UW Medicine Critical Care Management of COVID-19
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Key Updates from last version (marked with *):
- Recommendation for rehab medicine and psychology consultation for COVID-19 patients
- Imaging recommendations for ECMO cannula position and CT scans
- Considering proning in non-intubated patients
- Recommendations for VTE prophylaxis
- Updated recommendations for COVID-19 antiviral and anti-inflammatory drugs

These recommendations supplement standard ICU care. Evidence and recommendations regarding the care of patients with potential, suspected, or confirmed COVID-19 are expected to evolve rapidly in the coming months. Clinicians treating patients with COVID-19 should review CDC’s updated recommendations frequently and consult with ICU leadership and/or infectious disease specialists as needed.

All UW Medicine guidelines can be found here: https://one.uwmedicine.org/coronavirus

I. OPERATIONAL CONSIDERATIONS

1. Level of care
   - Level of care is dictated by patient clinical condition, resources, and goals of care.
   - Low threshold for ICU admission/transfer; consider risk factors for worse disease (age >60, hypoxemia/dyspnea, comorbidities).
   - Establish goals of care (i.e., code status, ICU support) early, which may dictate available modes of oxygen delivery and disposition.
   - Consider Palliative Care consultation early.

2. Room Placement
   - Refer to UW Medicine Policy for current institutional policies.
   - Order appropriate isolation precautions for all patients undergoing evaluation or treatment for COVID.
     o Patients not undergoing aerosol generating procedures (AGPs): Droplet + Contact precautions
     o Patients undergoing AGPs: Droplet + Airborne precautions
     o PUIs who rule out for COVID should be cleared per UW Medicine Policy and have precaution orders updated based on usual clinical practice (e.g. standard (most), airborne (TB))
   - Patients being tested for screening purposes (e.g. admission, pre-op) do not need isolation.
   - Negative pressure room if high risk for aerosol generation (e.g., mechanically ventilated, high flow nasal cannula, non-invasive positive pressure ventilation), if available.
   - Cohorting patients with proven COVID-19 acceptable in accord with surge plan.

3. Staffing
   - Refer to UW Medicine Policy
   - Minimize number of clinical staff who enter patient room.
   - Consider log of staff on unit and adherence to UW Medicine Policy on self-symptom screening.
   - Check in on staff about their wellness.

4. Personal Protective Equipment (PPE)
   - Refer to UW Medicine Policy
5. Patient Visitors
   - Visitors currently restricted, though may be permitted after negative COVID test; see UW Medicine Policy. Consider communication with telephone or video. Tablets are available for patients to borrow from clinical units if patients do not have their own device.

6. Physical and Rehabilitative Therapy
   - Therapist to assess patient as per current standards. Recommendations for therapy should account for limiting healthcare worker (HCW) exposure / PPE utilization. No ambulation outside room.
   - Consider consultation to Rehab Medicine and/or Rehab Psychology for rehabilitation assessment and planning.

7. Patient Transport
   - Refer to UW Medicine Policy
   - Necessity should be confirmed by attending physician prior to transport.
   - Non-intubated patients should wear a surgical face mask during transport.
   - Intubated patients should be transported on the ventilator or bag ventilation with viral filter.
   - Avoid transporting patient on non-invasive ventilation or oxygen by face-mask (e.g. non-rebreather)

8. Provider Clothing and Equipment
   - Use only disposable stethoscopes.
   - Do not bring personal items (e.g., stethoscope, pager, phone, jewelry) into room.
   - Clean communication devices (e.g., phone, pager) often with germicidal wipes.
   - Wear hospital scrubs only and change to clean/street clothes before departure.
   - Wipe with Sani-wipes all equipment that enters room (e.g., ultrasound, Glidescope, etc.) per UW Medicine Policy

II. CLINICAL EVALUATION

9. Risk Stratification and Demographic Information
   - Document age, comorbidities (cardiac, pulmonary, hepatic, renal, immunologic, etc.), pre-hospital location, baseline functional status, smoking status, suspected exposure, duration of symptoms, family or personal contacts, legal next of kin, goals of care.

