

Severity of Bronchospasm

Mild to moderate

- Expiratory with/without inspiratory wheezing
- Speaking in full or partial sentences
- SOB at rest; tachypnea less than 40/min
- Normal mentation

Severe to near death

- Distant wheezing or silent chest
- Single word responses or mute
- Tachypnea greater than 40/min; laboured or fatigued respiratory effort to apnea
- Confused or unresponsive

SFA
FMR
EMR
PCP

Standard Approach and Ongoing Assessment

SFA
FMR
EMR
PCP

Consider assisting patient with own salbutamol and/or ipratropium bromide

Mild/Moderate

Severe/Near Death

PCP

Less than 20 kg:
salbutamol 1 puff MDI with spacer every 30-60 seconds prn to a maximum of 15 puffs
ipratropium bromide 1 puff MDI with spacer every 30-60 seconds prn to a maximum of 12 puffs

Greater than or equal to 20 kg:
salbutamol 1 puff MDI with spacer every 30-60 seconds prn to a maximum of 30 puffs
ipratropium bromide 1 puff MDI with spacer every 30-60 seconds prn to a maximum of 15 puffs

PCP

Less than 20 kg:
salbutamol 2.5 mg mixed with ipratropium bromide 250 mcg nebulized prn to a total maximum of 7.5 mg/750 mcg respectively
Or:
salbutamol 1 puff MDI with spacer every 30-60 seconds prn to a maximum of 15 puffs
ipratropium bromide 1 puff MDI with spacer every 30-60 seconds prn to a maximum of 12 puffs

Greater than or equal to 20 kg:
salbutamol 5 mg mixed with ipratropium bromide 500 mcg nebulized to a total maximum of 15 mg/1500 mcg, respectively
Or:
salbutamol 1 puff MDI with spacer every 30-60 seconds prn to a maximum of 30 puffs
ipratropium bromide 1 puff MDI with spacer every 30-60 seconds prn to a maximum of 15 puffs

Condition improved?

Yes

No

PCP

Assist ventilations.
Mandatory OLMC to consider advanced airway options.

SFA
FMR
EMR
PCP

Continue treatment and assessment until transfer of care to EMS

Infection Prevention and Control (IP&C) Considerations

Adhere to the following procedures if the patient presents with influenza-like illness (ILI) symptoms:

1. The patient should wear a procedure mask if tolerated. Oxygen can be administered while the patient is wearing the procedure mask via nasal cannula. If the patient requires additional oxygen, a non-rebreather can be used without the accompanying procedure mask.
2. PPE including a gown, N-95 mask, safety glasses/goggles or face shield, and gloves must be used for all aerosol generating procedures (AGMPs). These procedures include, but are not limited to:
 - a. Airway management (intubation, OPA/BVM)
 - b. Suctioning
 - c. MDI administration
 - d. Nebulization of medication

Many therapies for respiratory conditions and airway management techniques are known as aerosol generating medical procedures (AGMPs). These often produce splashes of oral secretions, as well as blood, and emesis when they are present. In the presence of an infectious state, oral secretion can transmit harmful pathogens. Personal protective equipment (PPE) that protects the pre-hospital care provider's eyes, nose and mouth as a minimum is mandatory.

The patient should wear a procedure mask, if tolerated. Oxygen can be administered while the patient is wearing the procedure mask via a nasal cannula. If the patient requires additional oxygen, a NRB can be used without the accompanying procedure mask.

Patients with a history of respiratory illness such as COPD or asthma can also experience influenza, Covid-19 or other contagious infections. It is important to remain vigilant in these instances and continue to wear the appropriate PPE. All practitioners on scene must don their PPE, even if they are not directly performing any interventions.

Pediatric Respiratory Assessments

Pediatric patients may be less afraid if their parents are involved in the assessment. For instance, have the parent continue to hold the child while you listen to their lungs. Consider demonstrating what you will be doing by first performing a set of vitals on yourself, a caregiver or another MFR responder. Determining an oxygen saturation may be difficult with a standard finger-clip pulse oximeter as they don't fit well on small fingers. You may try placing it on the big toe, but it is most important to be monitoring signs of observable respiratory distress. Warming the bell and diaphragm of the stethoscope before placing it on a patient's body may help obtain lung sounds.

Croup is a viral infection that frequently infects children and causes swelling of the throat, larynx, and trachea. This swelling can cause changes to the child's voice and can give their cough a hard, bark-like sound. Croup can also cause stridor, a high-pitched sound with inspiration. One of the most effective treatments can be cold air exposure, so having the caregiver step outside with the patient for a few minutes can help. Children between the ages of three months and five years are most likely to experience these specific symptoms. Older children and adults in the household will only experience common cold symptoms.

Signs of respiratory distress in a young pediatric patient can include grunting, nostril flaring, increased respiratory and heart rate, cyanosis, accessory muscle use and chest retractions. With accessory muscle use, you may see the neck muscles flexing or moving when the child breathes, or you may note the head moving up and down in time with the respirations. Chest retractions are when the chest appears to sink in just below the neck, sternum or around the ribs with each breath. In both cases, the body is trying to create for room for tidal volume to increase available oxygen.

Vital Sign	Infant 0-12 months	Child 1-11 years
Heart rate	100 - 160 beats per minute	70 - 120 beats per minute
Respirations	0 – 6 months: 30-60 breaths per minute 6 - 12 months: 24-30 breaths per minute	1 - 5 years: 20 - 30 breaths per minute 6-11 years: 12 - 20 breaths per minute
Blood pressure	0 - 6 months: 65-90/45-65 6 - 12 months: 80-100/55-65	All ages: 90-110/55-75
Temperature	All ages: 35.8 °C	All ages: 35.8 °C

Etiology

Bronchospasm is an abnormal contraction of the smooth muscle of the bronchi, resulting in an acute narrowing and obstruction of the lower airway. A cough with generalized wheezing usually indicates this condition. Wheezing is produced by the movement of air through constricted airways. It is critical to recognize there may be little or no air flow in severe bronchospasm attacks with the result being minimal audible wheezing. In cases of severe

bronchospasm, audible wheezing may be absent prior to treatment. In these cases, the onset of wheezing following treatment may be indicative of improved airflow.

