

UW Medicine Critical Care Management of COVID-19

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Key Updates from last version:

- Considerations for renal replacement therapy added
- Evaluation for secondary bacterial infection recommended in patients with new fever or sepsis physiology
- Tocilizumab or IL-6 pathway antagonists no longer recommended

These recommendations supplement standard ICU care. Evidence and recommendations regarding the care of patients with potential, suspected, or confirmed COVID-19 evolve rapidly. Clinicians treating patients with COVID-19 should review CDC's updated recommendations frequently and consult with ICU leadership, Infectious Disease specialists and local institutional protocols and leaders 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, especially in elderly or those with comorbidities.

2. Room Placement and Precautions

- Refer to [UW Medicine Policy](#) for current institutional guidelines.
- Order appropriate isolation precautions for all patients undergoing evaluation or treatment for COVID.
 - Patients not undergoing aerosol generating procedures (AGPs): Droplet + Contact precautions.
 - Patients undergoing AGPs: Droplet + Airborne precautions.
 - 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.
- Discontinuation of transmission-based precautions is per the [UW Medicine guideline](#)

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.
- Consider impact on resources and staffing (MD, RN, RT) when accepting outside transfers.

4. Personal Protective Equipment (PPE)

- Refer to [UW Medicine Policy](#)

5. Patient Visitors

- Visitors currently restricted. 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

- 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 clinical worsening.
 - 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 (rather than bronchoscopy or mini-BAL) 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 approved cleaning solution per Infection Control guidelines.
- 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.
 - Record POCUS images and document findings in electronic medical record
 - Stored images may be reviewed by Cardiology/Radiology
- Routine chest or other CT scans are not recommended. If CT necessary, coordinate with other travel (e.g., from ED to ICU).
 - 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.
 - CT imaging *may* identify findings to guide repeat testing for SARS-CoV-2.
- Consider secondary bacterial infection should patient have new fever or sepsis physiology, especially if not explained by underlying COVID-19 infection.
 - Consider alternative causes of tachycardia and hypotension (i.e, assess volume status, consider pulmonary embolism).
 - Before starting empiric antibiotics, obtain cultures including urine, blood (if febrile), and sputum.
 - Please call the patient's respiratory therapist and request a sputum culture to ensure this sample is obtained.
 - Follow local guidelines for empiric antimicrobial therapy. Review prior culture data prior to ordering empiric therapy to ensure no prior history of resistant organisms.

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

- Carefully consider whether clinical question can be answered via alternate means as bronchoscopy is an AGP Personnel should be in appropriate airborne PPE.
- For 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.
 - Must be in appropriate isolation (negative pressure room, airborne/droplet PPE). Place a surgical mask over the patient when possible.
- 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) high (patient-induced) driving pressure may lead to lung injury and (3) open systems may increase droplet or aerosol 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 and equipment in the room but consider having backup personnel and equipment staged outside of the room.
- 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.
 - 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.
 - Maximize pre-oxygenation with nasal cannula, simple face mask, or non-rebreather.
 - 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 rapid sequence intubation procedure unless compelling clinical reason to use alternate approach.

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. It is unknown if proning reduces the need for invasive mechanical ventilation or improves outcome. 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 ≥ 16 h / 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.
 - 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.
- Deep sedation prior to NMB is mandatory.
- 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 dyssynchrony requiring increased RN interactions.

23. Other Respiratory Care

- Weigh risk of mechanical insufflation-exsufflation or chest physiotherapy.
- Tracheostomy placement per UW Medicine COVID-19 tracheostomy 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.
- Consider point-of-care ultrasound (POCUS) or TTE if unexplained shock and/or elevation in troponins, BNP, or EKG findings concerning for ischemic changes

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 \leq 25k/uL, bleeding) using usual dosing.
 - Several national organizations (ACCP, ACC, ASH, SCCM) recommend standard dosing of LMWH for VTE prophylaxis, however, some recommend intermediate dose VTE chemoprophylaxis (LMWH 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 \geq 50k/uL and fibrinogen \geq 100g/dL
- Anticoagulation and blood products are not recommended to treat abnormal lab values (e.g., d-dimer) or coagulation parameters (e.g. thromboelastography) unless there is a clinical indication (e.g. procedure, bleeding, thrombosis).