10. Laboratory Testing
   - COVID-19 and other respiratory virus testing per UW Medicine Policy
   - Use the ORCA order set (“Confirmed COVID-19 Protocol”) for COVID+ patients (not PUI)
   - Admission labs:
     - CBC with differential (absolute lymphocyte count), CRP, LDH, CK, DIC panel (includes D-dimer), ferritin, IL-6 level, troponin, BNP.
     - Consider repeating inflammatory markers (CRP, ferritin, IL-6, D-dimer, LDH) if concern for hyperinflammatory syndrome
     - Consider cardiac biomarkers (troponin, BNP) for critically ill patients with unexplained shock
   - Telemetry is recommended in ICU patients.
   - Minimize and batch lab testing to minimize HCW exposure risk.
• Consider endotracheal aspirate (preferred) or mini-BAL (rather than bronchoscopy) to obtain lower respiratory tract sample if needed to assess for bacterial infection. See UW Medicine Policy on Bronchoscopy.

11. Imaging and Diagnostic Testing
• Consider utility of diagnostic studies in context of personnel exposure, travel, and potential for equipment contamination.
• Ensure careful cleaning of equipment (e.g., ultrasound) brought into room with purple top Sani-Wipes per Infection Control guidelines.
• *Chest radiographs can be obtained through glass panes in doors and windows in some settings. In-room radiographs may be necessary for some studies (e.g. ECMO cannula position)
• Consider POCUS for serial imaging of lungs, cardiac function, evaluation of DVT, and other bedside diagnostic studies if operator is adequately trained and/or supervised.
  o Record POCUS images and document findings in EMR
  o Stored images may be reviewed by Cardiology/Radiology
• Routine CT scans unnecessary. If CT necessary, coordinate with other travel (e.g., from ED to ICU).
  o CT imaging may be worthwhile if an alternative diagnosis suspected (e.g., PE) but is unlikely to change management of ARDS due to COVID-19.
  o CT imaging may identify findings to guide repeat testing for SARS-CoV-2.

12. Bedside Procedures
• Bundle procedures to minimize PPE (e.g., intubation, vascular access, proning)
• Residents/fellows may participate in procedures with appropriate supervision and if PPE trained
• Conduct pre-procedure huddle / checklist before entering room. Consider adequate supplies, coagulation status, consent, personnel, positioning, equipment

13. Bronchoscopy
• Recommend strongly against aerosol-generating diagnostic procedures, particularly bronchoscopy, unless specific clinical question that cannot otherwise be answered. Personnel should be in appropriate airborne PPE.
• For [rare] instances when bronchoscopy needed, use disposable bronchoscope, if available.

14. Non-Invasive Ventilatory and Oxygen Support
• HFNC may be used in airborne precautions; see UW Medicine guideline for High Flow Nasal Cannula. Reevaluate within 1-2 hours for clinical improvement using clinical judgment and objective measures (e.g. work of breathing, ROX index = (SpO2/FiO2)/RR). Lack of clinical improvement should prompt consideration of intubation if consistent with goals of care and resources available. Patients who are “Do Not Intubate” may trial increased FiO2/flow and consider transition to comfort measures if failing. Must be in appropriate isolation (negative pressure room, airborne/droplet PPE).
• Controlled intubation is preferred if patient’s clinical trajectory is such that intubation is inevitable and consistent with goals of care. (1) HFNC/NIPPV may not prevent intubation; (2) initial NIPPV may yield worse outcomes; (3) high (patient-induced) driving pressure may lead to lung injury and (4) open systems may increase droplet dispersion (risk to HCW) with poorly fitting interface.
• If NIPPV utilized (e.g., COPD exacerbation, OHS/OSA), use closed expiratory circuit mask/device with HEPA filter and ensure good mask seal with appropriate isolation (negative pressure room, airborne/droplet PPE, PAPR preferred).

15. Endotracheal Intubation (personnel, location, PPE)
• See UW Medicine Anesthesia and Airway Care of the COVID-19 guideline
• Intubation by the most experienced operator (will vary by hospital).
• Perform intubation in negative pressure room, if possible. If going to operating room, intubate in negative pressure room first before transport to operating room.
• Minimize the number of staff in the room but consider having a qualified backup physician nearby (outside room) for support.
• Preferred PPE: PAPR with shroud, gown, and gloves that extend over gown cuffs.

