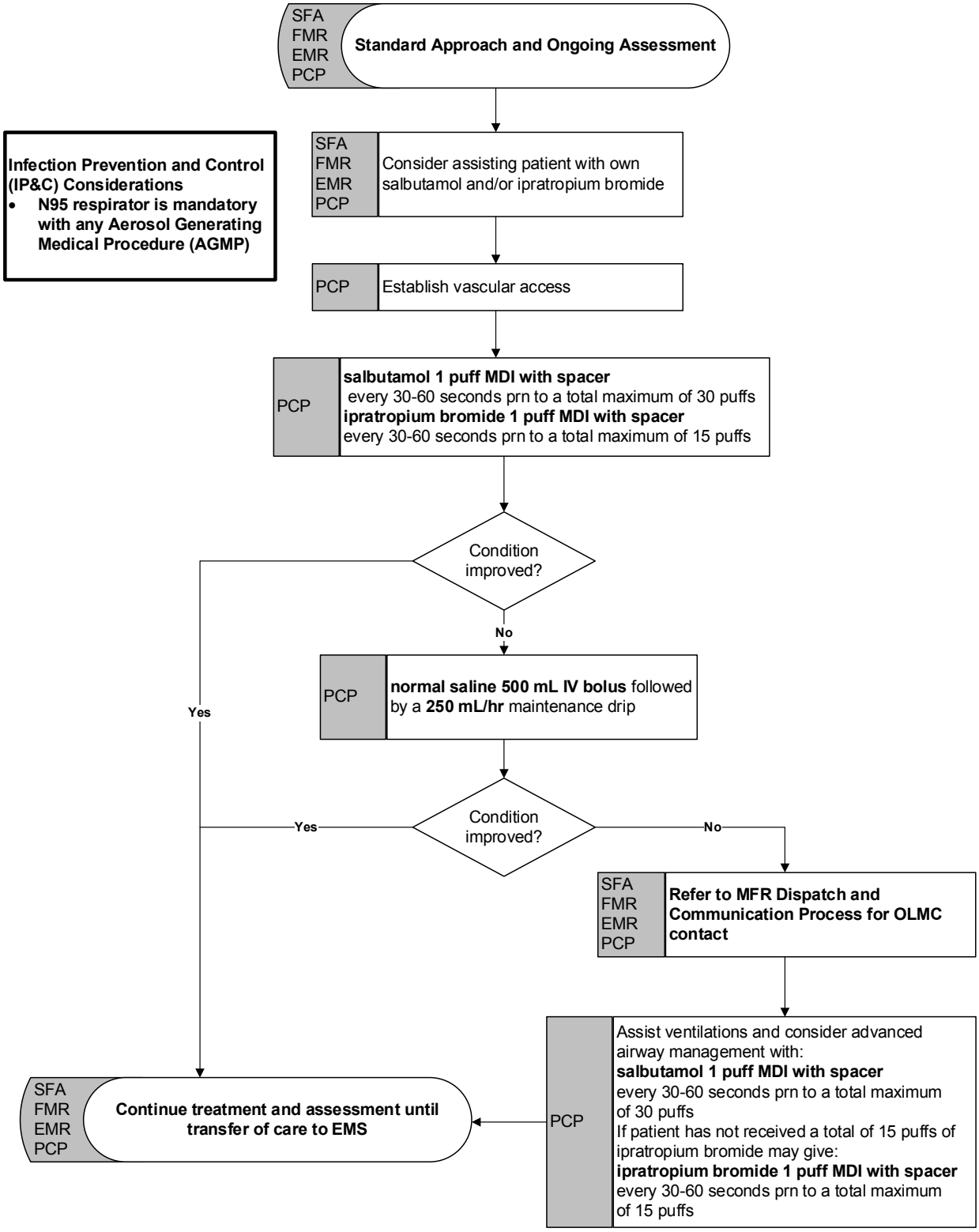
Adult Bronchospasm 2.1



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	• Expiratory • Low pitched	• Expiratory & inspiratory • High pitched	• Distant • Near absent	• Absent • Work of breathing compromised • Silent chest
Speech	• Full sentences	• Partial sentences	• Single words • Difficulty speaking	• Not responding
Respiratory Rate & Effort	• Normal to slight tachypnea	• Greater than 25/min • SOB at rest • Congested • Chest tightness	• Greater than 40/min • Labored	• Slowing • Apnea
Mentation	• Normal	• Normal • Distracted	• Distracted • Becoming disoriented	• Exhausted • Confused

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 SpO2 less than 90%
4. Practitioners must be prepared to assist ventilation; assisted ventilations are also indicated for patients who are unable to maintain SpO2 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_2) 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_2 saturation of 90% using as low a ventilatory rate and volume as possible. The oxygen saturation level rather than the CO_2 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