26. Renal Replacement Therapy

- Consider Nephrology consultation early after the development of AKI to allow time for mobilization of RRT resources
- Dialysis lines should preferentially be placed in the right internal jugular vein to minimize clotting
 - For patients who may be ECMO candidates, right internal jugular site should be preserved for potential cannulation. Consider alternate sites for dialysis access (e.g., femoral, left IJ with tip at cavoatrial junction).
- Anticoagulation according to local guidelines is recommended for CRRT Consider higher blood flow rates i.e. 200- 300 ml/min in hemodynamically stable patients to minimize filter clotting

27. ECMO

- Apply [UW Medicine ECMO Guideline](#) patient selection criteria. Consider staff exposure, staff availability for duration of treatment, between-unit transfer, and availability of airborne isolation rooms.
- Perform cannulation and ECMO in negative pressure room.
- External facility transfers for ECMO to be discussed with on-call ECMO physician and ICU attending and Medical Director.

28. Cardiac Arrest

- Have goals of care discussion early in admission.
 - Consider informed assent approach for DNAR based on severity of illness, premorbid status, and resource availability.
 - Note delay in CPR due to PPE donning may reduce efficacy.
- See [UW Code Blue – COVID Guideline](#)

29. 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:
 - Primary cause (e.g. ARDS, pneumonia, respiratory failure)
 - 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. Of note, the incidence of community-acquired pneumonia on presentation is low in patients with COVID-19, but hospital-acquired infections may be common. 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** are recommended for COVID-19 patients requiring supplemental oxygen or mechanical ventilation.
 - Following publication of the dexamethasone arm of the RECOVERY trial, dexamethasone is now recommended by several national organizations (e.g. IDSA, NIH).
 - Additional data suggest a class effect for corticosteroids. A meta-analysis of randomized trials demonstrated reduction of 28-day mortality in hospitalized patients receiving supplemental oxygen or mechanical ventilation.
 - Monitoring for adverse effects (e.g. secondary infections, hyperglycemia, delirium, weakness, etc.) is recommended.
 - Dosing used in RECOVERY, the largest trial to date: dexamethasone 6 mg IV or PO once daily for 10 days or until hospital discharge, whichever is sooner.
 - We recommend against systemic corticosteroids for patients not receiving supplemental oxygen or mechanical ventilation unless one or more of the following indications exists:
 - COPD or asthma in exacerbation
 - Refractory hypotension
 - Other steroid-responsive conditions
- **Tocilizumab or other medications targeting IL-6:** Recommend against outside of a trial.

Anti-Viral Therapy

- **Remdesivir**
 - Consider for patients with hypoxemia ($S_{pO_2} < 94\%$ on ambient air). Weaker recommendation for those requiring mechanical ventilation or ECMO.
 - Caution: ALT levels $> 5x$ ULN, eGFR < 30 mL/min or renal replacement therapy
 - Dosing: 200 mg IV x 1 on Day 1, followed by 100 mg IV daily for 5 days
- **Hydroxychloroquine:** Recommended against.

- **Lopinavir/Ritonavir:** Recommended against.
- **IVIG:** Recommended only with enrollment in a clinical trial.
- **Monoclonal antibodies:** Recommended only with enrollment in a clinical trial.
- **Convalescent Plasma:**
 - Evidence does not support the routine use of convalescent plasma for treatment of COVID-19.
 - Recommend only in the context of a clinical trial.
 - If treatment with convalescent plasma is desired outside of a clinical trial, it is available according to the FDA Emergency Use Authorization through UW Medicine transfusion services.
- **Other immune suppression** (e.g., interferons, anakinra, JAK inhibitors, etc.)
 - Recommended only with enrollment in a clinical trial.
- **Ivermectin:**
 - Recommend against the use of ivermectin for the treatment of COVID-19, except in a clinical trial.
 - Recommended to treat potential *Strongyloides* infection in patients from endemic areas who are likely to receive systemic corticosteroids.

References

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