16. Endotracheal Intubation (preparation)
• Perform pre-intubation timeout. Identify 1st to 4th intubation equipment. Only bring necessary supplies into the room.
• Peri-intubation hypoxemia is common and often profound.
  o Gentle bag mask ventilation, HFNC or NIPPV may be used if needed to maintain pre-oxygenation
    ▪ If BVM necessary, use small tidal volumes, two-person technique to achieve tight mask seal, and ensure HEPA filter in place.
    ▪ If NIPPV felt to be indicated (e.g., COPD exacerbation), ensure good mask seal and viral filter. Use in airborne precautions. Discuss with RT & RN to ensure situational awareness for all staff.
    ▪ HFNC should not be initiated if intubation is imminent and within goals of care. If HFNC in use, discuss discontinuation strategy with RT & RN before intubation to avoid excess aerosol generation.
  o Maximize pre-oxygenation with nasal cannula, simple face mask, or non-rebreather.
  o Recommend apneic oxygenation with 6L/min nasal cannula if needed.

17. Endotracheal Intubation (equipment)
• Prefer video laryngoscopy as added distance from oropharynx and better visualization through PAPR hood.
• Keep backup equipment and extra supplies outside the room.
• Ensure bag valve mask & ventilator have appropriate HEPA filter placed on endotracheal tube proximal to sidestream capnography adapter.
• Ensure cleaning/transport protocol followed for reusable dirty equipment.

18. Endotracheal Intubation
• Use RSI procedure to avoid aerosol generating bag/mask ventilation if possible.

19. Mechanical Ventilator Management
• Initiate lung protective/low-tidal volume ventilation for ARDS.
• Use existing lung-protective ventilation or hypoxemia protocol. Titrate PEEP to individual patient’s need, optimizing hemodynamics, compliance, driving pressure, and oxygenation.
20. Proning
- *Proning in non-intubated patients may improve oxygenation and can be considered. Use cycles of 2-3 hours prone alternating with periods supine, as tolerated.
- For ventilated patients, consider early proning for patients with $P_aO_2/F_iO_2$ ratio <150; goal duration is ≥16h / day.
  - Alert staff as soon as proning anticipated to ensure adequate personnel available. Incorporate staff exposure in decision to prone. Have pre-prone huddle outside room before entering.
  - Use existing institutional proning protocol; see updated version with Airborne Isolation addendum
  - Consider placing central venous catheter and arterial line prior to proning.
  - Deep sedation and neuromuscular blockade is not mandated prior to or during proning and should be individualized to patient need.

21. Neuromuscular Blockade
- *Routine neuromuscular blockade (NMB) has not shown benefit in ARDS. However, individual patients with severe/refractory hypoxemia, hypercarbia, or dyssynchrony may benefit. NMB should be titrated to ventilator synchrony if used. Train-of-four monitoring is not required.

22. Sedation
- Ensure adequate analgesia and sedation with RASS goal 0 to -2 to reduce anxiety and ventilator dysynchrony requiring increased RN interactions.

23. Other Respiratory Care
- Avoid mechanical insufflation-exsufflation or chest physiotherapy if possible
- *Tracheostomy placement per UW Medicine guideline.

24. Cardiovascular Support and Fluid Management
- Obtain baseline 12-lead ECG and maintain telemetry while in ICU.
- After initial resuscitation, consider conservative fluid management strategy.
- Mild-to-moderate vasopressor-dependent shock is not uncommon.
- Cardiac manifestations have been reported. Current institutional recommendations are to obtain baseline troponin and BNP and monitor with telemetry. Consider POCUS or TTE for further evaluation.

