ACUTE RESPIRATORY DISTRESS SYNDROME
(ARDS)

(Last updated 07/23/2019; Reviewed by: Chun Wan, MD)

PRESENTING COMPLAINTS: Respiratory distress, tachypnea, oxygen-starved (can’t be relieved by routine oxygenation)

FINDINGS
- A Check Airway
- B RR ↑, respiratory distress
- C BP ↓ / N, HR↑ / ↓ / N, arrhythmias
- D Variable altered (V, P, U, D)*
- E Cyanosis
- L_{PC} ABG, WBC, Hb, lactate
- U_{PC} Lung (bilateral B lines, irregular pleural segment thickening, heart (RV enlargement if prolonged hypoxemia)

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

U_{PC} (point of care ultrasound)  L_{PC} (point of care labs)

HISTORY
- Signs & Symptoms
  - New or worsening dyspnea signs within one week of a known predisposing conditions
  - Hypoxemia
    - Clinical evidence of non-cardiogenic pulmonary edema
- Predisposing conditions
  - Sepsis, shock, aspiration or near drowning, pneumonia, pancreatitis, any transfusion of a blood product, stem cell transplantation
  - Mechanical ventilation
    - Also if only for a short period, e.g. during general anesthesia for surgery, or ventilation in the ICU before this admission
  - Severe trauma: includes chest trauma, but also head trauma, long bone fractures
- Other history
  - Pneumonia, aspiration, toxic inhalation, severe systemic infection, trauma, surgery of high risk, pancreatitis
DIFFERENTIAL DIAGNOSIS

- Severe pneumonia, cardiac insufficiency, cardiogenic pulmonary edema, pulmonary embolism, fluid overload
- ARDS mimickers: Acute exacerbation of chronic interstitial lung disease, Idiopathic acute eosinophilic pneumonia, Cryptogenic organizing pneumonia, Diffuse alveolar hemorrhage

OTHER INVESTIGATIONS

- Labs: ABG
  - **ABG**: PaO$_2$/FiO$_2$ < 300 mm Hg at PEEP on CPAP ≥ 5 cm H$_2$O; Note: hypoxemia at no PEEP still could mean that a patient has ARDS
  - **Pulse oximetry**: SpO$_2$/FiO$_2$ < 315 at PEEP on CPAP ≥ 5 cm H$_2$O; Note: hypoxemia at no PEEP still could mean that a patient has ARDS
- Bronchoscopy/BAL +/- lung biopsy in unexplained causes, beware of risk of bronchoscopy from derecruitment precipitating hypoxemia
- **Lung ultrasound**: as mentioned above
- **Chest radiograph, or CT–scan**: new or worse bilateral alveolar and/or interstitial infiltrates on chest radiograph or CT–scan, Often heterogeneous (Consider uncontrolled source of infection and/or ischemia)

THERAPEUTIC INTERVENTIONS

- **Mechanical Ventilation**: Consider trial of non–invasive mechanical ventilation; Invasive mechanical ventilation; Use Lung Protective Ventilation settings (**Low tidal volume**: ~4-8 mL/kg Predicted Body Weight, **Low plateau pressure**: ≤ 30 cm H$_2$O, **Low driving pressure**: defined as the difference between plateau pressure and PEEP, ≤ 12-15 cm H$_2$O)
  - Oxygen Goal: SpO$_2$ 88–92% with the lowest FiO$_2$ and/or PEEP level
  - Consider neuromuscular blockade for ventilator asynchrony
- **Prevention of nosocomial pneumonia**: “Ventilator bundle”
  - Prompt evaluation and treatment if needed with timely broad antimicrobial therapy
- **Rescue therapies in cases of refractory hypoxemia**: Treat shock, prone position, ECMO; Recruitment maneuvers, followed by PEEP adjustments (Avoid prolonged, > 40 seconds maneuvers)
- **Supportive care**
  - Adequate sedation: Using a protocol and sedation–scores, intermittent instead of continuous infusion of benzodiazepines, or propofol, analgo–sedation instead of hypno–sedation
  - Restrictive fluid management: Aim for even to negative fluid balance as soon as hemodynamically stable
- Corticosteroids for specific situations: Pneumocystis pneumonia, drug-induced (amiodarone), severe pneumonia (CRP > 150)
- Consider VV–ECMO (if available) for refractory hypoxemia and hypercapnia
- Consider VA–ECMO (if available) for refractory cardiopulmonary dysfunction

**ONGOING TREATMENT**

- **Consider bronchoalveolar lavage:** Adapt antibiotics to culture results: de-escalation; To assist with differential diagnosis: diffuse alveolar hemorrhage and atypical infections (PJP, fungi)
- **Weaning from mechanical ventilation:** Daily awakening and breathing trials, consider tracheostomy when expected duration of ventilation will exceed 10 days
- **Prevent or treat complications related to critical illness:** Delirium, VAP, DVT and stress ulcer, PICS, PTSD, neuromuscular weakness; early physical therapy and psychological support
- **Family information**
  - Discuss prognosis, including expectations with regard to mortality, duration of stay in ICU, duration of ventilation, complications (like risk of cognitive impairment), muscle weakness
ALGORITHM

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