, foreign bodies may be removed using Magill forceps – do not attempt to blindly insert forceps into the airway. High vacuum suction, coupled with the Ducanto catheter, may help relieve some airway obstructions.
- Advanced providers should have a low threshold to perform a surgical airway in patients who cannot be ventilated effectively and where the obstruction cannot be visualized and readily removed. The same applies in cases of pathological airway obstruction that cannot be immediately reversed.

- Open cricothyrotomy is contraindicated in children under the age of 12. In these patients, needle cricothyrotomy can be performed instead.

## Referral Information

- Paramedics and EMRs/FRs should be aware that abdominal thrusts have the potential to cause significant trauma, including lacerations of internal organs. Patients who received abdominal thrusts, whether from health care providers or lay rescuers, should be conveyed for observation and evaluation.
- Pathological airway obstructions must be conveyed for evaluation and treatment.

## General Information

- In adults, eating is the most common precipitating event of a FBAO, with meat being the most likely culprit. Children, by contrast, are more prone to have non-food foreign bodies.
- Submersion or drowning victims do not, as a general rule, experience airway obstructions. The use of abdominal thrusts is not recommended for these patients; the focus should be on the initiation of chest compressions as early as possible for those who are unresponsive and pulseless, with effective bag-valve mask ventilations to address the underlying hypoxia. Patients who are conscious and breathing spontaneously may benefit from CPAP use.

## Interventions

### First Responder

- Position patient for optimal intervention
- For partial airway obstruction: encourage patient to cough
- For complete airway obstruction **in conscious patients**: begin abdominal thrusts
  - In children under 1 year of age, administer alternating sequences of 5 back blows and 5 chest compressions until the obstruction clears or the patient becomes unconscious
- For complete airway obstruction **in unconscious patients**: begin chest compressions
  - → PR06: High Performance CPR
- Visualize oropharynx prior to every attempt at ventilation and remove foreign bodies if seen; do not attempt blind finger sweeps

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

- Initiate conveyance with notification
- Consider intercept with additional resources

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

- Consider video or direct laryngoscopy for FBAO removal using Magill forceps, with or without suction
- Consider surgical airway
  - → PR22: Surgical Airways

## Evidence Based Practice

Foreign Body Obstruction(Complete/Partial)

**Supportive**

- Abdominal Thrusts
- Direct Laryngoscopy and Magill forceps
- Oxygen

**Neutral**

**Against**

## References


1. Panchal AR, et al. Part 3: Adult basic and advanced life support: 2020 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. 2020. [Link]
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## Practice Updates

- 2023-12-18: Removed COVID-related restrictions.

# B03: Asthma and Bronchospasm

**Mike Sugimoto and Ryan Casselman**

Updated: July 02, 2025
Reviewed: July 02, 2025

## Introduction

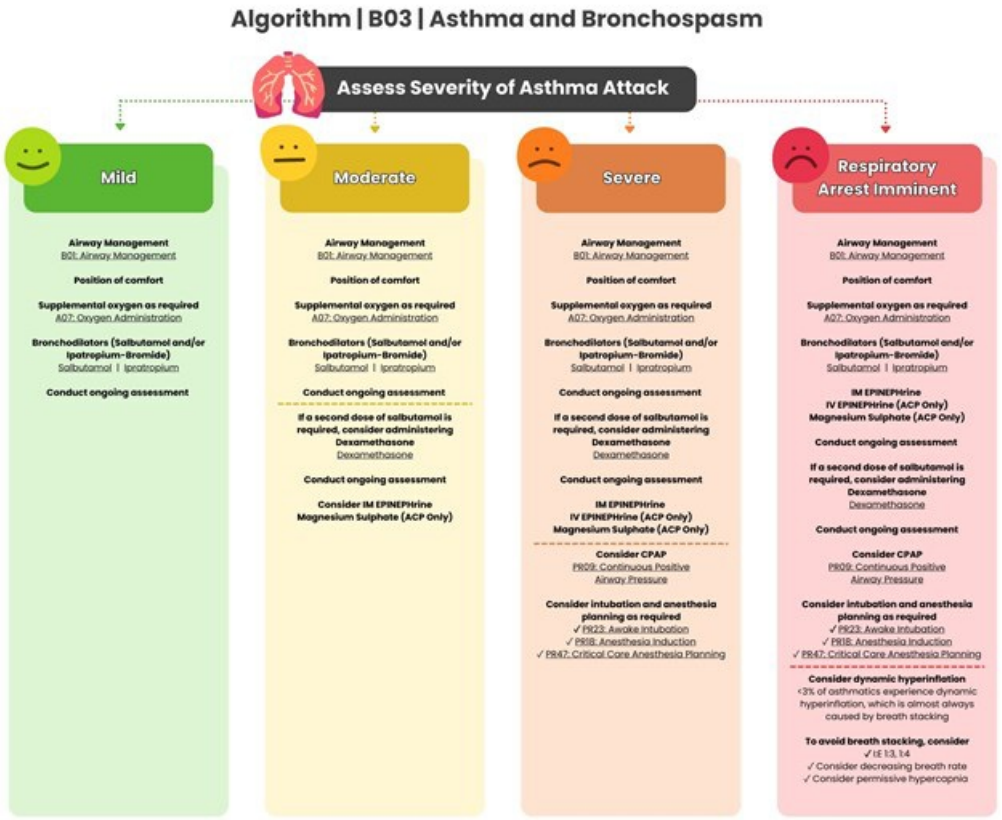
- Bronchospasm causes constriction of the bronchi's smooth muscles, leading to narrowed airways and is characterized by airway inflammation, coughing and generalized wheezing.
- In severe cases, air movement, especially during exhalation, may be significantly reduced, resulting in limited wheezing, air trapping, and increased respiratory secretions, causing mucus plugging.
- More time spent in the exhalation phase increases the inspiration-to-expiration ratio (I:E) and is a sign of bronchospasm
- Bronchospasm impairs ventilation, leading to potential oxygenation issues not solely due to oxygen exchange failure but often due to inadequate alveolar ventilation.
- In severe asthma cases, there's a risk of critically high carbon dioxide ($CO_2$) levels due to reduced ventilation.

