Medical Management of COVID-19

SUMMARY OF THE:
SCCM SURVIVING SEPSIS GUIDELINES, 3/20/2020

CDC GUIDELINES FOR TREATMENT OF COVID-19 2020

WHO CLINICAL MANAGEMENT OF SEVERE ACUTE RESPIRATORY INFECTION (SARI) WHEN COVID-19 IS SUSPECTED 3/13/2020

3/24/2020
As this is an ever changing problem, we will try to keep this slide set updated in a timely fashion.

Please feel free to e-mail us with any questions, concerns or changes @
- anthony.Hericks@avera.org
- travis.hanson@avera.org
COVID-19: SARS-CoV-2 Novel Coronavirus 2019

- **Biology**
  - 30kbp, +ssRNA, enveloped coronavirus
  - Likely zoonotic infection
    - Source/reservoir unclear? Bats/pangolins → people
  - Now spread person to person
    - Asymptomatic carries
  - Spread by **droplets**
  - Viral S spike binds to ACE2 on type 2 pneumocytes
    - Effect on ACE/ARB is unclear
    - ACE vs ARB’s may have the opposite effect
  - Other routes of infection possible
    - Enteric, contact, etc...
COVID-19: SARS-CoV-2
Novel Coronavirus 2019

- **Epidemiology**
  - Attack rate = 30-40%
  - $R_0 = 2-4$ (similar to influenza)
  - Case Fatality Rate (CFR) = up to 3.4% worldwide, but changing daily
  - Incubation period = 4-14 days
    - Reports of up to 24 days
  - Timeline
    - China notified WHO 12/31/2019
    - 1st case in US → Seattle 2/15/2020
    - WHO declared Pandemic 3/11/2020
    - National Emergency 3/12/2020
<table>
<thead>
<tr>
<th>Presentation</th>
<th>Diagnostics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Symptoms:</strong></td>
<td><strong>Leuko-/lymphopenia 80%</strong></td>
</tr>
<tr>
<td>○ Cough 65-80%</td>
<td>○ Low Platelets</td>
</tr>
<tr>
<td>○ Fever 45% initially with 85% during the illness</td>
<td>○ Elevated BUN/Creat</td>
</tr>
<tr>
<td>○ Dyspnea 20-40%</td>
<td>○ Elevated AST/ALT/Tbili</td>
</tr>
<tr>
<td>○ URI 15%</td>
<td>○ Elevated D-dimer, CRP, LDH, Ferritin</td>
</tr>
<tr>
<td>○ GI (diarrhea) 10%</td>
<td>○ Increased IL-6</td>
</tr>
<tr>
<td>○ Some asymptomatic carriers</td>
<td>○ Low Procalcitonin</td>
</tr>
</tbody>
</table>
COVID-19: SARS-CoV-2 Novel Coronavirus 2019

- Imaging
  - CXR: hazy, bilateral, peripheral pulmonary infiltrates
  - CT chest: ground glass infiltrates, crazy paving, consolidation
    - ** Rarely unilateral
    - ❖ CT NOT REQUIRED → ONLY CHECK IF THERE IS AN INDICATION
COVID-19/SARS-Cov-2
Presentation and Definitions

- Mild symptoms $\rightarrow$ Pneumonia $\rightarrow$ Severe Pneumonia $\rightarrow$ ARDS $\rightarrow$ Sepsis $\rightarrow$ Septic Shock

- Mild Illness to Pneumonia
  - Fever, cough, shortness of breath, and sore throat
  - Diarrhea, anorexia, myalgias, headache, nasal congestion
  - No hypoxemia and stable vitals

- Severe Pneumonia
  - Fever and/or suspected infection plus:
    - RR > 30 OR severe respiratory distress OR SpO2 < 94%
• **ARDS**
  - Occurs usually within ~1 week
  - Bilateral pulmonary infiltrates
    - Consistent with pulmonary edema
    - No evidence of acute CHF
  - Hypoxemia
    - Mild: PaO2/FiO2 ratio: 200-300 OR PEEP ≥ 5
    - Moderate: PaO2/FiO2 ratio: 100-200 OR PEEP ≥ 5
    - Severe: PaO2/FiO2 ratio: <100 OR PEEP ≥ 5
COVID-19/SARS-Cov-2
Presentation and Definitions

