Version 2
Updated 4/16/2020
New Changes in **BOLD**

Critical Care COVID-19 Protocol

Lifespan

PRESENTATION

- Any or all of fever , cough, myalgia, dyspnea, diarrhea, and/or worsening acute hypoxic respiratory failure of unclear etiology
- WBC can be high, low, or normal, frequently with lymphopenia
- May see elevated CRP, Ferritin, LDH, CPK and/or troponin but currently these do not add to diagnostic or management
- Chest imaging findings not sensitive nor specific for COVID-19 and can include an alveolar filling process, typically bilateral and peripheral in lower lobes, with ground glass opacities, with or without consolidations

DIAGNOSTIC WORK-UP

- COVID-19 PCR should be sent immediately and follow Lifespan Algorithm to Assess for COVID to maintain appropriate precautions. ID consult NOT required to send test. Negative tests should not be repeated in general, currently
- **D-dimer for possible anticoagulation**
- Co-infections possible, Respiratory Pathogen Panel (RPP) required
- ARDS – defined per Berlin Criteria to be acute (<1 week onset), bilateral opacities on chest imaging, ABG with P/F ratio < 300 mm Hg with minimum 5 PEEP, and must not be fully explained by cardiac failure or volume overload

INITIAL RESPIRATORY MANAGEMENT

Full Airway Management Algorithm

- Low threshold to consider intubation when acutely worsening (increasing FiO2 requirements, clinical deterioration, inability to maintain pulse ox at goal 92-96%)
- High flow nasal cannula (HFNC) can be used as first-line step-up therapy, however low threshold to intubate once requiring >15 L/min
- Non-invasive positive pressure ventilation (NIPPV), such as BiPAP/CPAP, can be used short-term if there is a tight face seal and in-line filters available (N95 mask with face-shield if filter used on NIPPV device)
- When requiring intubation, it should be performed with CAPR and by anesthesiology using RSI. If emergent, the next most skilled provider should intubate

RESPIRATORY FAILURE MANAGEMENT

LUNG PROTECTIVE VENTILATION

- **Two clinical phenotypes emerging – In order to differentiate, first trial High PEEP strategy (14-18) initially per usual ARDSNet. If no improvement in oxygen and/or worsening hemodynamics, then trial low PEEP (5-8) with same ox sat and TV goals and tolerate higher FiO2 than usual**
- Goal tidal volume 6 ml/kg ideal body weight (Low Tidal Volume Ventilation)
- Target SaO_2 of 92-96%, PaO_2 > 60mmHg
- Plateau Pressure < 30 and Driving pressure (Pplat-PEEP) < 15
- **Beware of possible lung injury related to: increased work of spontaneous breathing, tachypnea, or large tidal volumes despite low pressure settings**
- **Consider deeper sedation goals in these patients, many appear to need multiple Rx**
- **Hypercarbia common especially late in course , titrate respiratory rate to tolerate pH 7-7.15 to maintain low tidal volumes**

CONSERVATIVE FLUID STRATEGY

- Avoid maintenance fluids, LR bolus if needed for resuscitation
- Diuresis as hemodynamics and creatinine tolerate

PARALYTICS

- Trial of bolus NMBA favored, but continuous NMBA recommended if significant vent dysynchrony, proning, high plateau pressures, or requiring continuous deep sedation

PRONE POSITIONING

- Suggested for moderate to severe ARDS with hypoxemia, for a trial of 12-16 hours

INHALED THERAPIES

- Consider trial of inhaled epoprostenol if not meeting oxygenation goals, wean off if ineffective. Do not trial inhaled nitric oxide

If worsening

ECLS Consult
When failing above therapies, at discretion of MICU attending

If improving

Ventilator Liberation
When passing SAT/SBT and can extubate to ~6 L NC **(i.e. PSV 5/5 with $FiO_2 \leq 25\%$)**

OTHER MANAGEMENT CONSIDERATIONS

- **Many patients on ventilators appear to wean very slowly, often over weeks**
- Shock – Goal MAP >65mmHg, first-line vasopressor is norepinephrine
  - If worsening or refractory shock, consider cardiogenic shock with POCUS, troponins, ECG, and ScvO2, but formal TTE if high concern for this after discussion with cardiology
- **Anticoagulation – For patients with D-dimer >1000, elevation of D-dimer from baseline, and evidence of clotting (such as central line clot), start therapeutic anticoagulation. All patients require DVT prophylaxis. Please refer to COVID-19 Anticoagulation Protocol**
- Antibiotics – Empiric, broad spectrum antibiotics are recommended once patient requires mechanical ventilation
- Steroids – Only consider in mechanically intubated patients who meet criteria for severe ARDS, **methylprednisolone 1-2 mg/kg**
- Hemoglobin Transfusion goal of 6 to 6.5, depending on comorbidities

INVESTIGATIVE MEDICATIONS

- Remdesevir – Enrolling in trial for patients in ICU with clinical worsening, recommend early ID consult for aid in enrollment prior to intubation. Order daily LFTs and INR if on this.
- Hydroxychloroquine – Evolving guidelines, **currently we do not recommend**
- Statins, NSAIDs, lopinavir/ritonavir, and immunomodulatory medications are currently not recommended

DIFFERENCES FROM USUAL CARE

- Minimize staff in room, bundle bedside procedures
- Appropriate guideline-based isolation and CAPRs for aerosol generating procedures, including bronchoscopy, intubation, and extubation (Do not extubate to aerosol mask). Avoid bronchoscopy.
- Minimize use of nebulizers, prefer MDIs
- Minimize excessive testing, no role for daily CXRs
- Avoid travel when possible. Use surgical mask on patient if < 6 L. If requiring >6 L NC, then patient should travel on NIPPV with filter

HELPFUL LINKS

- Lifespan COVID-19 Provider Information
- Airway Management Algorithm
- Lifespan Algorithm to Assess for COVID
- ARDSnet Protocol
- Surviving Sepsis Campaign COVID-19 Guidelines
  - Oxygenation
  - Therapeutic Management

Note: this document was created by the Division of Pulmonary, Critical Care, and Sleep Medicine at Brown University and may be modified or updated as the COVID-19 situation evolves. Last update 4/16/20 – Version 2