  Key signs of worsening respiratory function include diminished breath sounds, reduced effort, fatigue, altered consciousness, and a dropping respiratory rate, indicating imminent respiratory failure
- Breath stacking in severe asthma refers to a dangerous situation where a patient is unable to fully exhale before taking another breath. This leads to increased lung volume with each successive breath, as air gets trapped in the lungs due to severe airway obstruction.

**Not all wheezing is asthma, and not all asthma wheezes. Beware the silent chest.**

## Essentials

| | Appearance | Wheezing | I: E Ratio | Accessory Muscle Use | Respiratory Rate | SPO2 % |
|---|---|---|---|---|---|---|
| MILD | Alert, Speaks in full sentences. | Expiratory wheezing only | 2:1 | Minimal | Slight tachypnea [20-30 RPM] | >95 |
| MODERATE | May be agitated.<br><br>Speaks in partial sentences. | Wheezing throughout expiration<br><br>With/or without inspiratory wheezing | 1:2 | Significant and or decreased tidal volume | Increased tachypnea [30-50 RPM] | 93-95 |
| SEVERE | Agitated **or** speaking in 1-2 word sentences | Inspiratory and Expiratory wheezing | >1:2 | Significant and or minimal tidal volume | Extreme tachypnea [>50] | 90-92 |
| RESPIRATORY ARREST IMMINENT | Drowsy or confused **and/or** cyanosis | Silent chest. | >1:2 | Inability to maintain respiratory effort | Extreme tachypnea [>50] **or** paradoxical hypoventilation. | <90 |




- Bronchodilator therapy, including salbutamol and ipratropium-bromide, improves clinical outcomes for bronchospasm. Salbutamol and ipratropium can be co-administered in the same nebulizer. Deliver bronchodilator therapy via the most appropriate method, MDI or nebulizer.
- Administer intramuscular epinephrine in cases of severe bronchospasm or if respiratory arrest is imminent to open the airways and provide relief quickly. Intravenous epinephrine is for ACP use and should be used in severe bronchospasm or if respiratory arrest is imminent. Epinephrine, as an adrenergic agonist, can produce dramatic bronchodilation in critically ill patients.
- Glucocorticoids (i.e., dexamethasone) can be given in cases of acute asthma exacerbations where a patient does not show sustained improvement or worsens after one bronchodilator, or has a history of severe or recurrent exacerbations. If the first round of salbutamol and ipratropium do not provide sustained improvement and repeat salbutamol is required, dexamethasone should be included in the treatment plan.
- Magnesium sulfate is for ACP use and, given intravenously, can produce bronchodilation through the relaxation of smooth muscle.
- Continuous Positive Airway Pressure (CPAP) is an option for optimizing oxygenation in patients who have already received bronchodilator therapy.

**Cardiac arrest considerations**: For all asthmatic patients in cardiac arrest, and especially for patients in which ventilation is complex, the possible diagnosis of tension pneumothorax should be carefully considered and treated with extreme caution. In addition, MDI delivery of salbutamol can be considered during ventilation after cardiac arrest procedures are well-established (i.e., high-quality CPR, defibrillation).

## Additional Treatment Information

- Consider the risk of infectious disease exposure when performing interventions that produce aerosols. Nebulized medications should be given with caution to patients with a fever and a history of a respiratory illness. Use appropriate PPE as necessary. Applying a surgical mask over a nebulizer is not an effective reverse isolation technique.

- Bronchospasm is a disease of ventilation. Although the oxygen saturation may be low, this is a result of alveolar hypoventilation and does not necessarily represent a fundamental failure of oxygen uptake or delivery. Do not over-focus on oxygenation to the exclusion of ventilation. Recall that the elimination of carbon dioxide from the body depends on minute ventilation (which is in turn based on tidal volume and respiratory rate). Critical hypercarbia can develop in acute severe asthma; the patient's level of consciousness and respiratory effort must be monitored closely and aggressive action taken to support ventilation if deterioration becomes evident.
- Signs of impending respiratory failure include decreased air entry and respiratory effort, fatigue, decreasing level of consciousness, and declining respiratory rate.
- Salbutamol often provokes coughing and may temporarily worsen audible bronchospasm. Allow the nebulized medication to run its course before making additional treatment decisions unless the patient is deteriorating rapidly. In some cases, continuous nebulizer therapy can be beneficial in optimizing drug delivery to the tissues of the bronchi and should be considered if the patient continues to be significantly short of breath, but able to ventilate effectively, following the initial dose of salbutamol.
- Ipratropium is an anticholinergic agent that reduces airway secretions and acts synergistically with salbutamol as a bronchodilator. Its activity is limited to the lung parenchyma and there is little risk of systemic toxicity.

## Referral Information

Refusal of care instructions and guidelines must be followed for patients who decline to be taken to hospital.