- Sepsis
  - Altered mental status (AMS), tachypnea, tachycardia, hypoxemia, low urine output, weak pulse, cold extremities, hypotension, skin mottling, coagulopathy, thrombocytopenia, acidosis, lactic acidosis, hyperbilirubinemia
  - qSOFA
    - AMS
    - RR > 22
    - SBP ≤ 100
    - Score ≥ 2 = high risk or a poor outcome from an infection
Septic Shock

- Sepsis + persistent hypotension despite adequate volume resuscitation, requiring vasopressors to maintain an SBP $\geq 65$ and a serum lactate $> 2$ mmol/L
  - Adequate volume $= 30$ mL/Kg
**INFECTION CONTROL**

- Aerosol generating procedures should require an PAPR or N95 respirator masks (or equivalent) in addition to PPE (gloves, gown, eye protection).
  - Opposed to surgical masks
- Aerosol generating procedures:
  - Intubation
  - Bronchoscopy
  - Open suctioning
  - Nebulizers
  - Disconnection from the ventilator
  - Non-invasive positive pressure ventilation (NIPPV)
  - CPR
  - Tracheostomy
  - Proning position
  - Bag ventilation

❖ Give patients a mask at initial contact and isolate
**INFECTION CONTROL**

- Any aerosol generating procedure should be done in negative pressure room (CDC also recommends this)
  - Non-ventilated patients
    - Droplet/contact precaution
      - Surgical mask with eye shield is probably OK
      - N95 or PAPR *NOT* necessarily needed
    - Aerosol generating procedure
      - PAPR or N95
  - Intubated/Ventilated patients (closed circuits)
    - Non-aerosol generating procedures
      - Droplet/contact precautions OK – Surgical mask/eye shield
    - Aerosol generating procedures
      - PAPR or N95

- IF RESOURCES AVAILABLE: PAPR OR N95/EYE PROTECTION IS RECOMMENDED
INFECTION CONTROL

- Negative pressure isolation
  - All aerosol generating procedures
    - Highest risk
      - Intubation
      - Bronchoscopies
      - NIPPV
  - WHO recommendations
    - 12 air changes per hour
      - At least 160 L/second/patient
    - HEP filter
      - Portable HEPA filters should be considered if not available
INTUBATION

- **HIGH RISK** aerosol generating procedure
  - Ideally done in negative pressure room with airborne precautions
    - Consider earlier intubation at lower FiO2 (? > 50%) and worsening respiratory status = planned vs emergent intubation
  - Recommend video-guided laryngoscopy over direct laryngoscopy
  - Intubation should be performed by most experienced HCP available to minimize attempts
**Intubated patients**
- Lower respiratory tract (LRT) > Oropharyngeal (OP) > Nasopharyngeal (NP) specimens
  - **CDC RECOMMENDS:** NP Swab and/or LRT specimen
  - **SDDOH RECOMMENDS:** ONLY NP swab → LRT specimen if signs of pneumonia
  - Bronchoscopy with wash/BAL should be avoided if possible

**Non-intubated patients**
- Nasopharyngeal (NP) OR Oropharyngeal (OP) specimens
  - **CDC RECOMMENDS:** NP swab and/or LRT in cough is productive
  - **SDDOH RECOMMENDS:** ONLY NP swab
  - Avoid sputum induction
A single **NEGATIVE** swab from the upper airway does not rule out COVID-19 in a patient with **HIGH** suspicion
- Repeat testing may be required

Coinfection with other viral pathogens is possible: a **NEGATIVE** test does not rule out COVID-19 in a **HIGH** risk patient.
- Repeat testing may be required

COVID-19 has an extended incubation period of ~2 weeks and may a prolonged interval of asymptomatic viral shedding for ~ 5 days
LABORATORY/DIAGNOSTIC SPECIMENS

