UVMMC CoVID-19 Clinical Care Pathway (comprehensive) 4-23-20

Note: The recommendations in this guide are meant to serve as treatment guidelines for use at the UVM Medical Center. Other UVM Health Network facilities should consider adopting to the extent possible, based on local policies and practice standards. These guidelines should not replace a provider’s professional medical advice based on clinical judgement.

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This document is subject to change.
Clinical presentation
1) Infected persons may be asymptomatic, present with mild to severe symptoms; most reports describe clinical presentation among hospitalized patients with pneumonia
2) Presenting symptoms frequently include fever (77-98%), cough (46-82%) myalgia or fatigue (11-52%) and dyspnea (3-31%) at onset of illness.
   a) Hemoptysis, headache, pleuritic chest pain, and gastrointestinal symptoms have all been reported but are less common.
   b) Gastrointestinal symptoms (diarrhea, nausea) may develop prior to constitutional and respiratory symptoms
3) Other end-organ failure
   a) Cardiac injury, coagulopathy, acute renal failure, and liver injury have all been described and are common in COVID-19 patients with severe disease.

Cytokine storm has been described in severely ill COVID-19 patients. Consider screening for hemophagocytic lymphohistiocytosis (HLH) or similar pathology such as cytokine release syndrome in severely ill patients and consider immunosuppressive therapy. See

b) Therapeutics section.

Clinical course

Labs

<table>
<thead>
<tr>
<th>Recommended labs:</th>
<th>Non-ICU Labs</th>
<th>ICU Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>On admission</td>
<td>Daily</td>
</tr>
<tr>
<td><strong>CBC with differential</strong></td>
<td>✓</td>
<td>Provider discretion</td>
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<tr>
<td><strong>BMP, Ca, Mg, Phos</strong></td>
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<td>Provider discretion</td>
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<td><strong>Blood cultures x 2</strong></td>
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<td><strong>Coags – PT/INR, aPTT, fibrinogen, d-dimer</strong></td>
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<td>✓</td>
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<td><strong>HLH screen (CRP, LDH, d-dimer, ferritin, triglycerides)</strong></td>
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<td><strong>Creatine kinase</strong></td>
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<tr>
<td><strong>Procalcitonin</strong></td>
<td>If suspected bacterial infection</td>
<td>If suspected bacterial infection</td>
</tr>
<tr>
<td><strong>NT-pro-BNP</strong></td>
<td>Provider discretion</td>
<td></td>
</tr>
<tr>
<td><strong>T. bili, AST, ALT, Alk phos</strong></td>
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<td>Provider discretion</td>
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<tr>
<td><strong>Lactic acid</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Urine pregnancy (for all patients of reproductive potential)</strong></td>
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<td>✓</td>
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<tr>
<td><strong>Sputum Culture or Tracheal aspirate (GS and Cx)</strong></td>
<td>✓</td>
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<tr>
<td><strong>Urine legionella and pneumococcal antigen</strong></td>
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Imaging

1) Either a Lung ultrasound or CXR should be done on all potential COVID-19 patients.
2) Chest film
   a) Bilateral alveolar or interstitial infiltrates are common and found almost universally in symptomatic patients
3) Point of care ultrasound
   a) Lung ultrasound
      - Findings supportive of COVID-19 (or other viral pneumonia) include: pulmonary edema that is either diffuse (B-lines in multiple lung fields) or focal (B-lines interspersed with A-lines).
b) POC Echo for critically ill patient
   - Point of care echocardiogram should be performed on patients with severe disease or signs of heart failure (see above for description and relevance of viral fulminant myocarditis) to help guide supportive care in critically ill patients.

Triage, level of care and patient placement for PUI and confirmed cases

COVID-19 Inpatient Testing and Precautions Algorithm

Quick Triage Guide

1) Consider ICU
   a) Persistent RR > 30
   b) FiO2 > 0.50 (as anything over 6 liters is considered high flow)
   c) Persistent hypotension
   d) Rapid escalation in O2 requirements regardless of absolute requirement.

2) Consider Floor
   a) Stable oxygen requirements for an hour (from time of initiation of oxygen, not call to admit)
   b) Non-ICU patients requiring hospitalization will be placed in a PUI/COVID positive unit.
      i) Medically stable PUIs may be hospitalized without having another indication for admission.
      ii) For these patients, the admission History and Physical should document the following that the patient requires hospitalization for COVID-19 testing because they do not have a safe disposition to rule out in the outpatient setting and would represent a risk to the community.
   d) Floor capabilities
      i) In the case of clinical deterioration requiring intubation, location of intubation will be at the discretion of the Critical care attending.

