

# COPD EXACERBATION

(Last updated 01/20/2020; Reviewed by: Bo Hu, MD)

**PRESENTING COMPLAINTS:** Increased shortness of breath, cough and sputum production

## FINDINGS

- **A** Check airway (may need intubation)
- **B** ↑RR, ↑work of breathing, wheezing, shortness of breath
- **C** ↑HR, ↓BP
- **D** Variable altered (V,P,U,D)\*
- **E** Use of accessory respiratory muscles, and/or paradoxical chest wall movements, central cyanosis, wheeze and crackles on auscultation
- **L<sub>PC</sub>** ↓PaO<sub>2</sub>, ↑PCO<sub>2</sub>, ↑↓WBC
- **U<sub>PC</sub>** A lines and/or Pleural effusion, Atelectasis, consolidation

\*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

- **Symptoms:** New onset or worsening in dyspnea, cough (frequency/severity), sputum (volume/color/change in character), tachypnea, wheezing
- **Predisposing Conditions:** History of one or more exacerbations in the previous 12 months (most important factor), severe airflow obstruction, advanced emphysema, female sex, advanced age, low BMI, mucopurulent sputum production (chronic bronchitis phenotype), presence of comorbidities (e.g. CAD, CHF, DM, metabolic syndrome, obesity, lung cancer, asthma), GERD, smoking, environmental exposure to hazardous fumes, gases, dust

## DIFFERENTIAL DIAGNOSIS

Asthma, CHF/pulmonary edema (“cardiac asthma”), PE, pneumonia, bronchiectasis, tuberculosis, aspiration, bronchiolitis, obliterans, panbronchiolitis, cystic fibrosis

## OTHER INVESTIGATIONS

- **Monitoring:** Vital signs, pulse oximetry, telemetry
- **Labs:** Blood count, biochemistry (rule out hyperglycemia and electrolyte abnormalities), **arterial blood gas** (may show uncompensated or partially compensated hypercapnic respiratory acidosis), **sputum gram stain and culture** (particularly if recent/recurrent antibiotic therapy)
- **Imaging:** CXR/ultrasound (pneumonia, pneumothorax, pulmonary edema, cardiomegaly), ECHO (RV/LV dysfunction), venous ultrasound (DVT), EKG (co-existing cardiac issues/arrhythmias)

- **Severity Scores:** BODE (Body mass index Obstruction, Dyspnea, and Exercise)

## THERAPEUTIC INTERVENTIONS

- **Medications**
  - **Oxygen** titrated to target SpO<sub>2</sub> = 88-92% or PaO<sub>2</sub> 60-70mmHg (increase FiO<sub>2</sub> in small increments of 1l/min or 4-7%/min to avoid hypercapnic respiratory failure); Check ABG 30-60min after initiation of O<sub>2</sub> therapy
  - Inhaled **bronchodilators:** short-acting beta<sub>2</sub>-agonists with or without short-acting anticholinergic; use spacer or air-driven nebulizers
  - **Systemic steroids:** prednisone 40 mg PO (or equivalent) daily for 5 days (equivalent dose can be given IV if oral route is not possible)
  - **Antimicrobial** treatment (typically given in all patients pending sputum culture results)- azithromycin or levofloxacin are first choice medications. Broad spectrum antibiotics may be required for patients known to harbor resistant pathogens (pseudomonas etc.)
  - For severe anxiety, cautiously consider small dose benzodiazepines
  - Rate control for tachyarrhythmia (beta-blockers are NOT contraindicated)
- **Procedures**
  - **Non Invasive Ventilation (NIV): for increased work of breathing/hypercapnic respiratory failure**
  - Adapted interface with heated humidification
  - BiPAP rather than CPAP. Difference between expiratory pressure and inspiratory pressure of at least 5 cmH<sub>2</sub>O (e.g. IPAP= 10 cm/H<sub>2</sub>O and EPAP= 5 cm/H<sub>2</sub>O)
  - Increase inspiratory pressure gradually until work of breathing is reduced and respiratory rate decreases
  - Continue nebulized or inhaled bronchodilator treatment on a frequent schedule (Q 2hrly initially, followed by Q 4-6hrly)
  - **Prompt intubation if NIV fails or contraindicated** (somnolence with inability to protect the airways, copious secretions, hemodynamic instability/shock, severe acidosis: pH <7.1, bradycardia with loss of alertness, severe hypoxemia, respiratory pauses with loss of alertness/gasping for air, failure/intolerance of non-invasive ventilation):
    - Assist-control (AC) or pressure support ventilation (PSV) modes
    - Volume/flow trigger set to high sensitivity
    - Avoid dynamic hyperinflation (auto-PEEP)- maximize flow rates to allow increased time for expiration.
    - Low tidal volume 4-6 mL/kg

- High inspiratory flow rate (>60 L/min) and low respiratory rate to allow increase in expiratory time
- Adjust cycle-off setting in PSV mode to stop inspiration and allow prolonged expiration
  - Sedation/paralysis as required to maintain ventilator synchrony. Once patient stabilized and ready for weaning from ventilator, consider extubation to BIPAP or high flow O<sub>2</sub>

## ONGOING TREATMENT

- **Labs:** Blood count (monitor WBC), biochemistry/glucose (rule out hyperglycemia and electrolyte abnormalities), repeat ABG (detect progressive hypercapnia)
- **Therapy Goals:** Monitor fluid balance (consider diuretics & DVT prophylaxis) as indicated and monitor nutrition
- **Prophylaxis:** against DVT (consider subcutaneous heparin or LMWH), peptic ulcer (while on mechanical ventilation)
  - Smoking cessation counselling, early outpatient pulmonary rehabilitation
  - Vaccinations (Pneumococcal Polysaccharide & Influenza) prior to hospital discharge
  - Treatment with long-acting inhaled bronchodilators with or without inhaled corticosteroids; consider phosphodiesterase inhibitors (PDE4) for chronic bronchitis phenotype
  - Consider Azithromycin 250mg daily for exacerbation prevention in patients with multiple exacerbations ( $\geq 2$  per year)

## CAUTIONS

- Risk of CO<sub>2</sub> narcosis if rapidly increasing FiO<sub>2</sub>: increase FiO<sub>2</sub> in small increments of 1l/min or 4-7%/min
- Avoid Hyperoxia: target 88-92% SpO<sub>2</sub>
- Phosphodiesterase inhibitors (theophylline) are associated with cardiac arrhythmias

## REFERENCES AND ACKNOWLEDGEMENTS

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