- **Collect additional specimens**
  - Blood cultures
  - Sputum cultures
  - Comprehensive respiratory PCR panel

- **Imaging**
  - CXR is adequate
  - CT of the chest only if clinically indicated to rule out other etiology (i.e. rule out PE, etc...) or for other reasons
Hemophagocytic Lymphohistiocytosis

- Some evidence for cytokine storm
- Consider screening critically ill COVID-19 patient
- H-score (find in a med calc)
  - Immunosuppression
  - Temperature > 101.1
  - Organomegaly
  - Cytopenias
  - Ferritin (> 2000)
  - Triglycerides >130
  - Fibrinogen > 250
  - AST > 30
  - Bone marrow aspirate with hemophagocytosis
- Soluble IL-2 Receptor
- Soluble CD163
- Treatment
  - Steroids
  - Immunosuppressants
HEMODYNAMIC MONITORING

- FLUID RESPONSIVENESS
  - Dynamic skin temperature
  - Capillary refill time
  - Lactate levels
  - Passive Leg Raise (PLR) > Pulse Pressure Variation (PPV) and Stroke Volume Variation (SVV)
    - Static parameters (CVP, MAP, etc...) not recommend
HEMODYNAMIC SUPPORT

- Fluid therapy
  - Conservative (less fluid) > liberal fluid administration
    - 30 mL/Kg bolus up front for hypotension
    - Crystalloids > Colloids (albumin)
    - Lactated ringers (other balanced/buffered crystalloids) > 0.9%/normal saline (unbalanced crystalloids)
  - Avoid
    - Hydroxyethyl starch → risk of acute kidney injury/bleeding
    - Gelatins → no benefit/increased cost
    - Dextrans → no benefit/increased cost/increased blood transfusions/bleeding
    - Albumin → early in the resuscitation/no benefit/increased cost/limited availability
VASOPRESSOR SUPPORT

1st Line
- Norepinephrine (NE)
  - Dosage: 2-30 mcg/min (No relative maximum dose)
- Add Vasopressin with higher doses of NE
  - Dosage: 0.03-0.04 Units/min (Maximum dose: 0.07 Units/min)

2nd Line
- Vasopressin OR
- Epinephrine
  - Dosage: 0.2-2 mcg/Kg/min or 2-30 mcg/min

3rd Line
- Dopamine (DO NOT USE IF NE IS AVAILABLE)
  - Dosage: 3-30 mcg/Kg/min
**VASOPRESSORS: PERIPHERAL ACCESS**

**Recommendations:**
- Upper extremity only
  - No hand or wrist access
  - At or above AC
  - Contralateral to BP cuff
- 20 gauge or larger IV
  - Must have good blood
- Max duration of 24hrs
  - Central access should be established for extended administration or more if > 1 vasopressor

**Dopamine**
- Max conc: 800 mcg/mL
- Max rate: 10 mcg/Kg/min

**Epinephrine**
- Max conc: 32 mcg/mL
- Max rate: 20 mcg/min

**Norepinephrine**
- Max conc: 32 mcg/mL
- Max rate: 30 mcg/Kg/min

**Phenylephrine**
- Max conc: 160 mcg/mL
- Max rate: 200 mcg/min

**Vasopressin**
- Max conc: 20 Units/mL
- Max rate: 0.03-0.04 Units/min

**Monitor for extravasation Q2 hours**
VASOPRESSORS: EXTRAVASATION

- **Extravasation Management**
  - Stop vasopressor administration immediately
  - Aspirate residual medication and remove catheter
  - Outline extent of extravasation for monitoring the site
  - Notify physician immediately
  - Consider a Wound Care consult is necessary

- **Phentolamine**
  - Inject 0.5-1 ml in multiple injections around the leading edge of extravasation
    - Separate needles for each injection.