3) For DNR/DNI:
   a) May go to floor on higher O2 delivery (in negative pressure room) including high flow and BiPAP – assuming this is consistent with the goals of care.

4) PUI Unit in Patrick Gym Admission requirements
   - This is an observation unit with limited ability to provide complex medical care.
     a. Patients should be > 18 years of age.
     b. Patient stable and with low flow oxygen requirements.
     c. The capacity at the Patrick Gym to deliver higher flows of oxygen is limited; 6L NC O2 warrants transfer back to the hospital.
     d. Ambulatory or able to transfer on their own from wheelchair.
     e. No bedridden patients or patients with high ADL needs.
     f. No complex medical needs
     g. Takes 5 or fewer essential home medications
     h. No patients on home BiPAP/CPAP or home oxygen use.
     i. PUI patients who have been tested prior to arrival at the Patrick Gym.
     j. No visitors will be allowed.
     k. No patient-supplied controlled substances.
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***Patrick Gym is unable to lock or secure controlled substances and will not have pharmacy support for opiates, benzodiazepines, etc.

1. Uncomplicated pregnancy less than 20 weeks estimated gestational age is acceptable for observation at Patrick Gym (should be vetted through OB prior to calling for transfer)

Critical Care
Patients requiring ICU level of care go to the Intensive Care Unit (order of expanding ICU space can be found in the UVM Health Network Critical Care Emergency Response Plan.

Rapid Response and Emergency Procedures
UVMMC-specific procedures for code blue, rapid response, MET call and stroke codes can be found in a separate guideline for Rapid Response and Emergency Procedures.

Anesthesia Emergency Procedural Team: Pager to be called is “2292”, or call “111”
Questions to be asked by Emergency Operator:
• Physician (last name only) requesting the Anesthesia Team
• Patient (last name only) requiring procedure
• Patient’s location: building and room number
• Callback number of patient location
• COVID status (see below in red font)

Pager info to now include patient’s COVID19 status:

What is the patient’s COVID19 Status?
COVID: Positive = Confirmed positive
COVID: PUI = Patient under Investigation. Patient is being ruled out for COVID19, test pending
COVID: Needs Review = Status Unknown-Team members huddle outside of patient’s room. (Obtain further clinical information prior to evaluating patient-Don appropriate PPE, as indicated)

Critical care exclusion criteria
Refer to the UVMMC Network Plan for the Ethical Allocation of Hospital Beds and Mechanical Ventilators in the case of regional hospital surge that overwhelms critical care capacity and available resources.

Clinical management strategy for treating hospitalized patients with COVID-19

Infection Control and personal protective equipment (PPE)
1) Follow the UVMMC guidelines on the SharePoint drive for healthcare worker PPE: UVM PPE Guidelines
2) Use of stethoscopes in PUI or COVID positive patients is left to the discretion of the provider.

Therapeutics
Adjunctive, experimental and compassionate use therapies

1) Infectious Diseases approval is required for consideration of compassionate use of Remdesivir. Rheumatology approval is required for use tocilizumab. This applies to all patients regardless of location, age, and time of day (no exceptions) for medications in the COVID-19 Therapeutics Algorithm (see Appendix A: UVMMC Therapeutic Algorithm for COVID-19 patients).
Drugs that are potentially/theoretically harmful – AVOID the following:

a) Avoid NSAIDS due to theoretical risk
   - Upregulate ACE2 receptor, potentially creating additional targets for SARS-CoV-2.

b) Avoid thiazolidinediones (e.g., pioglitazone) due to theoretical risk
   - Also upregulate ACE2 receptor.
   - Use insulin for glycemic management.

c) Steroids: address on case-by-case basis
   - The current recommendation from the World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) is to avoid systemic steroids in patients with COVID-19 in the early stages.
   - Corticosteroids may still be implemented for other indications for which they are standard of care such as COPD, asthma exacerbation, or vasopressor refractory septic shock.
   - Hydrocortisone 50 mg IV q6h may be implemented for vasopressor refractory septic shock.
   - The Society of Critical Care Medicine suggests using systemic corticosteroids such as methylprednisolone in mechanically ventilated adults with COVID-19 and ARDS. However, it is a weak recommendation with poor quality of evidence.