Patients (especially children) with inspiratory stridor are more likely to have a partial upper airway obstruction (i.e. croup, epiglottitis, foreign body). Audible wheezing on inspiration is likely referred upper airway noise from stridor.

Practitioners must consider other causes of bronchospasm such as CHF, toxic inhalation and pneumonia. OLMC should occur early if the diagnosis is uncertain. Asthma or COPD may present as a “silent chest”. Remember, **“All that wheezes is not asthma”**.

Signs of Increased Respiratory Effort

	Mild	Moderate	Severe	Near Death
Wheeze	<ul style="list-style-type: none"> • Expiratory • Low pitched 	<ul style="list-style-type: none"> • Expiratory & inspiratory • High pitched 	<ul style="list-style-type: none"> • Distant • Near absent 	<ul style="list-style-type: none"> • Absent • Work of breathing compromised • Silent chest
Speech	<ul style="list-style-type: none"> • Full sentences 	<ul style="list-style-type: none"> • Partial sentences 	<ul style="list-style-type: none"> • Single words • Difficulty speaking 	<ul style="list-style-type: none"> • Not responding
Respiratory Rate & Effort	<ul style="list-style-type: none"> • Normal to slight tachypnea 	<ul style="list-style-type: none"> • SOB at rest • Congested • Chest tightness 	<ul style="list-style-type: none"> • Laboured 	<ul style="list-style-type: none"> • Slowing • Apnea
Mentation	<ul style="list-style-type: none"> • Normal 	<ul style="list-style-type: none"> • Normal • Distracted 	<ul style="list-style-type: none"> • Distracted • Becoming disoriented 	<ul style="list-style-type: none"> • Exhausted • Confused

Asthma

1. Asthma is a reversible obstructive lung disease characterized by:
 - a. Bronchial smooth muscle contraction
 - b. Mucosal and submucosal inflammation and edema
 - c. Increased mucous production and congested airways
2. Asthma may be triggered by extrinsic factors (e.g. pollution, exercise, cold air, pharmacological products) or intrinsic factors (e.g. allergies).

Pneumonia

1. Pneumonia is a breathing (respiratory) condition in which there is an infection of the lung.

2. The most common symptoms of pneumonia are:
 - a. Cough (may be productive – greenish/yellow mucus, or even bloody mucus)
 - b. Fever
 - c. Shaking / chills
 - d. Shortness of breath

Interventions

Ventilation

1. Respiratory failure can consist of hypoxia, hypercapnia (elevated CO₂) or both; in most patients with respiratory failure the goal is to treat the 2 conditions simultaneously.
2. In the critically ill asthmatic, however, the primary treatment goal is to correct hypoxia rather than hypercapnia because assisted mechanical ventilation in an asthmatic is associated with a high risk of barotrauma (pneumothorax); excessive ventilation (by rate or volume) can induce pneumothorax which is significantly more serious than hypercapnia in a patient with reasonable oxygenation.
3. The primary treatment goal in the critically ill asthmatic patient is to ventilate to an O₂ saturation of 90% using as low a ventilatory rate and volume as possible; the oxygen saturation level rather than the CO₂ level ultimately determines the rate and volume of assisted ventilation; this concept is known as “permissive hypercapnia”.
4. Oxygen saturations of 88 – 90% are completely compatible with life and aggressive attempts to improve oxygen saturation with high ventilatory volumes and pressures are dangerous due to the risk of barotraumas.
5. Positive end expiratory pressure (PEEP) should not be applied
 - a. Due to incomplete expiration caused by bronchoconstriction, “air trapping” and “breath stacking” occurs (i.e. the lungs are incompletely emptied before the next breath is in).
 - b. This leads to increased pressures in the airways (“auto PEEP”); the increased intrathoracic pressure from auto PEEP may reduce venous return to the heart, and hence reduce cardiac output and blood pressure levels; the increased intrathoracic pressure may also lead to barotraumas such as tension pneumothorax.

Airway Management

1. Early and aggressive supportive care may decrease the need for advanced airway placement.

What to expect when EMS arrives

Incoming EMS crews are likely going to want to know what the patient's initial O₂ saturation was, what treatments were performed and whether O₂ saturation or respiratory effort changed in response to any interventions. If the patient has a history of asthma or COPD, knowing whether they have ever had to be intubated in the past is useful knowledge.

If a patient is in severe respiratory distress, EMS practitioners may stay on scene to try and stabilize the patient prior to packaging for transport. IV medications such as a steroid, magnesium sulfate or epinephrine may be utilized, or C-PAP (continuous positive airway pressure) may be initiated.

Many patients will not tolerate any positioning other than sitting straight up. In these instances, the EMS crew may choose to utilize a stair chair or rescue seat to move the patient to the stretcher. In these cases, adjusting the head of the stretcher into a high fowler's position (straight up) before the patient is transferred to the stretcher may help.

Cold air can induce or increase the severity of bronchospasm. In cold weather, consider reducing the time the patient is outside while being transferred from scene to ambulance by ensuring the ambulance is ready to load and as close to the scene as possible. Ensuring the heat is on in the back of the ambulance can reduce cold exposure. The ventilation fan should always be turned on when practitioners are in the back of the ambulance with an ILI patient.