## General Information

- Signs of acute severe asthma include tachypnea (> 30 breaths/minute), tachycardia, accessory muscle use during inspiration, diaphoresis, the inability to speak in full sentences, and the inability to lie supine. Note that not all patients with severe bronchospasm will exhibit these signs.
- Patients with bronchospasm typically have a prolonged expiratory phase, often 2-3 times longer than their inspiratory phase; this is the result of the effort required to exhale against the constricted airways. In the absence of audible wheezes in a patient who is visibly short of breath, consider the inspiratory-expiratory ratio as an additional piece of information.
- Obtaining a medical history from an acutely short of breath patient can be difficult. It is critical to ask concised, targeted questions to maximize the information return, and to minimize exertion for the patient. Investigations should be tailored towards developing an understanding of the potential for deterioration as opposed to solely establishing the severity of the disease. Severity directs the intensity of intervention, whereas a history helps predict the likely course or potential for exacerbations.
  - WHIPS is a mnemonic to help direct a clinical history for bronchospasm:
    - **W**orst you've ever had?
    - **H**ospital visits?
    - **I**CU stays?
    - **P**uffer requirements?
    - **S**teroid requirements?
- Questions should be formulated so that the patient can answer with single words or head movements.
  - Past medical history considerations
    - Hospital visits or admissions for asthma: number of previous visits or admissions; frequency of visits or admissions.
  - Current prescription drug use
    - Use of corticosteroids
    - Use of bronchodilators
    - Changes to medication doses or frequency
- A history of repeated hospital visits for asthma, with or without a concurrent history of increasing bronchodilator use, is predictive for severe disease and places the patient at risk for heightened mortality.

## Interventions

**First Responder**

- Place the patient in a position of comfort, as permitted by clinical condition; in general, this will be a seated position with the patient leaning forward; limit patient movement
- Provide supplemental oxygen as required
  - → A07: Oxygen Administration
- Conduct ongoing assessment and gather collateral information, such as medications and identification documents
- May retrieve (but not administer) patient MDIs upon request
- Establish ingress and egress routes from the patient's location
- Communicate patient deterioration to follow-on responders

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

- Supplemental oxygen to maintain $SpO_2$ ≥ 94% (caution: may not be achievable)
  - → A07: Oxygen Administration
- □□ **Requires completion of EMR scope expansion education:**
  - Salbutamol
  - In patients without influenza-like illness (ILI), nebules are preferred. In patients with ILI or other infectious respiratory conditions, MDI and spacer use is strongly recommended.
- Convey early
- Consider intercept with additional resources

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

- Salbutamol
  - In patients without influenza-like illness (ILI), nebules are preferred. In patients with ILI or other infectious respiratory conditions, MDI and spacer use is strongly recommended.
- □□ **Requires completion of PCP scope expansion education or BCEHS Respiratory Assessment course:**
  - Salbutamol with ipratropium (Both salbutamol and ipratropium can be combined in the same nebulizer for co-administration purposes. Note: ipratropium is a single dose administration, while salbutamol may be repeated).
  - Consider dexamethasone if no improvement from salbutamol and ipratropium (☎□ Clinicall consultation required prior to administration of dexamethasone)
  - For severe disease or imminent respiratory failure: administer intramuscular epinephrine
    - Epinephrine via intramuscular injection should be considered for a patient with $SpO_2$ < 90% and/or moderate to severe symptoms of bronchospasm that are unresolved with the use of salbutamol administered by MDIs or nebulizer treatment
  - □ Clinicall consultation recommended to discuss care planning options.
- Consider CPAP
  - → PR09: Continuous Positive Airway Pressure

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

- Salbutamol and ipratropium
  - Consider repeated salbutamol therapy if limited/no improvement in bronchospasm symptoms
- Consider vascular access
  - → D03: Vascular Access
- Consider intravenous magnesium sulfate
- Consider intravenous or intramuscular EPINEPHrine for impending respiratory arrest; epinephrine via intramuscular injection should be considered for a patient with SpO2 < 90% and moderate to severe symptoms of asthma that are unresolved with the use of salbutamol
- Consider intubation as required; ☎□ CliniCall consultation required prior to attempting intubation for patients with perfusing rhythms who are breathing spontaneously.
  - → PR18: Anesthesia Induction
  - → PR23: Awake Intubation

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

- Consider use of mechanical ventilation.
  - → PR29: Mechanical ventilation
    - Consider use of non-invasive ventilation
    - Consider invasive ventilation
    - Consider dynamic hyperinflation
      - < 3% of asthmatics develop dynamic hyperinflation. It is almost always due to breath stacking.
      - Consider decreasing breath rate to avoid breath stacking
      - Set PEEP 50-80% of the auto-PEEP
    - Consider I:E 1:3, 1:4
    - Consider reduced driving pressure < 15 $cmH_2O$
    - Consider permissive hypercapnia
    - Volume ventilation is generally preferred to maintain $V_E$ typically 6-8 ml/kg
    - Consider ABG/VBG sampling to guide therapy
    - Consider radial arterial line placement
    - Consider femoral arterial line placement
- Consider a reduced cabin altitude if conveying by air. (Boyle's law)
- Anesthesia planning
  - Avoid morphine if possible (histamine release)
  - Consider Ketamine
  - Consider Propofol
  - Avoid Etomidate (increased airway resistance and adrenal dysfunction)
  - Consider paralytics
    - Succinlcholine
    - Rocuronium
    - Cisatracurium
- Glucocorticoids
  - Prednisone 40 mg
  - Methylprednisolone 60 mg or (0.5-1 mg/kg q6 hrs to a max of 60 mg/day pediatric)
  - Dexamethasone
- Consider use of empiric antimicrobials (azithromycin).
- Magnesium 2-4g or (25-75 mg/kg to a max of 2g pediatric)
- ☎☐ Call ETP prior to anesthetic gases. Consider anesthetic gas if unable to transport due to severe refractory bronchospasm. This is a temporizing measure until safe transport is possible. Must have an anesthetist capable of using the equipment and medication.
  - Consider sevoflurane or isoflurane.  Avoid use of desflurane.
- Consider transport to ECMO center if not already planned.