Angiotensin Converting Enzyme Inhibitors

1) Angiotensin converting enzyme inhibitors (ACE-inhibitors) and Angiotensin receptor blockers (ARBs) present a theoretical risk; recommend avoiding starting as a new medication.
   a) Consensus statements recommend ACE-inhibitors and ARBs NOT be discontinued unless clinically indicated for reasons other than COVID-19. This decision should be based upon clinical consensus of the team providing care to the patient.

Vitamin C – Consider

1) High-dose vitamin C is a low-risk intervention that may provide mortality benefit seen in patients with sepsis and ARDS.

Organ-system based approach to care

For all COVID-19 patients and PUIs

1) Recommend acetaminophen 650-1000 mg PO/PR q6 hours PRN for fever; consider scheduling in ICU patients or in patients with persistent high-grade fever.
2) Recommend against using NSAIDs for fever.

Neurology

Non-ICU/non-intubated patients

1) Consider melatonin nightly for sleep.

ICU/intubated patients

1) An analgesia-first, sedation-second approach should be utilized, utilizing a fentanyl or hydromorphone IV infusion with PRN boluses.
2) Recommend propofol a first-line agent sedation as long as hemodynamically tolerated.
a. Limit maximum propofol maintenance dose to 50mcg/kg/min. Higher doses may be utilized for up to 2 hours to allow for adjunct sedation to take effect.

3) Consider early initiation of antipsychotics (ie. Quetiapine or olanzapine) to minimize use of propofol.

4) Second-line adjunct agents, including phenobarbital, clonidine, and/or ketamine, can be utilized for patients with sedation/ventilator synchrony requirements refractory to propofol, opioid infusions and scheduled antipsychotics. Benzodiazepines should be reserved for patients who are refractory to first-line and second line therapies.

5) Consider early, intermittent neuromuscular blockade for moderate to severe ARDS (see more in Respiratory section). Limit to 48 hours.

Respiratory (Respiratory procedures outlined here apply to patients ≥12 years old)

Non-ICU Respiratory Support

1) See UVM Appendix B: Intubation Procedure Mini-Guide.

2) Predictor tools such as the quick sequential organ failure assessment (qSOFA) and new early warning core (NEWS) may not be sensitive to pending deterioration due to a potential period of “silent hypoxemia”(hypoxemia without signs of respiratory distress) that has been described.

3) Avoid aerosolizing procedures (venti-mask, HFNC, NIV, and nebulizers) as much as possible.
   a) See separate Respiratory Therapy Guidelines for patients needing bronchodilators.

4) Supplemental oxygen will be titrated using the following devices (all acceptable on the floor) to meet a goal SpO2 of 90-96%, in order of preference: standard nasal cannula, then Oxymizer, then Hudson nasal cannula, then non-rebreather.
   a) Oxymizer – Acceptable
      - May be used for pre-oxygenation prior to intubation.
      - May be used for transport with a surgical mask.
   b) Hudson nasal cannula- Acceptable
      - May be used for pre-oxygenation prior to intubation.
      - May be used for patient transport with a yellow mask.
   c) Non-rebreather (NRB) – Acceptable
      - NRB can be used with an attached exhalation viral filter, however these may not be available, and their efficacy is not well known.
      - May be used for transport with a surgical mask.
   d) High flow nasal cannula (HFNC) – Acceptable if patient has failed the above devices and is in a negative pressure room.
      - HFNC may prevent need for invasive ventilation.
      - Patients with COVID-19 may experience a period of early, relatively asymptomatic hypoxemia that is more severe than suggested by their clinical presentation.
      - Patients on high flow nasal cannula must be kept in a negative pressure room.
      - May NOT be used for patient transport.

5) Decision to intubate
   a) Consider early intubation in the rapidly deteriorating patient.
      - If the patient cannot maintain SpO2 ≥90% on Oxymizer, Hudson nasal cannula, NRB, call the Critical Care team to evaluate for potential intubation.
If the patient has a rapidly escalating supplemental oxygen requirement, the best option may be early intubation directly from low flow oxygen and pre-oxygenation with a non-rebreather. Discuss goals of care, code status and likelihood of benefit prior to intubation.

6) If an effort is being made to avoid intubation (DNR status, uncertain COVID status)
   a) The medical team will readdress likelihood of positive status before escalating to BiPAP or high-flow nasal cannula on the floor.
   b) HFNC and NIV will be offered to a PUI or COVID positive patient ONLY in a negative-pressure room.

7) Non-invasive ventilation (NIV) is not favored in COVID-19 due to a historically high failure rate in other forms of pneumonia.
   a) NIV may be trialed for acute COPD exacerbation with hypoxemic or hypercapnic respiratory failure.
   b) NIV may be trialed for suspected pulmonary edema from CHF exacerbation.
   c) NIV is considered high-risk for viral aerosolization and if absolutely necessary should take place in a negative pressure environment on airborne precautions with full high-risk procedure PPE.

