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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

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.
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.

    ***Patrick Gym is unable to lock or secure controlled substances and will not have pharmacy support for opiates, benzodiazepines, etc.
    l. 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) ID consult or approval is recommended for some therapies suggested 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.
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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) Address pain through intermittent analgesia first, as directed by institutional Guidelines for Management of Pain, Agitation, and Delirium.
2) Recommend propofol a first-line agent sedation as long as hemodynamically tolerated.
   a. Due to potential shortage consider longer acting medications like atypical anti-psychotics to minimize use of propofol.
   b. Try to limit propofol infusions to no greater than 40 mcg/kg/min.
3) Consider ketamine infusion for adjunctive synergy with opioid analgesia.
4) Favor intermittent opioid boluses PRN over continuous infusions – favor longer acting agent such as hydromorphone to minimize unnecessary trips into/out of room.
5) Consider early intermittent neuromuscular blockade for moderate to severe ARDS (see more in Respiratory section). Limit to 48 hours.
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.
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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).

Figure 2
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
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.
   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.

**Infectious Disease**

*Antibiotics*

1) Empiric antibiotics are indicated in patients with pneumonia and ARDS of unknown etiology. The WHO and CDC recommend treating patients with severe acute respiratory illness (patients with pneumonia and hypoxia) suspected to be due to COVID-19 with empiric antimicrobials.
   a) Choose empiric antibiotics according to individual risk of multi-drug resistant organisms and clinical judgement.
2) De-escalate antimicrobials as appropriate depending on confirmatory clinical and laboratory data.
3) If empiric therapy or treatment for MRSA is needed, ceftaroline is recommended over vancomycin to limit AKI risk and additional blood draws for levels.
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, dextran 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: UVMCC 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 review of currently available literature. There is in vitro data to suggest antiviral activity of hydroxychloroquine against coronavirus and there are ongoing studies evaluating in vivo efficacy. A risk/benefit analysis should be performed with each patient prior to prescribing. Updates will be made as more data becomes available.

COVID-19 positive patient or PUI\(^1\) without alternative diagnosis for whom a test is ordered and pending

- **Outpatient**
  - Supportive care with close monitoring

- **Non-ICU Admission**
  - No risk factors or Category 1\(^2\) only
    - Supportive care
  - At least 1 risk factor present from Category 2 or 3\(^2\)
    - Supportive care and consider starting hydroxychloroquine\(^3,4,5\)
      - Worsening clinical status\(^5\)
        - Consider starting hydroxychloroquine\(^3,4,5\) (if not already started)

- **ICU Admission**
  - Consider starting hydroxychloroquine\(^3,4,5\)
    - Consideration of biologics such as tocilizumab\(^6\)

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1. PUI: person under investigation
2. See Table 1
3. ID (Infectious Disease) approval required. Consult Peds ID for pediatric dosing.
4. Stop hydroxychloroquine (HCO) if COVID-19 test is negative and alternative diagnosis is made. Ok to continue if there is strong clinical suspicion and/or second test is pending.
5. EKG upon starting HCO—recommend against use if QTc > 500ms. Check for other drug-drug interactions.
6. See table 2, Rheumatology consult required
Table 1. COVID-19 Risk Factors for Severe Disease

<table>
<thead>
<tr>
<th>Category 1: Epidemiological risk factors</th>
<th>Category 2: Vital Signs</th>
<th>Category 3: Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-existing pulmonary disease</td>
<td>Respiratory rate &gt;24 breaths/min</td>
<td>D-dimer &gt;1000 ng/mL</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>Heart rate &gt; 125 beats/min</td>
<td>Creatine kinase &gt; 2x upper limit of normal</td>
</tr>
<tr>
<td>Diabetes with HbA1C &gt;7.6%</td>
<td>SpO2&lt;90% on ambient air</td>
<td>CRP &gt;100 mg/dL</td>
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<tr>
<td>History of hypertension</td>
<td></td>
<td>LDH &gt;245 U/L</td>
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<tr>
<td>Use of biologics</td>
<td></td>
<td>Elevated troponin</td>
</tr>
<tr>
<td>History of transplant or other</td>
<td></td>
<td>Admission absolute lymphocyte</td>
</tr>
<tr>
<td>immunosuppression</td>
<td></td>
<td>count &lt;0.8 k/dL</td>
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<tr>
<td>All patients with HIV (regardless of</td>
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<td>Ferritin &gt;300 µg/L</td>
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<tr>
<td>CD4 count)</td>
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Table 2. Potential Agents and Dosing
(Off-label Use, unless otherwise indicated)