## Algorithm

## Evidence Based Practice

Asthma

**Supportive**

- Anticholinergic
- Beta Agonist-MDI
- Beta Agonist-Nebulized

- Beta Agonist-Parenteral
- Epinephrine-Nebulized
- Hypertonic Saline-Nebulized
- Magnesium Sulfate-IV
- NiPPV
- Steroids-Inhaled
- Steroids-Oral
- Steroids-Parenteral
- Epinephrine- SQ
- Oxymetry Monitoring

**Neutral**

- Magnesium Sulfate-nebulized
- Steroids-IV
- High flow nasal canula
- Oxygen
- Epinephrine-IV
- Humidified oxygen
- Intubation

**Against**

Respiratory Distress NYD

**Supportive**

- NiPPV
- Intubation
- Oxymetry Monitoring
- Transfer of ECMO patients

**Neutral**

- High flow nasal canula
- Temperature Monitoring

**Against**

## References


1. Fanta CH, et al. Acute exacerbations of asthma in adults: Home and office management. UpToDate. 2021.
2. Wenzel S. et al. Treatment of severe asthma in adolescents and adults. UpToDate. 2021.


## Practice Updates

- 2023-09-29: updated EMR and PCP interventions to add salbutamol (EMR) and ipratropium, dexamethasone (PCP)
- 2023-12-18: removed COVID-related restrictions, added information about BCEHS Respiratory Assessment Course

# B04: Croup and Epiglottitis

**Mike Sugimoto**

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## Introduction

Croup and epiglottitis are infectious inflammations of the upper airway. Although adults and children can develop swelling in their upper airways as a result of illness, this inflammation is significantly more pronounced in children because of their inherently smaller airways. Both croup and epiglottitis are serious medical emergencies that require early identification and intervention.

## Essentials

- Epiglottitis in children is typically of abrupt onset and is associated with the 'three Ds': drooling; dysphagia; and distressed breathing. Coughing is rare. Classically, children adopt a tripod position and are reluctant to lie down. Adults may complain only of a severe sore throat, fever, and muffled voice. **Do not** attempt to visualize the oropharynx in these cases, unless necessary to control the airway in severely decompensated patients. Because out-of-hospital treatment options are so limited, urgent conveyance to an appropriate facility is of high importance. Do not place these patients in a supine position as doing so may cause respiratory arrest.
- The onset of croup is slower and is generally associated with a prodromal history of viral symptoms (e.g.,fever, cough, nasal congestion, etc). The barking or seal-like cough, with or without inspiratory stridor, is the hallmark of croup. Treatment of croup should be initiated regardless of the degree of stridor, as the inflammation can extend throughout the entire respiratory tract (a condition known as laryngotracheobronchitis).
- An effective treatment for croup in the out-of-hospital setting is nebulized epinephrine. Children who exhibit stridor while at rest should be treated with nebulized epinephrine regardless of whether they demonstrate retractions, agitation, lethargy, or cyanosis. Nebulized epinephrine is not indicated for epiglottitis. Westley Croup Score
- Croup is most prevalent in children between six months and three years of age and is uncommon in those over six years old.
- Paramedics and EMRs/FRs should be aware of the possibility of other causes of upper airway obstruction, including foreign bodies, trauma, and inhalation injuries.

## Additional Treatment Information

- Because the inflammation of croup can extend throughout the respiratory tract, compromising ventilation and oxygenation, paramedics and EMRs/FRs must be aware of the potential for sudden deterioration. An early warning sign of deterioration is a fall in oxygen saturation, though supplemental oxygen can artificially prop up $SpO_2$ limiting the usefulness of this tool. Patients with croup should not be kept on oxygen except as necessary to provide nebulized epinephrine therapy and should be monitored closely for other signs of increasing respiratory distress.
- Although cold or hot humid air can sometimes provide a temporary relief of symptoms for croup, these should not be considered definitive treatments.

## General Information

- Epiglottitis is a cellulitis of the epiglottis and surrounding structures caused either by a bacteremia or direct invasion by pathogenic organisms. Bacteria, viruses, and fungi have all been implicated in infectious epiglottitis, though similar symptoms can be seen in cases of trauma, inhalational injury, and airway burns. Although the disease was once commonly seen in children (again, because of the significant differences in airway size), epiglottitis has become comparatively rare due to routine immunization against *Haemophilus influenzae* type B (Hib) as part of routine childhood vaccinations. Risk factors for the development of epiglottitis, in both children and adults, include non-compliance with recommended immunization schedules and immune deficiencies.
- As a general rule, croup is caused by a viral infection and thus, often presents with a history of viral symptoms (e.g., nasal congestion, cough, sore throat, fever). It is important to remember that although the primary

manifestation of croup is upper airway stridor, the entirety of the respiratory tract can be inflamed (laryngotracheobronchitis).

- In both croup and epiglottitis, the tissues of the upper airway can act as a one-way valve, allowing exhalation while restricting inspiration. The prolonged inspiratory time can be a helpful tool to differentiate between upper and lower airway inflammation. If mechanical ventilation becomes necessary, higher airway pressures may be necessary to overcome this phenomenon.