**ICU Respiratory Support**

**Intubation procedure**

1) See Appendix B: Intubation Procedure Mini-Guide.

2) PPE and Infection control during intubation
   a) All intubation procedures are considered high risk due to high prevalence of asymptomatic disease in the community and will require PPE for all staff in attendance.

3) Providers
   a) Intubation should be performed by the most skilled operator available.
   b) Minimize the number of people in the room. The operator, one respiratory therapist and one RN should be sufficient.
   c) Have a second airway manager available and donned outside the room in case of difficulty.

4) Equipment
   a) Have all needed equipment and minimum necessary number of personnel present in the room prior to starting the intubation procedure to avoid in-and-out traffic.
      - Recommend use of video laryngoscopy to help keep operator’s head as far as possible away from the patient’s airway.
      - Use a disposable blade when possible.
      - Data suggest more expeditious tube insertion with non-hyper-angulated blade. Non-hyper-angulated disposable blades are available in the intensive care unit.
      - Have a reliable backup method available.
      - Consider use of a disposable bronchoscope as first choice for backup or on first attempt if difficult airway is anticipated. This helps keep distance between the operator and the patient.
      - If disposable bronchoscope is not readily available or familiar, have a bougie or laryngeal mask airway (LMA) on hand.
      - Insert viral filters into the ventilator circuit (inspiratory and expiratory)
      - Place an expiratory viral filter onto the Ambu-bag to fit between the mask/endotracheal tube and the bag prior to use (see Figure 2 below).
5) Oxygenation
   a) Preoxygenation
      - Preoxygenate for at least 5 minutes with either a Hudson nasal cannula, NRB or Oxymizer at 15 LPM if needed. This is meant to help avoid need for bag-valve mask (BVM) ventilation.
      - In cases of refractory hypoxemia during preoxygenation, it may be reasonable to consider using HFNC or NIV; use caution with aerosolization risk.
      - Patients with ARDS, pregnant, obese, and patients with underlying lung disease are apt to desaturate quickly.
      - Place head of bed upright or semi-upright during preoxygenation
   b) Oxygenation during intubation
      i) Turn the oxygen off prior to removing the mask when getting ready to intubate, in order to reduce risk of aerosolization.
      ii) If you need to bag, use a PEEP valve, viral filter, and hold a tight seal (see Figure 2) and allow oxygen to flow passively without bagging at all (apneic oxygenation). If needing to provide volume, deliver small, frequent volumes. Note that apneic oxygenation may increase viral aerosolization.
      iii) If bagging is required and the EtCO2 waveform appears triangular, consider whether a mask leak is present and re-adjust.

6) Hemodynamics
   a) Have norepinephrine ready for use (not necessarily accessed) in case of hypotension.

7) Medications
   a) Ensure adequate sedation and paralysis to prevent agitation leading to spread of fluids, blood and aerosols.
      - Consider using ketamine bolus or propofol for induction.
   b) Use high-dose neuromuscular blocking agents (NMBA) for faster, more complete apnea and no residual cough.
      - Consider 1.2 mg/kg IV rocuronium or 2 mg/kg IV succinylcholine.
   c) RN administering medications should move at least 6 feet from the airway once medications are given.

8) Intubation
   a) Use rapid sequence intubation, minimizing use of bag-valve mask ventilation to avoid aerosolization.
b) Immediately following intubation, inflate the endotracheal tube cuff/balloon **before** lung insufflation with the Ambu-bag or ventilator.

c) Check for appropriate ET tube placement.

**Equipment disposal and decontamination**

1) For non-disposable laryngoscopes
   a) Request a red bin be brought to the bedside. This can be made easier by bringing a red bin to the outside of the room prior to the intubation procedure.
   b) Red bins can ONLY be stored in the dirty utility room.
   c) More can be ordered from central supply (CSR).
   d) Place equipment in red bin, cover, bring back to dirty utility room.
   e) While maintaining PPE from procedure: gown, mask w/ shield, gloves,
      i) Spray down the equipment with pre-cleanser, cover, leave in dirty utility, request the to have red bin delivered to CSR for sterilization
      ii) There is a sign in the dirty utility room outlining this procedure

2) **Ventilator management for intubated patients with COVID-19 pneumonia and/or ARDS**

   1) Employ strategies to minimize health care worker exposure to aerosolized droplets.
      a) Minimize ventilator disconnects. If needing to disconnect the ventilator, clamp endotracheal tube. If unable to clamp, disconnect and reconnect quickly at end-expiration.
      b) Tighten vent connections while in the room for other tasks to avoid accidental disconnections and need for urgent entrance into the room.
      c) Use in-line suctioning as opposed to open suctioning.