- **Nitroglycerin paste**
  - Apply to the affected area

- **Submit adverse drug event report.**
HEMODYNAMIC SUPPORT

- **Goal Mean Arterial Pressure (MAP)**
  - 60-65mmHg

- **Cardiac dysfunction/heart failure and persistent hypotension**
  - Some evidence for cardiovascular collapse/acute systolic CHF by 2 weeks
  - **Dobutamine**
    - Dosage: 2-20 mcg/Kg/min
    - May cause worsened hypotension

- **Refractory shock**
  - Low dose corticosteroid therapy vs. No corticosteroid therapy
    - **Hydrocortisone**
      - Dosage: 50 mg IV Q6 hours
      - Steroids may cause persistent viral shedding +/- increased mortality
VENTILATORY SUPPORT

- **Goal SpO2 (or SaO2)**
  - 90-96%
    - Pregnant patient: 92-95%
- **Nasal cannula > Heated-high flow nasal cannula**
- **Heated-high flow nasal cannula > NIPPV**
- **NIVPPV can be considered for a short trial if tolerated**
  - CPAP may be tried and less of an aerosol generating procedure than BiPAP
  - Consider early intubation if intolerant or continued worsening
VENTILATORY SUPPORT

COVID-19 Resources

COVID-19 with hypoxia

- **Indication for endotracheal intubation?**
  - **Yes**
  - **DO IT:** Monitor closely short intervals
  - **DO NOT:** Delay intubation if worsening
  - **CONSIDER:** a trial of NIPPV
- **NO**
  - **DO IT:** Tolerating supplemental oxygen?
    - **Yes**
    - **DO IT:** Monitor closely for worsening
    - **DO IT:** Tolerating HFNC
    - **DO IT:** Target SPO₂ 92 to 96%
    - **DO IT:** Appropriate infection control precautions
    - **DO NOT:** Delay intubation if worsening
    - **CONSIDER:** HFNC
  - **NO**
  - **DO IT:** Not tolerating HFNC or HFNC is not available
    - **INDICATION FOR ENDOTRACHEAL INTUBATION**

**DO IT:**
- Endotracheal intubation
- Expert in airway to intubate
- Use N-95/FFP-2 or equivalent and other PPC/infection control precautions
- Minimize staff in the room

**CONSIDER:**
- HFNC = high-flow nasal cannula
- NIPPV = noninvasive positive-pressure ventilation
- SPO₂ = peripheral capillary oxygen saturation
INVASIVE MECHANICAL VENTILATION

- **Recommend**
  - Low tidal volume ventilation
    - 4-8mL/kg of ideal body weight over high volumes
  - Plateau pressure goal
    - <30cm H2O
  - PEEP
    - Moderate ARDS or worse (PaO2/FiO2 ratio <200)
    - Higher PEEP strategy over lower PEEP strategy
      - Monitor for barotrauma

- **Follow the ARDSnet Ventilation Protocol**
ARDSnet VENTILATION

OXYGENATION GOAL: PaO₂ 55-80 mmHg or SpO₂ 88-95%
Use a minimum PEEP of 5 cm H₂O. Consider use of incremental FiO₂/PEEP combinations such as shown below (not required) to achieve goal.

<table>
<thead>
<tr>
<th>Lower PEEP/higher FiO₂</th>
<th>0.3</th>
<th>0.4</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>FiO₂</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>PEEP</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>16</td>
<td>18</td>
<td>18-24</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Higher PEEP/lower FiO₂</th>
<th>0.3</th>
<th>0.3</th>
<th>0.3</th>
<th>0.3</th>
<th>0.3</th>
<th>0.4</th>
<th>0.4</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>FiO₂</td>
<td>5</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>14</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>PEEP</td>
<td>18</td>
<td>20</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

PLATEAU PRESSURE GOAL: ≤ 30 cm H₂O
Check Pplat (0.5 second inspiratory pause), at least q 4h and after each change in PEEP or Vₚ.
If Pplat > 30 cm H₂O: decrease Vₚ by 1 ml/kg steps (minimum = 4 ml/kg).
If Pplat < 25 cm H₂O and Vₚ < 6 ml/kg, increase Vₚ by 1 ml/kg until Pplat > 25 cm H₂O or Vₚ = 6 ml/kg.
If Pplat < 30 and breath stacking or dys-synchrony occurs: may increase Vₚ in 1 ml/kg increments to 7 or 8 ml/kg if Pplat remains ≤ 30 cm H₂O.