## 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 where indicated
  - → 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

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

- Monitor oxygen saturation and provide supplemental oxygen to maintain an $SpO_2 \geq 94\%$
  - → A07: Oxygen Administration
- Convey early
- Consider intercept with additional resources

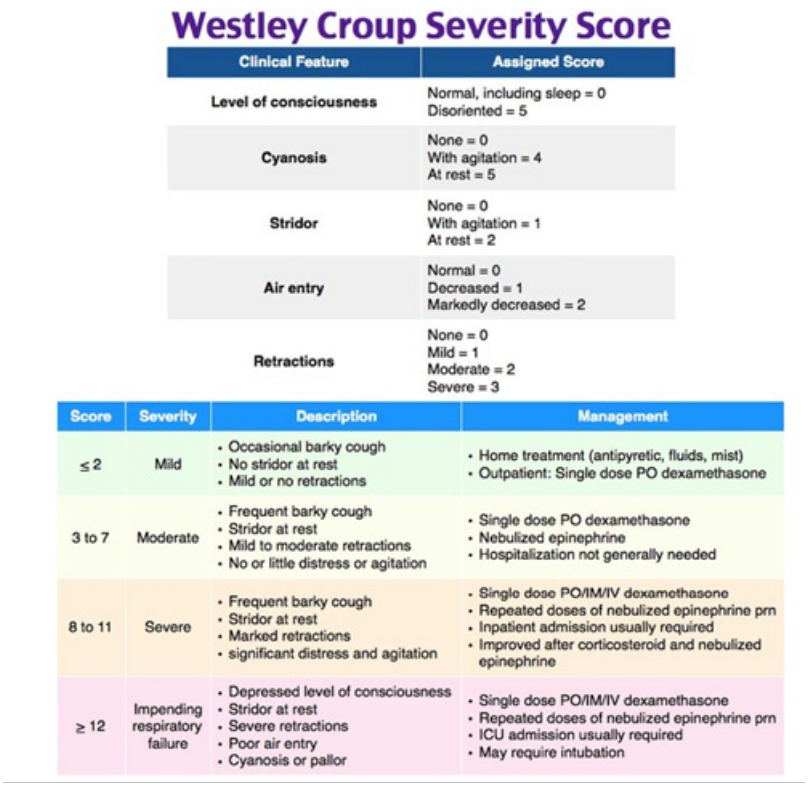
### Primary Care Paramedic – All FR and EMR interventions, plus:

- For croup with stridor in children over 6 month: Epinephrine via nebulizer over 15 minutes
  - ☐ CliniCall consultation recommended.
  - ☐☐ **Requires completion of PCP scope expansion education:**
    - Consider dexamethasone PO (preferred) or IV for mild to severe Croup
      - ☎☐ CliniCall consultation required prior to administration of dexamethasone

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

- Consider need for invasive airway management in severely decompensated patients. Intubation should be reserved for patients in extremis; difficulty should be predicted in these cases.
  - CliniCall consultation required prior to attempting intubation for patients with perfusing rhythms who are breathing spontaneously.
- Consider need for antipyresis
  - Acetaminophen

## Algorithm



**Westley Croup Severity Score**

| Clinical Feature | Assigned Score |
|---|---|
| Level of consciousness | Normal, including sleep = 0<br>Disoriented = 5 |
| Cyanosis | None = 0<br>With agitation = 4<br>At rest = 5 |
| Stridor | None = 0<br>With agitation = 1<br>At rest = 2 |
| Air entry | Normal = 0<br>Decreased = 1<br>Markedly decreased = 2 |
| Retractions | None = 0<br>Mild = 1<br>Moderate = 2<br>Severe = 3 |

| Score | Severity | Description | Management |
|---|---|---|---|
| ≤ 2 | Mild | • Occasional barky cough<br>• No stridor at rest<br>• Mild or no retractions | • Home treatment (antipyretic, fluids, mist)<br>• Outpatient: Single dose PO dexamethasone |
| 3 to 7 | Moderate | • Frequent barky cough<br>• Stridor at rest<br>• Mild to moderate retractions<br>• No or little distress or agitation | • Single dose PO dexamethasone<br>• Nebulized epinephrine<br>• Hospitalization not generally needed |
| 8 to 11 | Severe | • Frequent barky cough<br>• Stridor at rest<br>• Marked retractions<br>• significant distress and agitation | • Single dose PO/IM/IV dexamethasone<br>• Repeated doses of nebulized epinephrine prn<br>• Inpatient admission usually required<br>• Improved after corticosteroid and nebulized epinephrine |
| ≥ 12 | Impending respiratory failure | • Depressed level of consciousness<br>• Stridor at rest<br>• Severe retractions<br>• Poor air entry<br>• Cyanosis or pallor | • Single dose PO/IM/IV dexamethasone<br>• Repeated doses of nebulized epinephrine prn<br>• ICU admission usually required<br>• May require intubation |

## Evidence Based Practice

Pediatric Stridor

### Supportive

- Epinephrine-Nebulized
- Oxygen-Humidified
- Steroids-Oral

### Neutral

### Against

## Practice Updates

- 2023-09-29: added dexamethasone to PCP interventions
- 2023-12-19: removed COVID-related restrictions

# B05: Chronic Obstructive Pulmonary Disease

**Christine Hudson and Mike Sugimoto**

Updated: July 02, 2025
Reviewed: July 02, 2025

## Introduction

Chronic obstructive pulmonary disease (COPD) is a progressive, degenerative structural lung disorder that results in impaired ventilation. It is the result of persistent lung irritation from any of a number causes, including but not limited to, smoking, chemical exposure, and repeated infections. It includes progressive lung diseases such as emphysema. Although COPD cannot be cured, it can be managed. Patients with COPD often live with some degree of respiratory distress and frequently seek help during exacerbations of their disease, which are often prompted by respiratory tract infections.