   2) **Recommend** ARDSnet ventilator procedures.
      a) **Recommend** HIGH PEEP strategy in COVID-19 patients. Note this is different than the strategy reflected in the pre-existing UVM ARDS vent protocol.
      b) TV 6 cc/kg ideal body weight (IBW)
         - range of 4-8cc/kg IBW acceptable
      c) Maintain plateau pressure ≤ 30 cmH₂O
         - Decrease tidal volume by 1 cc/kg IBW increments to achieve plateau pressure ≤30 H₂O
      d) Permissive acidosis/hypercapnia
         - Adjust respiratory rate and volume (in that order) to achieve desired pH.
         - ARDSnet ventilator protocol allows for goal pH down to 7.3. However, a pH as low as 7.2 may be tolerable so long as hemodynamics are still stable.
      e) Aim for oxygenation goal of SpO₂ 90 to 96%
      f) Refer to ARDSnet High PEEP table for PEEP weaning guidelines.

3) **Recommend** conservative fluid management as it reduces mortality in ARDS.

4) **Recommend** prone positioning for severe ARDS (P/F ratio <150).
   a) Prone for 12-16 hours at a time, NMB not required.
   b) Capacity for multi-patient prone positioning may depend on resource availability.

5) **Recommend** early, intermittent neuromuscular blockade for moderate-severe ARDS. Attempt discontinuation after 48 hours to reassess need for NMB.

6) **Consider** airway pressure release ventilation (APRV) early to reduce sedation needs when patient requiring high sedation to tolerate conventional low tidal volume ventilation.
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a) APRV may be beneficial in COVID-19 patients with ARDS given primary pathophysiology related to alveolar filling, surfactant dysfunction and alveolar collapse/atelectasis.
   - Clinicians should only attempt using APRV if they're well-familiarized with titrating and weaning of APRV. If not, stick with low volume ventilation strategy described above.
   - If using APRV, ensure that T-low is appropriately truncated, such that expiratory flow never drops below 70% of peak expiratory flow rate before switching back to P-high.

7) **Consider** using inhaled pulmonary vasodilators such as epoprostenol (Flolan) for refractory hypoxemia.
8) **Do not use** inhaled nitric oxide.

**Extubation**

1) Extubation is a high-risk procedure for viral aerosol generation and requires appropriate PPE including N95/face shield or PAPR as listed above for Intubation Procedure.
   a) Only extubate in a negative pressure environment if available.
   b) Extubate to HFNC or NIV only in a negative pressure room.

**Mechanically ventilated pregnant patients**

1) Maternal Fetal Medicine should be consulted on all COVID-19 patients who are pregnant.
2) If mechanically ventilated, patient should have left uterine displacement and consider placing pregnant patient on her left side to minimize compression of IVC.

**Extracorporeal Membrane Oxygenation (ECMO)**

1) Veno-venous (VV) ECMO may be performed on a case by case basis.
   a) ECMO is a high-resource utilization procedure that may be considered within the context of resource availability and an individual patient’s likelihood of benefit.
2) Please refer official UVMMC COVID-19 specific guidelines for VV ECMO.
3) Veno-arterial (VA) ECMO is not available at UVM.

**Cardiac/Hemodynamic Support**

*Non-ICU patients*

1) Conservative fluid management is recommended- **Avoid** excessive fluid administration.

*ICU patients*

1) Goal MAP ≥ 60-65 mmHg
2) Consider the following succession of vasopressor therapy as indicated by hypotension and/or perfusion markers:
   a) 1st line: Norepinephrine
   b) 2nd line: Vasopressin
   c) Dobutamine or epinephrine if cardiac dysfunction is seen
   d) Do not use dopamine
3) Obtain point of care echo, EKG and consider troponin level for increasing vasopressor requirements
4) For vasopressor refractory shock, recommend starting 50 mg IV hydrocortisone q6h.
   a) Taper steroids once patient is weaned down to one vasopressor or off vasopressors.
5) For patients requiring central venous access, suggest placing CVC in the left inferior jugular to spare the right side for a hemodialysis catheter or introducer if needed.
6) Consider viral myocarditis, stress cardiomyopathy, and acute coronary syndrome in patients with signs of cardiogenic shock.
Antibiotics

1) Empiric antibacterial therapy for bacterial pneumonia is not recommended for patients with COVID-19 +testing and low suspicion for additional bacterial infection.
   a. Antibacterials for the treatment of community acquired pneumonia can be considered for those patients admitted to the MICU or who have a lobar infiltrate on CXR. See pages 31 and 33 of the Green Book for antibiotic selection.