25. VTE Prophylaxis and Systemic Anticoagulation
- *VTE may be common in critically ill patients with COVID-19, so vigilance is recommended with low threshold for imaging if there is clinical suspicion
- *Strongly recommend chemoprophylaxis for VTE with either LMWH or heparin (adjust for BMI > 40 or low GFR) unless there are contraindications (platelets ≤ 25k/ul, bleeding) using usual dosing.
  - Several national organizations (ACCP, ACC, ASH, SCCM) recommend standard dosing of LMWH for VTE prophylaxis, however, some experts recommend considering intermediate dose VTE chemoprophylaxis (LWMH 40 mg (or 0.5 mg/kg) SQ Q12 or heparin 7500 units q8 hours) in patients with low bleeding and high VTE (e.g., critically ill, prolonged immobility, prior history of VTE) risk adjusted for renal function and weight.
• Systemic anticoagulation for usual indications (e.g. known VTE, atrial fibrillation) is indicated as long as the platelet count ≥ 50k/μL and fibrinogen ≥ 100g/dL
• Anticoagulation and blood products are not recommended to treat abnormal lab values or coagulation parameters (e.g. thromboelastography) unless there is a clinical indication (e.g. procedure, bleeding, thrombosis).

26. ECMO
• Apply UW Medicine ECMO Guideline patient selection criteria. Consider staff exposure, between-unit transfer, and availability of negative pressure rooms.
• Perform cannulation and ECMO in negative pressure room.
• External facility transfers for ECMO to be discussed with on-call ECMO physician, ICU attending and Medical Director

27. Cardiac Arrest
• Have goals of care discussion early in admission.
  o Consider informed assent approach for DNAR based on severity of illness, premorbid status, and resource availability.
  o Consider unilateral DNAR for patients with refractory shock or worsening despite maximal support.
  o Note high likelihood of delay in CPR due to PPE donning may reduce efficacy.
• See UW Code Blue – COVID Guideline

28. Palliative Care and End of Life
• Consider early Palliative Care involvement in ICU admissions. See UW Medicine Policy.
• Consider video visitation for family members. Loaner tablets available to patients who do not have (or cannot use) their own devices.
• Death certificate should note:
  o Primary cause (e.g. ARDS, pneumonia, respiratory failure)
  o Second line: COVID-19
• List comorbidities in Medical Issues not directly related to death (e.g., diabetes, CHF, frailty)

III. PHARMACOLOGIC TREATMENT
See UW Infectious Disease COVID Treatment Guidelines

*Given the paucity of data and potential for harm, this guide supports considering enrollment in a clinical trial to study the effectiveness of unproven therapies rather than empiric therapy. Refer to the UW Infectious Disease COVID Treatment Guidelines or consult the Infectious Disease service based on resource availability.

Treatment of Bacterial Pneumonia
• Imaging appearance, symptoms, or exam findings consistent with bacterial PNA should be treated for CAP/HAP. Recommend obtaining cultures prior to antibiotics. Endotracheal aspirate is preferred over bronchoscopy for lower respiratory tract sampling (see UW Medicine Policy).
• Consider stopping empiric antibiotics after 48-72 hours if no suggestive culture data or low clinical concern.
Anti-inflammatory Therapy

- Systemic Corticosteroids
  - Not routinely recommended for treatment of inflammatory syndrome/cytokine storm due to COVID-19 due to risk of prolonged viral shedding and possible harm. Steroids could be considered in the context of a clinical trial for patients with ARDS due to COVID-19.
  - Consider for patients with COPD or asthma in exacerbation.
  - Clinician discretion for refractory hypotension.

- Tocilizumab
  - *Recommend against routine use. Consider in the context of a clinical trial.

Anti-Viral Therapy

- Remdesivir
  - *Consider for patients with hypoxemia (SpO₂ < 94% on ambient air or requiring mechanical ventilation or ECMO)
    - Exclusion criteria: ALT levels >5x ULN, eGFR < 30 mL/min or renal replacement therapy
  - Request via emergency use authorization: https://redcap.link/remdesivirEUA_UW

- Hydroxychloroquine
  - Recommended only with enrollment in a clinical trial

- Lopinavir/Ritonavir: Do not use

- IVIG: Recommended only with enrollment in a clinical trial

- Convalescent Plasma
  - Consider via expanded access program for patients with severe or life-threatening disease. Optimal patient selection, timing of administration in course of illness and clinical benefits are under investigation.
  - Contact Transfusion Services to begin enrollment process via Mayo Clinic Expanded Access Program

- Other immune suppression (e.g., interferons, anakinra, JAK inhibitors, etc.): Recommended only with enrollment in a clinical trial

References

- UW Medicine COVID public site: covid-19.uwmedicine.org
- UW Medicine COVID OneDrive (internal site): https://one.uwmedicine.org/coronavirus