## Essentials

- COPD is primarily a disease of ventilation. Treatment should be directed towards improving overall airflow with bronchodilators and steroids.
- Critical hypercarbia can develop in patients with COPD despite high respiratory rates and apparently effective tidal volumes due to changes in the alveoli and pulmonary circulation. Monitor patients closely for signs of impending respiratory failure (a falling level of consciousness, a decreasing respiratory rate, decreasing tidal volumes) and intervene early if necessary.
- Oxygen therapy should be titrated based on what is typical for the patient, where this information is readily available. Although oxygen should never be withheld from patients who are acutely short of breath, its administration should be a considered act with due care and attention. Patients living with COPD are often very aware of their oxygen saturation when not in crisis; they, or their caregivers, can be used as a resource to guide oxygen therapy.
- When patients report a history suggestive of respiratory infections, paramedics and EMRs/FRs must use appropriate personal protective equipment and should avoid all aerosol generating procedures until protective measures are in place.
- Recognize that treatment options for COPD exacerbations in the out-of-hospital environment are limited. Extrication and conveyance should be accomplished as soon as practical and safe. Do not exert patients during movement.

## Referral Information

Patients with COPD are at significant risk for recurrent hospital admissions due to exacerbation of their disease.

Community paramedics should refer to the CP COPD guidelines for additional management information.

## General Information

- Patients with COPD often have comprehensive management plans prescribed by their care team. These plans reflect an individual's condition and describe a series of actions to be taken based on symptoms. Compliance with the action plan, and response to treatment, should form part of any investigation into an exacerbation of COPD.
- Complete relief of symptoms, including audible wheezes, is frequently not possible. Although paramedics and EMRs/FRs should be aggressive in attempting to relieve dyspnea, therapeutic end points should be set with reference to the patient's normal condition.
- In the absence of patient-specific information, paramedics and EMRs/FRs should consider observable signs that describe the degree of distress. The ratio of inspiratory time to expiratory time is an important clinical clue to the effectiveness of therapy, as is the tidal volume with each breath.
- Paramedics and EMRs/FRs should consider the possibility of concurrent disease processes and seek evidence to include or exclude other diagnoses.
- If a patient continues to deteriorate despite aggressive therapy, consider the possibility of barotrauma and pneumothorax.

# Interventions

## First Responder

- Minimize patient activity and do not exert patients during movement
- Provide supplemental oxygen as required
  - → A07: Oxygen Administration
- Place patient in position of greatest comfort and easiest breathing (generally sitting up)
- Assist patient with retrieval of own inhalers if prescribed
- Begin positive pressure ventilation using bag-valve masks if respiratory failure develops

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

- Titrate supplemental oxygen to $SpO_2$ 88-92%
  - → A07: Oxygen Administration
- □□ **Requires completion of EMR scope expansion education:**
  - Salbutamol
    - MDI and spacer use is strongly recommended for patients with signs of influenza-like illness, or other infectious respiratory conditions
- Convey early
- Consider intercept with additional resources

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

- Salbutamol
- □□ **Requires completion of PCP scope expansion education:**
  - Salbutamol and ipratropium
    - MDI and spacer use is strongly recommended for patients with signs of influenza-like illness, or other infectious respiratory conditions
  - Consider dexamethasone if no improvement following salbutamol and ipratropium (☎□ CliniCall consultation required prior to administration of dexamethasone)
- Consider CPAP
  - → PR09: Continuous Positive Airway Pressure

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

- Salbutamol and ipratropium
- Apply a staged approach to airway and breathing interventions as required
- CliniCall consultation required prior to attempting intubation for patients with perfusing rhythms who are breathing spontaneously.

## Community Paramedic (CP) Interventions

- → CP 4.9: Chronic Obstructive Pulmonary Disease

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

- Consider use of mechanical ventilation
  - → PR29: Mechanical ventilation
- Consider use of non-invasive ventilation
- Consider invasive ventilation
- Consider dynamic hyperinflation
  - set PEEP 50-80% of the auto-PEEP
  - Consider decreasing breath rate to avoid breath stacking
- Consider I:E 1:3, 1:4
- Consider reduced driving pressure < 15 $cmH_2O$
- Consider permissive hypercapnia

- Consider ABG/VBG sampling for guidance of therapy.
- Consider radial arterial line placement.
- Consider femoral arterial line placement
- Anesthesia planning
  - Avoid morphine if possible (histamine release)
  - Consider Ketamine
  - Consider Propofol
  - Avoid Etomidate (increased airway resistance and adrenal dysfunction)
  - Consider paralytics
    - Succinylcholine
    - Rocuronium
    - Cisatracurium
- Glucocorticoids
  - Prednisone 40 mg
  - Methylprednisolone 60 mg
- Antimicrobial
  - antibiotic
  - antiviral
- Magnesium 2-4g
- Call ETP prior to anesthetic gas administration.
- Consider anesthetic gas if unable to transport due to severe refractory bronchospasm. This is a temporizing measure until safe transport is possible. Must have an anesthetist capable of using the equipment and medication.
  - Consider Sevoflurane
  - Avoid Desflurane

## Evidence Based Practice

COPD

### Supportive

- Beta Agonist-Nebulized
- Beta Agonist-Parenteral
- NiPPV
- Oxygen-titrated
- Beta Agonist-MDI
- Oxymetry Monitoring

### Neutral

- Anticholinergic
- High flow nasal canula
- Humidified oxygen
- Intubation

### Against

- Oxygen-high flow

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3. Beasley R, et al. Thoracic Society of Australia and New Zealand oxygen guidelines for acute oxygen use in adults: "Swimming between the flags." 2015. [Link]
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## Practice Updates

- 2023-09-29: added salbutamol to EMR interventions; added ipratropium, dexamethasone to PCP interventions
- 2023-12-19: removed COVID-related restrictions

# B06: Pulmonary Embolism

**Mike Sugimoto**

Updated: May 01, 2025
Reviewed:

## Introduction

A pulmonary embolism occurs when the pulmonary arterial circulation becomes blocked by material originating elsewhere in the body, either fat, air, or a thrombus. The occlusion causes a variety of symptoms resulting from a combination of poor pulmonary circulation, poor gas exchange and oxygen transport, and right ventricular strain; these can include chest pain, shortness of breath, cough, hypotension, and syncope.