2) Please obtain sputum culture prior to initiation of antibiotic therapy.
   a. Evaluation of need of antibiotics should occur daily and de-escalation of antibiotics is strongly encouraged if no bacterial infection is found.

3) If empiric or definitive anti-MRSA therapy is needed, ceftaroline is recommended over vancomycin.
   a. This limits risk of acute kidney injury and need for additional blood draws to check vancomycin levels.
   b. Ceftaroline also has activity against MSSA, streptococcus species, E. coli, Haemophilus, and Klebsiella. It does not have activity against pseudomonas.

4) If both anti-MRSA and anti-pseudomonal empiric therapy is needed, recommend one-time dose each of ceftaroline + ceftazidime while awaiting culture results.

Renal

1) Avoid nephrotoxins, particularly NSAIDs.

2) Target a net-even to negative fluid balance goal.
   a) Balanced/buffered crystalloids should be used.
   b) Do not use colloids, gelatins, dextrans or hydroxyethyl starches.

3) Anticipate possible need for renal replacement therapy in critically ill patients.

GI/Nutrition

1) Enteral nutrition is appropriate – consider gravity or bolus feeds if supply of pumps is low.

2) Ulcer prophylaxis with H2 blocker for intubated patients.

Heme

1) DVT prophylaxis: hold for platelets count < 30K.

2) COVID-19 appears to favor pro-coagulable DIC even with thrombocytopenia

3) Consider TEG in setting of high D-dimer or when considering therapeutic anticoagulation

4) Transfusion goal of hemoglobin ≥ 7 mg/dL
   a) May consider goal ≥ 8 for patients with cardiomyopathy
   b) Consider giving furosemide with transfusions to avoid volume overload.

Endocrine

1) Perform daily glucose screening for non-diabetics; do not order q6 POC blood glucose levels unless clinically indicated.

2) Attempt to manage hyperglycemia with basal / bolus subcutaneous insulin and avoid continuous insulin infusion whenever possible to minimize need for frequent glucose monitoring.

3) Use of IV methylprednisolone is controversial and should be limited to patients with moderate to severe ARDS.
OB/GYN: Special considerations for pregnant patients with COVID-19

1) **Consult Maternal Fetal Medicine.**
   a) Maternal Fetal Medicine should be consulted on any ICU patient, regardless of gestational age.
   b) For non-ICU pregnant admitted patients, consult Maternal Fetal Medicine or the patient's obstetric provider.
   c) While there is no evidence at this time that COVID-19 is more severe in pregnancy, most acute lung infections are worse in pregnancy especially in the third trimester. This is true for all other types of influenza.
   d) Women in the third trimester may deteriorate more quickly than non-pregnant patients for any given illness.
   e) Acute pneumonia is associated with high perinatal morbidity and mortality.

2) There are no compelling data that in utero transfer of virus from mother to newborn occurs. Manage critical illness by following the same recommendations for adults as described above.

3) Maternal Fetal Medicine should be consulted in the use of any experimental or compassionate use of new medications.

4) Refer to the UVMMC COVID-19 Labor and Delivery Workflow for related information.

**Avoid common ICU complications**

Follow rigorous preventative practices to reduce the incidence of common complications of critical illness:

   a) Ventilator associated pneumonia (VAP)
   b) Venous thromboembolism (VTE)
   c) Pressure ulcers
   d) Catheter associated bloodstream infections and urinary tract infections (CLABSI and CAUTI, respectively)
   e) Gastrointestinal stress ulcers and bleeding
   f) Weakness due to critical illness
   g) Delirium

**Discharges and Expired Patient Transport Process**

1) Discharge
   a) Please incorporate the COVID-19 Patient Instruction SmartPhrase, .COVIDDISCHARGE into patient discharge instructions.
   b) The CDC Provides guidance pertaining to patients who may be cared for at home.
   c) Patients who do not initially meet criteria for admission may deteriorate in the second week of illness.

