

## **Acute Asthma Attack**

*Participants:* Family medicine residents; pediatric residents/students, internal medicine residents, respiratory therapists and RT students

### *Learning Objectives*

**At the end of the session the participants will be able to:**

- 1. recognize the signs and symptoms of an acute asthma exacerbation**
- 2. manage an acute asthma exacerbation appropriately**
- 3. if the patient is having respiratory decompensation, properly provide ventilatory support**
- 4. (optional) start an intravenous line**

### *Simulation overview*

**Acute asthma exacerbation is a potentially fatal event if not treated appropriately. This event involves bronchospasm and increased secretions in the airways. In those individuals who are prone to reactive airway disease, precipitants include antigen exposure (e.g. allergens), infection, cold air, and exercise. Bronchospasm limits gas exchange, and if severe, can cause hypoxemia and eventual respiratory arrest. Signs of an acute asthma exacerbation include dyspnea, tachypnea, use of accessory muscles, tachycardia, wheezing (although this may not be heard with severe bronchospasm), cyanosis with severe hypoxemia, and an elevated pulsus paradoxus. The degree of bronchospasm can be evaluated by measuring the degree in which the peak expiratory air flow is affected using a flowmeter. The average peak expiratory flow rate, or PEFr, is determined by the patient's height, age, and gender. If the patient does home measurement, the baseline is the average of his measurements when he is doing well. The goals of acute therapy are to assess the degree of bronchospasm, work up for the patient for the etiology of the episode, and render treatment to bring the patient back to at least 70% of his baseline or expected PEFr value. Treatment includes oxygen, bronchodilators (B2 agonists, anticholinergic agents), steroids, and antibiotic therapy if infection is present. Steroids are helpful in that they reduce other causes of airway obstruction: airway edema, and intraluminal mucus plugging. Failure to give steroids may manifest as airway obstruction once the bronchodilators have worn off.**

**This scenario presents a young person who is presenting with an acute asthma attack. The etiology is either from exposure from allergens (pollen etc.) or due to a mycoplasma infection. The expected actions are listed below. If the patient is not treated in a timely fashion or is discharged prior to documentation of adequate improvement, he will go into severe bronchospasm and will require intubation and ventilatory support. For pediatric training the patient will be a 10 year old child with a similar history. This patient should not be sent home until significant improvement occurs – PEFr at appropriate levels.**

## **Patient History**

**Patient is a 10 year old male who presents with complaints of acute shortness of breath approximately 2 hours prior to admission. He denies any precipitating incident but notes that his allergies have “been acting up” lately. He has not been hospitalized before. The last time he has had steroids was about 2 years ago. He does not self measure peak flow rate. Optional: he started having a cough yesterday and notes that he has a slight fever. No chills but he has not much to eat or drink since yesterday.**

**PMH: Asthma since he around 4 years old**

**PSH: none**

**Meds: Albuterol inhaler, Singulair**

**All: seasonal allergies**

**SHx: In school; parent smokes**

**FHx: non-contributory**

**ROS: as above; cough is non-productive**

**Physical examination (provided only if asked)**

**Height 140cm; 40 kgs**

**Skin is dry; mucous membranes are dry**

**Cardiac: S1S2 tachycardia**

**Lungs: bilateral wheezing**

**Neck: supple**

**Chest: Bilateral wheezing**

**Pulsus Paradoxus: 15 mmHg**

## **Labs:**

- CBC either normal or if choose the infected patient: WBC 13.3; Hct 42; Hgb 13.5; plts 315**
- Chem 7: Na - 139; K - 4.2; Cl - 101; HCO<sub>3</sub> 24; BUN 16; Cr 0.8**
- ABG initial: 7.47/30/58/23; after sent home: 7.30/47/48/23**
- CXR - normal; if infected, interstitial pneumonia (mycoplasma)**
- PEFR: expected 307 L/minute; initial 180 L/min  
After bronchodilator treatment it improves to 220 L/min**

### *Simulation Parameters*

#### **Initial Parameters**

**BP: 100/65**

**HR: 120**

**RR: 40**

**Sat: 88%**

**Heart sounds: normal**

**Lung sounds: bilateral wheezing**

#### **Scenario run**

The patient will present with complaints of dyspnea. Saturation should be adjusted as above for Laerdal. For METI, change shunt fraction to achieve desired saturation. If oxygen is administered, saturation should improve to 92% although wheezing is still present. If oxygen is not administered, he will continue to worsen and his saturation will decrease to 80% over five minutes. Patient feels a little better. If bronchodilator is provided his sat will improve to 94% and he will state that he feels better. The case is accelerated to one hour later and the patient will want to go home. He will still have audible wheezing. A repeat PEFr will show that he has not significantly improved. If he is sent home, the case is declared over. The participants will go to the debriefing room. After five minutes they will be told that the patient was just brought back to the ER with severe respiratory distress. He is breathing 18 times a minute with decreased tidal volumes. The breath sounds are diminished without wheezing. His sat will be 82%. He will complain of difficulty catching his breath. Over five minutes, his RR will decrease to 8 and he will gradually desaturate to 70% and the patient will lose consciousness. The decision should be made to intubate. Once intubation is completed, orders should be given for bronchodilators, and ventilator settings. If cricoid pressure is not provided and the patient is given positive pressure, he will aspirate and his hypoxemia will worsen.

#### **Materials needed:**

- 1. one Laerdal or METI mannequin**
- 2. nebulizer equipment**
- 3. oxygen mask and tubing**
- 4. BMV apparatus**
- 5. endotracheal tube and laryngoscope**

## 6. bronchodilator of choice

**Diagnostic studies: chest radiograph showing interstitial pneumonia (optional)**

**Props:**

**Personnel: one “ER nurse” or respiratory therapist**

### *Expected actions by participants*

The participants performed the following tasks: (note) depending on the level of training, the “correct” tasks may vary

- the participant asked about:
  - \_\_\_current symptoms
  - \_\_\_current medications
  - \_\_\_history of asthma
  - \_\_\_history of hospitalizations for asthma
  - \_\_\_past history of steroid use
  - \_\_\_potential precipitating incidents
  - \_\_\_cough, fever
  - \_\_\_home PEFR
- \_\_\_ auscultated the lung fields
- \_\_\_ asked for an oxygen saturation
- \_\_\_ asked for a blood pressure
- \_\_\_ asked for telemetry
- \_\_\_ evaluated a pulsus paradoxus
- \_\_\_ inquired about use of accessory respiratory muscles
- \_\_\_ measured a PEFR
- \_\_\_ ordered or administered oxygen
- \_\_\_ ordered a bronchodilator in the appropriate dose
- \_\_\_ considered an anticholinergic agent in the correct dose
- \_\_\_ ordered a steroid in the correct dose
- \_\_\_ ordered an arterial blood gas
- \_\_\_ ordered (or correctly started) intravenous access
- \_\_\_ ordered arterial blood gas
- \_\_\_ correctly interpreted the arterial gas
- \_\_\_ ordered a complete blood count
- \_\_\_ (if suspected infection) ordered a chest radiograph
- \_\_\_ (if infected) ordered empiric antibiotics
- \_\_\_ reevaluated condition
- \_\_\_ obtained PEFR after treatment
- \_\_\_ upon seeing no significant improvement, does not allow patient to go home

- \_\_\_ when patient returns in distress, orders another ABG
- \_\_\_ correctly interprets ABG
- \_\_\_ recognizes need for intubation
- \_\_\_ applies cricoid pressure
- \_\_\_ correctly performs endotracheal intubation
- \_\_\_ correctly confirms endotracheal intubation