

**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

salbutamol 1 puff MDI with spacer every 30-60 seconds prn  
ipratropium bromide 1 puff MDI with spacer every 30-60 seconds prn

PCP

salbutamol 5 mg nebulized continuous or 1 puff MDI with spacer every 30-60 seconds prn  
ipratropium bromide 500 mcg nebulized q5min to a maximum of 1500mcg or 1 puff MDI with spacer every 30-60 seconds prn

Condition improved?

No

PCP

normal saline 500 mL IV bolus followed by a 250 mL/hr maintenance drip

Condition improved?

Yes

Yes

No

SFA  
FMR  
EMR  
PCP

**Continue treatment and assessment until transfer of care to EMS**

PCP

Assist ventilations and consider advanced airway management with:  
**salbutamol 1 puff MDI with spacer every 30-60 seconds prn to a total maximum of 30 puffs**  
If patient has not received a total of 15 puffs of ipratropium bromide may give:  
**ipratropium bromide 1 puff MDI with spacer every 30-60 seconds prn to a total maximum of 15 puffs**

## 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.

## 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.

## Signs of Increased Respiratory Effort

|                           | Mild  | Moderate   | Severe  | Near Death  |
|---------------------------|---|--|---|---|
| Wheeze                    | <ul style="list-style-type: none"> <li>• Expiratory</li> <li>• Low pitched</li> </ul> | <ul style="list-style-type: none"> <li>• Expiratory &amp; inspiratory</li> <li>• High pitched</li> </ul>                                       | <ul style="list-style-type: none"> <li>• Distant</li> <li>• Near absent</li> </ul>              | <ul style="list-style-type: none"> <li>• Absent</li> <li>• Work of breathing compromised</li> <li>• Silent chest</li> </ul> |
| Speech                    | <ul style="list-style-type: none"> <li>• Full sentences</li> </ul>                    | <ul style="list-style-type: none"> <li>• Partial sentences</li> </ul>  | <ul style="list-style-type: none"> <li>• Single words</li> <li>• Difficulty speaking</li> </ul> | <ul style="list-style-type: none"> <li>• Not responding</li> </ul>  |
| Respiratory Rate & Effort | <ul style="list-style-type: none"> <li>• Normal to slight tachypnea</li> </ul>        | <ul style="list-style-type: none"> <li>• Greater than 25/min</li> <li>• SOB at rest</li> <li>• Congested</li> <li>• Chest tightness</li> </ul> | <ul style="list-style-type: none"> <li>• Greater than 40/min</li> <li>• Labored</li> </ul>      | <ul style="list-style-type: none"> <li>• Slowing</li> <li>• Apnea</li> </ul>  |
| Mentation                 | <ul style="list-style-type: none"> <li>• Normal</li> </ul>                            | <ul style="list-style-type: none"> <li>• Normal</li> <li>• Distracted</li> </ul>   | <ul style="list-style-type: none"> <li>• Distracted</li> <li>• Becoming disoriented</li> </ul>  | <ul style="list-style-type: none"> <li>• Exhausted</li> <li>• Confused</li> </ul>   |

## Asthma

Asthma is a reversible obstructive lung disease characterized by:

1. Bronchial smooth muscle contraction.
2. Mucosal and submucosal inflammation and edema.
3. Increased mucous production and congested airways.

Asthma may be triggered by extrinsic factors (e.g. pollution, exercise, cold air, pharmacological products) or intrinsic factors (e.g. allergies).

## Chronic Obstructive Pulmonary Disease (COPD)

COPD is a disease process which causes chronic outflow obstruction; the two dominant forms are:

1. Emphysema (Pink Puffers): characterized by an abnormal enlargement of the air spaces distal to the terminal bronchioles accompanied by the destruction of their walls.
2. Chronic Bronchitis (Blue Bloaters): characterized by inflamed and edematous airways filled with secretions. Copious respiratory secretions contribute to expiratory obstruction.
3. Despite the risk of suppressing the hypoxic respiratory drive, oxygen should never be withheld from a symptomatic patient or any COPD patient with SpO<sub>2</sub> less than 90%.
4. Practitioners must be prepared to assist ventilation; assisted ventilations are also indicated for patients who are unable to maintain SpO<sub>2</sub> greater than 90% by other adjuncts or whose mentation is compromised by hypoxia.

## Pneumonia

Pneumonia is an inflammatory condition of the lung, affecting primarily the microscopic air sacs known as alveoli. It is usually caused by infection with viruses or bacteria and less commonly other microorganisms, certain drugs and other conditions such as autoimmune diseases.

The most common symptoms of pneumonia are:

- Cough (may be productive – greenish/yellow mucus, or even bloody mucus)
- Fever
- Shaking / chills
- Shortness of breath

## Patient Safety Considerations

Remember, “All that wheezes is not asthma.” Practitioners must consider other causes of bronchospasm such as CHF, toxic inhalation and pneumonia. Asthma or COPD may present as a “Silent Chest.”

## Ventilation

1. Respiratory failure can consist of hypoxia, hypercapnia (elevated CO<sub>2</sub>) or both; in most patients with respiratory failure the goal is to treat the two 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 O<sub>2</sub> saturation of 90% using as low a ventilatory rate and volume as possible. The oxygen saturation level rather than the CO<sub>2</sub> 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 barotrauma.
5. Positive end expiratory pressure (PEEP) should not be applied
  - a. Due to incomplete expiration caused by bronchoconstriction, “air trapping” and “breath stacking” occurs (e.g. 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.

## What to expect when EMS arrives

Incoming EMS crews are likely going to want to know what the patient’s initial O<sub>2</sub> saturation was, what treatments were performed and whether O<sub>2</sub> 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.