INCLUSION CRITERIA: Acute onset of
1. PaO₂/FiO₂ ≤ 300 (corrected for altitude)
2. Bilateral (patchy, diffuse, or homogeneous) infiltrates consistent with pulmonary edema
3. No clinical evidence of left atrial hypertension

PART I: VENTILATOR SETUP AND ADJUSTMENT
1. Calculate predicted body weight (PBW)
   Males = 50 + 2.3 [height (inches) - 60]
   Females = 45.5 + 2.3 [height (inches) - 60]
2. Select any ventilator mode
3. Set ventilator settings to achieve initial Vₚ = 8 ml/kg PBW
4. Reduce Vₚ by 1 ml/kg at intervals ≤ 2 hours until Vₚ = 6ml/kg PBW.
5. Set initial rate to approximate baseline minute ventilation (not > 35 bpm).
6. Adjust Vₚ and RR to achieve pH and plateau pressure goals below.
ARDSnet VENTILATION

**pH GOAL: 7.30-7.45**

**Acidosis Management: (pH < 7.30)**
- If pH 7.15-7.30: Increase RR until pH > 7.30 or PaCO₂ < 25 (Maximum set RR = 35).
- If pH < 7.15: Increase RR to 35.
  - If pH remains < 7.15, V̇r may be increased in 1 ml/kg steps until pH > 7.15 (Pplat target of 30 may be exceeded).
  - May give NaHCO₃

**Alkalosis Management: (pH > 7.45)**
- Decrease vent rate if possible.

**I:E RATIO GOAL**: Recommend that duration of inspiration be ≤ duration of expiration.

**PART II: WEANING**

**A. Conduct a SPONTANEOUS BREATHING TRIAL** daily when:
1. FiO₂ ≤ 0.40 and PEEP ≤ 8 OR FiO₂ ≤ 0.50 and PEEP ≤ 5.
2. PEEP and FiO₂ ≤ values of previous day.
3. Patient has acceptable spontaneous breathing efforts. (May decrease vent rate by 50% for 5 minutes to detect effort.)
4. Systolic BP ≥ 90 mmHg without vasopressor support.
5. No neuromuscular blocking agents or blockade.

**B. SPONTANEOUS BREATHING TRIAL (SBT):**
- If all above criteria are met and subject has been in the study for at least 12 hours, initiate a trial of UP TO 120 minutes of spontaneous breathing with FiO₂ ≤ 0.5 and PEEP ≤ 5:
  1. Place on T-piece, trach collar, or CPAP ≤ 5 cm H₂O with PS ≤ 5
  2. Assess for tolerance as below for up to two hours.
     a. SpO₂ ≥ 90: and/or PaO₂ ≥ 60 mmHg
     b. Spontaneous V̇r ≥ 4 ml/kg PBW
     c. RR ≤ 35/min
     d. pH ≥ 7.3
     e. No respiratory distress (distress= 2 or more)
       - HR > 120% of baseline
       - Marked accessory muscle use
       - Abdominal paradox
       - Diaphoresis
       - Marked dyspnea
  3. If tolerated for at least 30 minutes, consider extubation.
  4. If not tolerated resume pre-weaning settings.

**Definition of UNASSISTED BREATHING (Different from the spontaneous breathing criteria as PS is not allowed)**

1. Extubated with face mask, nasal prong oxygen, or room air, OR
2. T-tube breathing, OR
3. Tracheostomy mask breathing, OR
4. CPAP less than or equal to 5 cm H₂O without pressure support or IMV assistance.
VENTILATOR BUNDLE

- Head of Bed elevation: 30-45°
- Closed suctioning system
- Drain moisture from tubing
- Change HME or filters per recommendations
- H-2 blocker or PPI for GI prophylaxis
- Heparin or Lovenox for DVT prophylaxis
- Turn Q2 hours (if able) to prevent pressure ulcers
- Early mobilization if clinically stable
- Daily sedation holidays and spontaneous breathing trials if stable
IINVASIVE VENTILATION/ARDS