2) Expired patients
   a) See Appendix D: UVMMC COVID-19 Expired Patient Transport Process prior to preparing or moving expired patients.
**UVMMC COVID-19 Therapeutic Algorithm**

Currently there is no FDA approved antiviral therapy for SARS-COV-2 infection. The mainstay of therapy is supportive care. The treatment algorithm presented here is based on a review of currently available literature. The treatment algorithm will be updated to reflect new data as it becomes available.

**Confirmed positive COVID-19 patient or PUI\(^1\) without alternative diagnosis**

- Emergency Department, Urgent Care, or transfer from another facility
  - Outpatient
  - Pediatric (age < 18 years) inpatient admission
  - Pregnant woman inpatient admission
  - Adult non-ICU admission

  - Supportive care
  - Supportive care
  - Supportive care

  - Worsening clinical status
    - Infectious Diseases approval for obtaining Remdesivir\(^2\) for compassionate use
    - Rheumatology approval for consideration of tocilizumab\(^3\) for treatment of cytokine storm

  - Worsening clinical status\(^3\)
  - Adult ICU admission

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1. PUI = person under investigation
2. See Table 1 for information about remdesivir
3. See Table 1, criteria of use for and information about tocilizumab

This document is subject to change. Updated by the UVMMC COVID-19 Therapeutics Working Group on 4/22/2020.
### Table 1. Potential Agents and Dosing

<table>
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<th>Medication</th>
<th>Dosing</th>
<th>Notes</th>
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<tr>
<td>Remdesivir</td>
<td>200 mg IV on day 1, then 100 mg IV daily for up to 10 days</td>
<td>Remdesivir is currently only available via compassionate use for pregnant women and pediatric patients. Remdesivir is an investigational nucleotide analog with antiviral activity. Prior animal studies have looked at its utility for MERS and SARS. It is not FDA approved and does not have safety or efficacy profiles.</td>
</tr>
</tbody>
</table>
| Tocilizumab  | 400 mg IV x1 (Use order panel)  | Tocilizumab is an interleukin-6 (IL-6) receptor inhibitor, binding to soluble and membrane-bound IL-6 receptors. It is currently under investigation as an agent targeting cytokine storm as a result of COVID-19. Criteria for consideration of use:  
  • COVID-19 positive  
  • Intubated and PaO₂/FiO₂ <150; call Rheumatology if patient is being transferred from the floor to ICU with worsening respiratory decline.  
  • Onset of symptoms less than 1 week and hospitalization <48 hours  
  • Temperature > 38.3 °C  
  • Labs  
    • Ferritin > 1000 ng/mL  
    • D-Dimer >1000 ng/mL  
    • LDH >250 U/L  
    • CRP > 70 mg/L or >40 mg/L and doubling within 48 hours  
    • Lymphocyte count < 0.6 x 10⁹/L  
  • Likelihood of good clinical outcome based on age and other comorbidities  
  • Contraindications: any known hypersensitivity to tocilizumab. |
### UVMCoVID-19 Clinical Care Pathway (comprehensive) 4-23-20

#### Appendix B: Intubation Procedure Mini-Guide

<table>
<thead>
<tr>
<th>Patient</th>
<th>Place</th>
<th>Pre</th>
<th>People</th>
<th>Equipment</th>
<th>Oxygen</th>
<th>Meds</th>
<th>Intubate</th>
</tr>
</thead>
<tbody>
<tr>
<td>• COVID-19 Patient or PUI with respiratory failure requiring intubation</td>
<td>• Ideally procedure will take place in a negative pressure room with the door closed</td>
<td>• Hair cover or hood</td>
<td>• Minimal number of staff in the room - operator, RT, RN</td>
<td>• Have all needed equipment in the room prior to starting the intubation procedure including backups</td>
<td>• Use a Hudson nasal cannula, Oxymizer or NRB (with surgical mask) with 15LPM flow to pre-oxygenate at least 5 minutes to avoid needing BVM ventilation</td>
<td>• Use RSI, minimizing use of the BVM</td>
<td>• Use RSI, minimizing use of the BVM</td>
</tr>
<tr>
<td>• Discuss goals of care and code status</td>
<td>• Intubation may take place on the floor at the critical care attending’s discretion.</td>
<td>• Eye protection with side shields, goggles, full-face shield or PAPR</td>
<td>• Have a second airway manager available and donned outside the room in case of difficulty</td>
<td>• Use videolaryngoscopy and disposable blades (non-hyperangulated are available and may facilitate quicker tube insertion)</td>
<td>• May cautiously consider NIV for preoxygenation in refractory hypoxemia</td>
<td>• Ensure ketamine bolus or propofol</td>
<td>• Inflate endotracheal tube cuff before insufflation of lungs by Ambu-bag or ventilator</td>
</tr>
<tr>
<td>• Assess likelihood of benefit</td>
<td></td>
<td>• Fit-tested N95 respirator or PAPR</td>
<td>• Intubation should be performed by the most skilled operator available</td>
<td>• Favor bronchoscopic intubation if difficult airway is anticipated; bougie or LMA acceptable.</td>
<td>• If you need to bag, hold a tight seal and allow oxygen to flow passively without bagging at all; otherwise deliver small, frequent volumes</td>
<td>• Ensure faster, more complete apnea and no residual cough with high-dose neuromuscular blocking agents - consider rocuronium 1.2 mg/kg IV</td>
<td>• Check for appropriate ET tube placement by observing chest-rise and end-tidal CO2 - do not use a stethoscope</td>
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<td></td>
<td></td>
<td>• Fluid-resistant gown or full coveralls</td>
<td></td>
<td>• Insert viral filters into the vent circuits and bag-valve mask (see graphic below)</td>
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<td></td>
</tr>
</tbody>
</table>
Covid-19 (Positive and PUI/Rule Out) Expired Transport Process