## Essentials

- For hemodynamically normal and stable patients with signs and symptoms of a pulmonary embolism, no specific therapies are required beyond monitoring, supplemental oxygen as required, and conveyance to hospital.
- Hemodynamically compromised or otherwise unstable patients require a similar approach, but consideration must be made to the logistics of conveyance and the provision of en route care.
- When conveying a hemodynamically compromised patient with a suspected pulmonary embolism, paramedics and EMRs should plan their conveyance strategy with regards to the need for effective chest compressions should the patient progress to cardiac arrest. Though this may require additional resources, paramedics and EMRs should not wait before initiating conveyance – consider intercept with additional resources en route.
- Patients with a strong suggestion of a pulmonary embolism, and who are in cardiac arrest, should be conveyed as soon as possible with an emphasis on effective chest compressions and early notification to the receiving facility.
- Under most circumstances, paramedics and EMRs/FRs should not cease resuscitation of patients with a suspected pulmonary embolism until contact with CliniCall has been made.

## General Information

The severity of symptoms caused by a pulmonary embolism can be extremely variable. Patients can be asymptomatic or near death. Emboli can develop acutely or over a longer term. There can be a clear precipitating event or the origin of the thrombus can be uncertain. As a result, the diagnosis of a pulmonary embolism can be very complex, often subtle, and remains – even with imaging and laboratory tests – one of the most difficult diagnoses in medicine.

In the out-of-hospital environment, the provisional diagnosis of a pulmonary embolism should be reserved for those cases that unequivocally point towards that conclusion – either because of significant history findings, or as a result of clinical presentation. Suspicion will be vastly more common than certainty. Clinical history findings that should prompt the consideration of a pulmonary embolism include:

- Malignancy
- Pregnancy or other hormonal change (e.g., birth control)
- Recent stroke
- Recent hospitalization or restriction of movement
- Recent traumatic spinal cord injury
- Recent joint replacement or other surgical procedure
- Known thrombophilia
- Known venous thromboembolism

Common signs and symptoms of pulmonary embolism can include:

- Sudden onset shortness of breath at rest or on exertion
- Pleuritic chest pain
- Cough
- Orthopnea
- Calf or thigh pain or swelling

- Wheezing
- Syncope

Patients with pulmonary embolisms may present with significant hemodynamic compromise that can progress to cardiac arrest. The possibility of a pulmonary embolism should be entertained when other causes of hemodynamic instability do not adequately account for the patient's presentation. Suspicion should be further raised when the symptoms develop suddenly and without warning.

There is no specific out-of-hospital treatment for a pulmonary embolism. Care is primarily supportive, aimed at optimizing oxygenation and ventilation while supporting blood pressure and ensuring rapid conveyance to hospital.

If a patient with a suspected pulmonary embolism suffers a cardiac arrest, early consultation with both CliniCall and the receiving hospital should be made to discuss a resuscitation and potential reperfusion strategy. Thrombolysis is an option for patients whose cardiac arrests are likely due to embolic events; conveyance should be prioritized, with a focus on ensuring high-quality CPR during patient movement to the maximum extent possible.

## Interventions

### First Responder

- Provide airway management as required
  - → B01: Airway Management
- In cardiac arrest: begin chest compressions
  - → PR06: High Performance CPR
- Provide supplemental oxygen as required
  - → A07: Oxygen Administration

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

- Provide supplemental oxygen as required to maintain an $SpO_2 \geq 94\%$ (caution: may not be achievable)
  - → A07: Oxygen Administration
- Provide rapid conveyance
- Consider intercept with additional resources

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

- Consider supraglottic airway for decreased levels of consciousness when unable to ventilate using pharyngeal airways
  - → PR08: Supraglottic Airways

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

- Intubation as required; avoid intubation strategies that depress blood pressure
  - → PR18: Anesthesia Induction
  - → PR23: Awake Intubation

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

- Mechanical ventilation
- RV failure can be exacerbated with induction. Follow right heart induction strategies.
  - Avoid high Pplat.
  - Avoid high PEEP
- Hemodynamic support
  - Ultrasound guided (IVCDI, right heart strain, McConnel's sign)
  - IV fluid (potentially harmful in patients with right heart failure)
    - With the right heart failure do not decrease preload.
    - The right ventricle can not compensate with an increase in contractility. It compensates with heart rate due to interventricular coupling. Therefore, allow for tachycardia.
  - Norepinephrine

    - Phenylephrine
    - Epinephrine and Dopamine may exacerbate tachycardia predisposing one to dysrhythmias.
- Call ETP prior to thrombolytics or pulmonary vasodilators. Consider inotropic support with possible pulmonary vasodilator effects.
    - Dobutamine
    - Milrinone
- Anticoagulation consider Wells scoring
    - Heparin
    - Thrombolysis (tPA)

