

# ACUTE ASTHMA

(Last updated 07/26/2019; Reviewers: Srdjan Gavrilović, MD; Ognjen Gajic, MD; Yiwu Zhou, MD)

**PRESENTING COMPLAINT:** Dyspnea/tachypnea, wheezing, life-threatening asthma: drowsy, confused

## FINDINGS

- **A** Check airway
- **B** ↑ RR, ↑ work of breathing, expiratory wheezing, silent chest
- **C** ↓ BP, ↑ HR, weak pulse, pulsus paradoxus
- **D** Variable altered (V, P, U, D)\*
- **E** Cyanosis
- **L<sub>PC</sub>** ↓ PaO<sub>2</sub>, ↑ PCO<sub>2</sub>, PEF persists < 25%, Peak Expiratory Flow (PEF) < 200 L/min
- **U<sub>PC</sub>** Lung sliding, B-lines (Pulmonary edema), RV/LV dysfunction

\***V** (verbal), **P** (pain), **U** (unconsciousness), **D** (delirious)

**U<sub>PC</sub>** (point of care ultrasound) **L<sub>PC</sub>** (point of care labs)

## OTHER HISTORY

- History of recent infection; Usually more than one symptom, cough, chest tightness
- Severe attack if any of the following: Use of accessory muscles, mental status alteration, absence of lung sounds, bradypnea, bradycardia, pulsus paradoxus, diaphoresis

## DIFFERENTIAL DIAGNOSIS

COPD exacerbation, pulmonary embolism, tension pneumothorax, congestive heart failure, vocal cord dysfunction, foreign body aspiration

## OTHER INVESTIGATIONS

- Peak Expiratory Flow (PEF)  $\downarrow$  < 200 L/min indicates obstruction, and lack of significant improvement after 30-60 minutes of treatment predicts refractory course
- Labs: CBC, Arterial Blood Gas (If dyspnea is present and PEF persists <25% of normal after treatment): Initially low pCO<sub>2</sub>, which can degenerate to hypoxemia with high pCO<sub>2</sub>
- Monitoring: SpO<sub>2</sub>, Peak Flow Meter, repeated use worsens bronchospasm in severe cases, ECG (to monitor tachyarrhythmia)
- Imaging
  - CXR: Only indicated when suspected complications: Hyperinflation (most common); Other findings: pneumonia, pneumothorax, pulmonary edema, pneumomediastinum, atelectasis
  - Ultrasound: Femoral/popliteal veins, DVT/PE

## THERAPEUTIC INTERVENTIONS

- Oxygen therapy: To achieve SpO<sub>2</sub> 93-95%, oxygen should be administered by nasal cannula or mask, oxygen therapy should not be withheld if pulse oximetry is not available
- Medications: Inhaled bronchodilators: Short-acting beta-2-agonists (albuterol 2.5mg) by metered dose inhaler (MDI) or continuous flow nebulization (every 20 minutes, 3 stack doses) for one hour, upon improvement of PEF space dose
- Combined anticholinergic (Ipratropium 500mcg) if severe airflow obstruction
- Consider SC Epinephrine or Terbutaline in non-compliant/refractory cases
- Systemic/oral steroids: IV Methylprednisolone 125 mg IV push; IV Hydrocortisone 100mg/6h IV; PO Prednisolone: starting dose 37.5–50 mg PO, then repeat each morning on second and subsequent days (Total 5–10 days, with or without taper)
- Consider IV Magnesium for persistent severe exacerbation 2 gr MgPO<sub>4</sub> IV push
  - Consider antimicrobial treatment: Only recommended for treatment of a suspected pneumonia or sinusitis
- Mechanical Ventilation: If increased work of breathing (WOB) or hypercapnic acidosis
  - Non Invasive Ventilation (NIV) if no contraindication (inability to protect the airways, massive secretions, shock, severe acidosis pH < 7.1)
    - Adapted interface with heated humidification: Target RR<25 VT 7 ml/kg IBM
    - CPAP 5-7.5cm H<sub>2</sub>O or BiPAP 8-15 cm H<sub>2</sub>O IPAP and 3-5 cm H<sub>2</sub>O EPAP (Inspiratory pressure gradually increased until respiratory rate < 30/min)
  - Intubation/mechanical ventilation: Prompt but cautious if NIV contraindicated (see above) or failed
    - Avoid dynamic hyperinflation (auto-PEEP): P<sub>plat</sub> < 30 cmH<sub>2</sub>O auto-PEEP < 15 cmH<sub>2</sub>O, with VT 6-8 mL/kg, initial inspiratory flow rate 60L/min and respiratory rate adjusted to decrease inspiratory time, ~11-14/min and low PEEP 0-5, pressure limitation increase to 100 cm H<sub>2</sub>O may be needed for achieving adequate TV
    - Propofol (0.005-0.05mg/kg/min) is the preferred sedation agent, others include lorazepam (0.01-0.1mg/kg/hr) and midazolam (0.05-0.2mg/kg/hr)
    - Analgesia with morphine (0.8-10 mg/hr) or fentanyl (1-2mcg/kg/hr)
    - Ketamine (0.1-0.5mg/min) is a sedative and analgesic reserved for refractory cases
    - Short term paralysis often necessary to limit respiratory rate and allow full expiration (intermittent doses every 4-6 hr)

- Risk of hypotension and PEA arrest (dynamic hyperinflation with decreased venous return and increased pulmonary vascular resistance); r/o pneumothorax due to barotraumas. Inhaled bronchodilators can be used close to the ventilator circuit and flow has to be lowered to 40 L/min for small periods of time
- Consider alternative therapies (IV beta-agonist, helium-oxygen, inhalation anesthetics, extracorporeal life support) if inefficient ventilation despite maximal standard therapy
- Consider sodium bicarbonate for severe acidosis (pH < 7.1)

## ONGOING TREATMENT

- Extubation: Perform once: well tolerated spontaneous breathing trial, awake or easily arousable patient, oxygen requirements are not excessive, PEEP ≤ 5, hemodynamically stable patient, secretions not excessive; Observation in an ICU is warranted for 12 hours afterwards
- Control Labs: Electrolytes: Hypokalemia, hypermagnesemia
- Medications: Space short-acting beta-2-agonists nebulizations or MDI; Steroids; Start long-term control options: Inhaled steroids, long-acting beta-2 agonists, leukotriene inhibitors
- Miscellaneous: Educate patients (Self-management for early recognition and treatment of a recurrent attack)

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