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosing</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Hydroxychloroquine (HCQ)</td>
<td>400 mg PO BID x 2 doses, then 200 mg PO BID for 4 days</td>
<td>There is no randomized, clinical trial data supporting the use of HCQ in the treatment of COVID-19. There is in vitro data suggesting both antiviral and anti-inflammatory properties. HCQ can cause QTc prolongation, particularly in combination with other QTc-prolonging medications. Check for drug-drug interactions. It is recommended not to use HCQ if QTc &gt;500ms. HCQ can be crushed and administered via GU or NG tube. It is to be administered with food. Administer antacids at least 4 hours before or after HCQ. HCQ may cause hypoglycemia, exacerbation of porphyria, rhabdomyolysis in the setting of G6PD deficiency, or pericarditis. Contraindications: any known hypersensitivity to 4-aminoquinolines compounds. Discontinue if COVID-19 testing is negative.</td>
</tr>
<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>
<tr>
<td>Tocilizumab</td>
<td>400mg IV x1 (Use order panel)</td>
<td>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:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• COVID-19 positive</td>
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<td></td>
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<td>• IL6 burden and IL 6 &gt;200</td>
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<td></td>
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<td>• Onset of symptoms less than 7 days and hospitalization &gt; 48 hours</td>
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<td>• Temperature &gt;103.5 F</td>
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<td>• Labs:</td>
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<tr>
<td></td>
<td></td>
<td>• Ferritin &gt;1000 ng/mL</td>
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<td>• D-Dimer &gt;1000 ng/mL</td>
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<tr>
<td></td>
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<td>• Lymphocyte count &lt;0.6 x 10^9/L</td>
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<td>• CRP &gt;70 mg/dL or &gt;40 mg/L and doubling within 48 hours</td>
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<td></td>
<td>• Likelihood of good clinical outcome based on age and other comorbidities</td>
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</tbody>
</table>

This document is subject to change. Updated by the UVM Covid-19 Therapeutics Working group on 4/6/2020. Adapted from the Massachusetts General Hospital COVID-19 Treatment Guidance Version 1.0 3/17/2020.
Appendix B: Intubation Procedure Mini-Guide

**Patient**
- COVID-19 Patient or PUI with respiratory failure requiring intubation
- Discuss goals of care and code status
- Assess likelihood of benefit

**Place**
- Ideally procedure will take place in a negative pressure room with the door closed
- Intubation may take place on the floor at the critical care attending's discretion

**PPE**
- Hair cover or hood
- Eye protection with side shields, goggles, full-face shield or PAPR
- Fit-tested N95 respiratory or PAPR
- Fluid-resistant gown or full coveralls
- Gloves that cover cuffs of gown

**People**
- Minimal number of staff in the room - operator, RT, RN
- Have a second airway manager available and donned outside the room in case of difficulty
- Intubation should be performed by the most skilled operator available

**Equipment**
- Have all needed equipment in the room prior to starting the intubation procedure including backups
- Use video laryngoscopy and disposable blades (non-hyperangulated are available and may facilitate quicker tube insertion)
- Favor bronchoscopic intubation if difficult airway is anticipated; bougie or LMA acceptable
- Insert viral filters into the vent circuits and bag-valve mask (see graphic below)
- Ensure PEEP valve is on Ambu-bag

**Oxygen**
- 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
- May cautiously consider NIV for preoxygenation in refractory hypoxemia
- If you need to bag, hold a tight seal and allow oxygen to flow passively without bagging at all; otherwise deliver small, frequent volumes
- Patients with ARDS, pregnant and obese patients will desaturate quickly

**Hemodynamics**
- Have norepinephrine hanging and ready in case of hypotension

**Meds**
- Ensure adequate sedation – consider ketamine bolus or propofol
- Ensure faster, more complete apnea and no residual cough with high-dose neuromuscular blocking agents - consider rocuronium 1.2 mg/kg IV
- Honor medication onset time

**Intubate**
- Use RSI, minimizing use of the BVM
- Inflate endotracheal tube cuff before insufflation of lungs by Ambu-bag or ventilator
- Check for appropriate ET tube placement by observing chest-rise and end-tidal CO2 - do not use a stethoscope
Appendix C: Intubation Procedure Mini-Guide

Covid 19 Positive/PUI (Rule Out) Patient: O2 Support (Age 12 and Up)

- Nasal Cannula use at 1-5 L/min

  - Is Target SpO2 reached?
    - No: Escalate to:
      - Oxybooster (1-12 L/min) OR
      - Hudson (1-15 L/min)
    - Yes: Maintain current support (consider weaning as tolerated)

  - Is Target SpO2 reached?
    - No: Escalate to NRB at 15 L/min (minimum flowrate)
    - Yes: Team Collaboration: discuss potential next intervention
      - Consider risk of intubation transport (to ICU, bed, or other area)

  - Is Target SpO2 reached?
    - No: Consider potential for HFNC or NIV (CPAP/BiPAP)
      - Only in negative pressure rooms
    - Yes: Intubate, then transport to ICU

  - Is the patient stable?

- Target SpO2 Range 90 – 96%
Appendix D: UVMMC COVID-19 Expired Patient Transport Process

*To prevent transfer of disease, non-valuable belongings may be discarded at the discretion of the nurse.*