- **Conservative > Liberal fluid strategy**
  - Less fluid better than more fluid
  - CVP <4 vs. CVP 10-14

- **Prone positioning**
  - Moderate ARDS or worse
    - PaO2/FiO2 <200
  - Suggest prone ventilation for 12-16hrs/day
    - Consider availability of nursing staff and comfort level with proning
INVASIVE VENTILATION/ARDS

- Sedation
  - Use the ICU Intubation order set
    - Fentanyl
    - Propofol
    - Precedex
  - Avoid benzodiazepines if possible
  - Daily sedation holiday recommended if stable
INVASIVE VENTILATION/ARDS

- Intermittent neuromuscular blockade (NMB)
  - Moderate ARDS or worse
    - $\text{PaO}_2/\text{FiO}_2 < 200$
  - May help facilitate protective lung ventilation

- Deep sedation +/- continuous NMB
  - Up to 48 hours
  - Nimbex (cisatracurium preferred)
  - Indications
    - Persistent ventilator dyssynchrony
    - Prone ventilation
    - Persistently high plateau pressures, suggested to use continuous NMBA infusion for up to 48hrs (Nimbex preferred)
INVASIVE VENTILATION/ARDS

- NOT ROUTINELY RECOMMENDED
  - Pulmonary vasodilators
    - Use: refractory hypoxemia
    - Inhaled nitric oxide
    - Could be consider as rescue therapy if other treatments optimized
  - Pulmonary recruitment maneuvers
    - Using ultra high levels of PEEP for short bursts
    - Increased risk of barotrauma
    - Some harm
    - No proven benefit
OTHER TREATMENTS: Corticosteroids

- Systemic steroids
  - Potential harm
    - Increased viral shedding
    - Increased mortality
  - Potential benefit
    - Shock
    - Severe ARDS
  - Mechanically ventilated adults **WITHOUT** ARDS
    - Recommend **AGAINST** the routine use of systemic steroids
  - Mechanically ventilated adults **WITH** ARDS
    - Recommend the **USE** of systemic steroids
      - Dosage: Methylprednisolone 1-2 mg/Kg/day (divided doses) for 5-7 days
OTHER TREATMENTS: ECMO

- Veno-Venous Extracorporeal Membrane Oxygenation (V-V ECMO)
  - Indication: refractory hypoxemia despite previous interventions
  - Rescue therapy in carefully selected patients
  - Only available at specialty centers (Mayo, Univ. of MN or Univ. of NE)
**ARDS MANAGEMENT**

### COVID-19 Resources

#### COVID-19 with mild ARDS
- **DO:** Vt 4-8 ml/kg and P \(_{\text{pat}}\) < 30 cm H\(_2\)O
- **DO:** Investigate for bacterial infection
- **DO:** Target SPO\(_2\) 92% - 96%
- **CONSIDER:** Conservative fluid strategy
- **CONSIDER:** Empiric antibiotics
- **UNCERTAIN:** Systematic corticosteroids

#### COVID-19 with Mod to Severe ARDS
- **CONSIDER:** Higher PEEP
- **CONSIDER:** NMBA boluses to facilitate ventilation targets
- **CONSIDER:** If PEEP responsive, Traditional Recruitment maneuvers
- **CONSIDER:** Prone ventilation 12-16 h
- **CONSIDER:** If prone, high P \(_{\text{pat}}\) asynchrony
- **CONSIDER:** NMBA infusion for 24 h
- **DON'T DO:** Staircase Recruitment maneuvers
- **CONSIDER:** Short course of systematic corticosteroids
- **UNCERTAIN:** Antivirals, chloroquine, anti-IL6

#### Rescue/Adjunctive therapy
- **UNCERTAIN:** Antivirals, chloroquine, anti-IL6
- **UNCERTAIN:** If prone, high P \(_{\text{pat}}\) asynchrony
- **CONSIDER:** NMBA infusion for 24 h
- **CONSIDER:** Prone ventilation 12-16 h
- **CONSIDER:** If prone, high P \(_{\text{pat}}\) asynchrony
- **CONSIDER:** NMBA infusion for 24 h
- **DON'T DO:** Staircase Recruitment maneuvers
- **CONSIDER:** Short course of systematic corticosteroids
- **UNCERTAIN:** Antivirals, chloroquine, anti-IL6