## References


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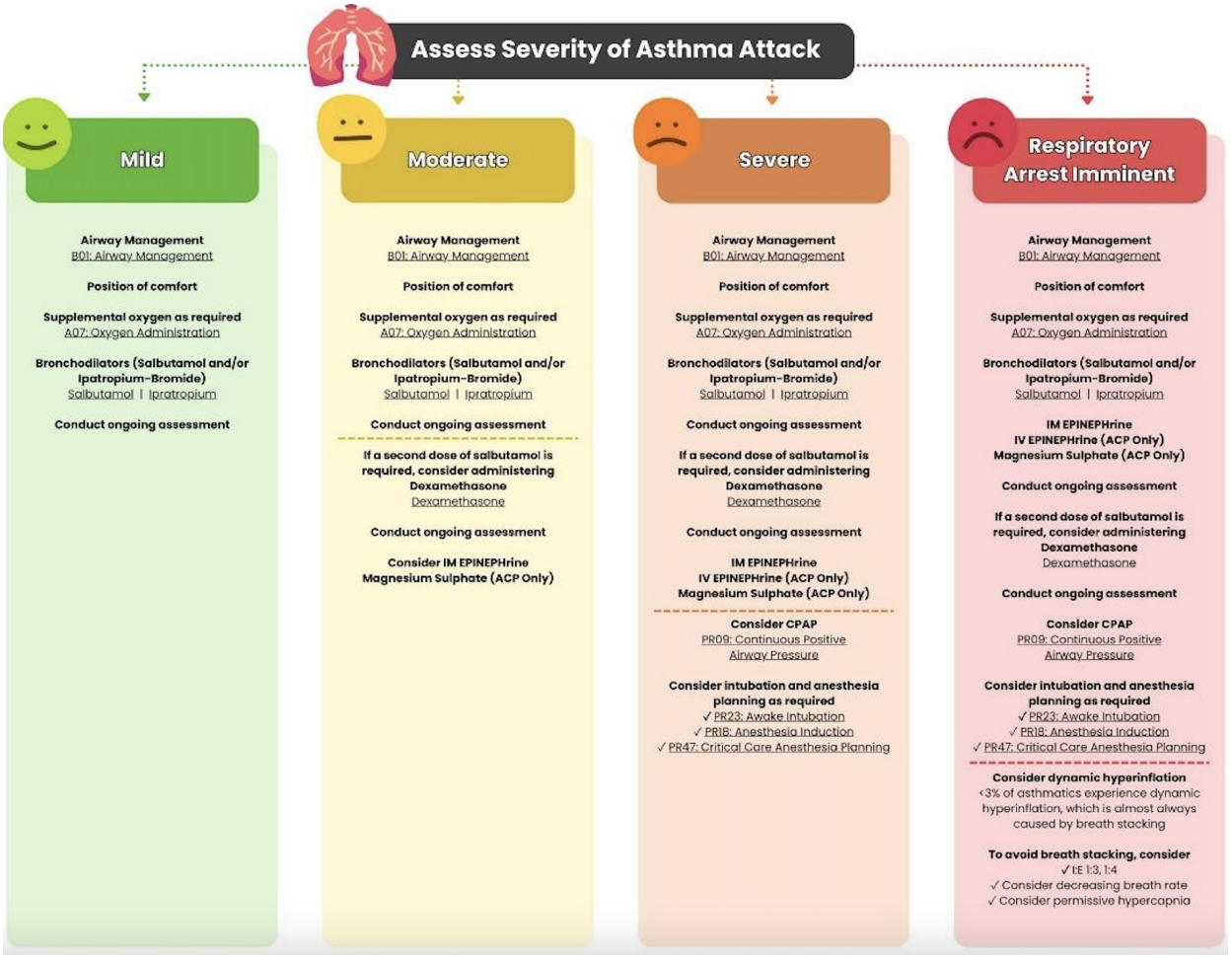
Assess Severity of Asthma Attack
Mild
Airway Management
B01: Airway Management
Position of comfort
Supplemental oxygen as required
A07: Oxygen Administration
Bronchodilators (Salbutamol and/or Ipatropium-Bromide)
Salbutamol | Ipratropium
Conduct ongoing assessment
Moderate
Airway Management
B01: Airway Management
Position of comfort
Supplemental oxygen as required
A07: Oxygen Administration
Bronchodilators (Salbutamol and/or Ipatropium-Bromide)
Salbutamol | Ipratropium
Conduct ongoing assessment
If a second dose of salbutamol is required, consider administering Dexamethasone
Dexamethasone
Conduct ongoing assessment
Consider IM EPINEPHrine
Magnesium Sulphate (ACP Only)
Severe
Airway Management
B01: Airway Management
Position of comfort
Supplemental oxygen as required
A07: Oxygen Administration
Bronchodilators (Salbutamol and/or Ipatropium-Bromide)
Salbutamol | Ipratropium
Conduct ongoing assessment
If a second dose of salbutamol is required, consider administering Dexamethasone
Dexamethasone
Conduct ongoing assessment
IM EPINEPHrine
IV EPINEPHrine (ACP Only)
Magnesium Sulphate (ACP Only)
Consider CPAP
PR09: Continuous Positive Airway Pressure
Consider intubation and anesthesia planning as required
✓ PR23: Awake Intubation
✓ PR18: Anesthesia Induction
✓ PR47: Critical Care Anesthesia Planning
Respiratory Arrest Imminent
Airway Management
B01: Airway Management
Position of comfort
Supplemental oxygen as required
A07: Oxygen Administration
Bronchodilators (Salbutamol and/or Ipatropium-Bromide)
Salbutamol | Ipratropium
IM EPINEPHrine
IV EPINEPHrine (ACP Only)
Magnesium Sulphate (ACP Only)
Conduct ongoing assessment
If a second dose of salbutamol is required, consider administering Dexamethasone
Dexamethasone
Conduct ongoing assessment
Consider CPAP
PR09: Continuous Positive Airway Pressure
Consider intubation and anesthesia planning as required
✓ PR23: Awake Intubation
✓ PR18: Anesthesia Induction
✓ PR47: Critical Care Anesthesia Planning
Consider dynamic hyperinflation
<3% of asthmatics experience dynamic hyperinflation, which is almost always caused by breath stacking
To avoid breath stacking, consider
✓ I:E 1:3, 1:4
✓ Consider decreasing breath rate
✓ Consider permissive hypercapnia