Patient Support Staff/Members:
- Request received for morgue stretcher and body bag to unit
- PSS to verify that trip slip is signed and complete
- PSS to receive stretcher in hallway and place stretcher cover over body
- Transport body to morgue and place in Cooler A
- Wipe down stretcher with Dispatch bleach wipes (in morgue)
- Return stretcher to storage location

Inpatient Nurse:
- Nurse wearing appropriate PPE prepares body
- Nurse to receive morgue stretcher and body bag into patient room
- Nurse to complete identification verification of patient (for trip slip)
- Nurse to place tags on patient and put body in bag
- Nurse to place patient belonging bag into body bag
- Nurse to attach third (toe) tag to zipper on body bag
- Nurse to wipe down body bag and stretcher with Dispatch (bleach) wipes
- Nurse to push stretcher into hallway (and wipe last area touched)

*To prevent transfer of disease, non-valuable belongings may be discarded at the discretion of the nurse.*
COVID-19 Inpatient Testing & Precautions Algorithm

Clinician determines patient meets criteria for COVID testing

COVID Precautions ordered: Special Droplet & Contact OR Airborne & Contact*

Lab prioritizes NP swab for PCR for rapid turnaround

COVID Result

Positive Result

Maintain Airborne & Contact Precautions

Infection Prevention updates Epic flag

Negative Result

*COVID-19 Precautions
Click for UVMC PPE Guidelines

Patient type
PPE

PUI without aerosol-generating procedures
Special Droplet & Contact
Airborne & Contact
Universal n95 or procedure mask, face shield, gown, gloves

PUI with aerosol-generating or COVID +
Universal n95 or procedure mask, face shield, gown, gloves

Test based criteria to discontinue COVID-19 precautions:
To meet criteria for discontinuation of precautions while admitted:
1. Arbofie for 3 days without fever reducing medicines AND
2. Improvement in respiratory symptoms AND
3. 14 days have passed since symptom onset AND
4. NP swab PCR negative x 2 (separated by >/= 24 hours)**
   **Contact 1st swab 48 after symptom onset (or 100 times positive test in asymptomatic person)
   - If PCR is positive, assess >/= 3 days and repeat PCR.
   - If PCR is negative, repeat test after 72 hours from previous.

- If a patient requires admission and has been infected with COVID within the last 30 days, place on airborne/contact precautions and repeat PCR x 2.
- No need for repeating if patient had negative NP swab x 2 (per criteria above) within that time.
- If a patient requires admission, was infected with COVID >30 days ago, is asymptomatic, place on airborne/contact precautions and repeat PCR.
- If a patient requires admission, was infected with COVID >30 days ago, is asymptomatic, place on standard precautions (staff wear procedure mask, etc).

Moderate to High clinical suspicion for COVID

Maintain Special Droplet & Contact OR Airborne & Contact* precautions

Provider places note in chart with clinical suspicion & rationale for precautions

Infection Prevention places Epic flag

Obtain sputum sample. If unable to obtain sputum, treat as positive.

Low clinical suspicion for COVID

Provider uses "COVIDRESULTBRIEF" to document result & follow standard precautions

Infection Prevention removes Epic flag

If High suspicion for COVID remains, treat as positive. Begin Airborne & Contact precautions. Consider ID consult

A. Telenon MD, C. Neyes MD, K. Robinson MD, P. Stevens RN 4/22/2020