---

Mod = moderate  
ARDS = adult respiratory distress syndrome  
P \(_{\text{pat}}\) = plateau pressure  
SPO\(_2\) = peripheral capillary oxygen saturation  
PEEP = positive end-expiratory pressure  
NMBA = neuromuscular blocking agents  
ECMO = extracorporeal membrane oxygenation
OTHER TREATMENTS: EMPIRIC

- Empiric antibiotics/antimicrobials
  - Recommended over No antibiotics
  - Appropriate antivirals if influenza is suspected
  - Duration and spectrum of coverage based on local microbiology
  - Obtain appropriate cultures
  - Give within 1 hour
  - Evaluate for de-escalation daily

- Fever
  - Acetaminophen or Paracetamol
  - Avoid NSAIDs → variable reports of potential complications
OTHER TREATMENTS: Nutrition

- Place an orogastric tube over a nasogastric tube for suctioning and feeding
- If hemodynamic stable, consider early enteral nutrition within the first 24-48 hours
  - Trophic feedings for the first 5-7 days and advance as tolerated is acceptable
- Do not check residuals
- Avoid parenteral nutrition unless unable to feed enterally for $\geq 7$ days
OTHER TREATMENTS: AVOID

- Immunoglobulins
  - Do not routinely give IVIG

- Convalescent plasma
  - Do not routinely give

- Kaletra
  - Lopinavir/Ritonavir
  - Recent study (NEJM 3/18/20) – NO BENEFIT

- Other antivirals
  - Remdesivir: currently being studied – INSUFFICIENT EVIDENCE
OTHER TREATMENTS: AVOID

- Recombinant Interferon
  - rINFN's – INSUFFICIENT EVIDENCE
- Chloroquine and Hydroxychloroquine
  - Antimalarial and autoimmune disease treatment
  - Currently being studied - INSUFFICIENT EVIDENCE
- Azithromycin
  - INSUFFICIENT EVIDENCE
- Tocilizumab
  - Blocks IL-6
  - Currently being studied - INSUFFICIENT EVIDENCE
IMMOSUPPRESSION/TRANSPLANT

- **Kidney, Liver and Pancreas Transplant**
  - Consult the Transplant Team for ultimate direction:
  - Prednisone at baseline or 5 mg/day - **CONTINUE**
    - Reserve high dose for severe cytokine release syndromes, septic shock and/or ARDS per recommendations
  - Calcineurin inhibitors - **CONTINUE**
    - Tacrolimus and Cyclosporine
      - Reports suggest these may decrease viral replication
      - Tacrolimus goal level: 5 – 8 ng/mL
  - Antimetabolites - **STOP**
    - Mycophenolate and Azathioprine

- **Heart and Lung**
  - Contact the patients transplant center

*Suggestion based on discussions from Am. Soc. of Transplant, U of Wash, MGH, etc...*
COVID and Pregnancy

- Pregnant or recently pregnant women carry the same risk of COVID-19 infection as the general public.
- No current evidence of increased risk of illness severity or fetal compromise.
- No evidence of vertical transmission.
- Infection control practice needs to be discussed with a newly delivered mother with COVID-19 to prevent spread to the infant.
  - Standard and respiratory precautions are recommended.
  - Pumping and feeding if unable to breast feeding is recommended.
HELPFUL ORDER SETS

- **ICU Intubation**
  - Includes ventilator bundle, RT ventilator setting and weaning orders, RASS (Richmond Agitation and Sedation Scale, CAM-ICU for delirium, analgesia and sedation recommendations

- **Adult Sepsis Diagnostic/Treatment**
  - ICU or Med/Surg admit orders, labs/diagnostics, volume resuscitation, empiric antibiotic recommendations

- **COVID-19 Diagnostic/Treatment**