The following is based on experimental data and meant to offer guidance for COVID-19 clinical decision making and does not replace clinical judgment.

Version 10 9/2/2020

Refer to COVID checklist in the Covid Cerner Powerplan and on Med Staff Office Website

Consider COVID-19 in patients with:
- Fever
- Cough, Shortness of breath (SOB)
- Sore Throat, Loss of smell/taste
- Myalgias, Fatigue, Diarrhea, Abdominal Pain
- Exposure to COVID19, SNF resident, pending test

CLINICAL SIGNS/SYMPTOMS
- Fever in >75% of hospitalized cases at some point.
  - Almost 50% afebrile on admission
- Cough 60-80% dry/productive
- SOB 20-40%
- URI (HA, sore throat, rhinorrhea 4%)
- GI symptoms (diarrhea, nausea/vomiting) in <10%
  - Can be seen prior to respiratory symptoms
- Early symptoms: loss of taste and smell

LABS
- CBC with diff, CMP, procalcitonin, Ferritin, CPK, CRP, LDH, ESR, D-Dimer, Quantiferon, IL-6, blood type, troponin
- Look for leukopenia, lymphopenia, and transaminitis

LABS AND BIOMARKERS
- Median WBC 4.7, leukopenia in 30-45%
- Lymphopenia (absolute lymphocyte count <0.8)
- Platelets normal (slight decrease in 35%)
- AST/ALT increase in 4-22%
- CRP increase in 61-86%, ESR increase in up to 85%
- LDH >245 units/L
- Hgb decrease in 41-50%, Albumin decrease in 50-98%
- Procalcitonin: ≥ 0.5 in 5% overall, (14% if severe, 24% if ICU)
- Ferritin >300 ug/L
- D Dimer >1000ng/ml

MICROBIOLOGY
- Co-infection rates with other viruses and bacteria are unknown and reports vary.

IMAGING/OTHER
- CXR abnormal in 60% (77% if severe)
- Chest CT abnormal in 86% (95% if severe)
- Unilateral findings on CXR or CT in 14-25% (more so if mild or early)
- Most common: Bilateral ground glass opacities, patchy consolidations >50%, peripheral distribution >50%
- Nodules, cystic changes, effusions in <10%

IMAGING/OTHER
- Portable CXR. AVOID unnecessary CT imaging.
- Point of Care Ultrasound (POCUS)
- EKG for concern for myocardial involvement

MICROBIOLOGY
- Check Flu if in season, RSV, Respiratory viral panel if available
- Consider blood cultures
- Obtain NP swab. If patient very sick also obtain expectorated sputum culture, endotracheal aspirate, or bronchoalveolar lavage if possible.
  - DO NOT induce sputum

Refer to COVID checklist in the Covid Cerner Powerplan and on Med Staff Office Website

Consider COVID-19 in patients with:
- Fever
- Cough, Shortness of breath (SOB)
- Sore Throat, Loss of smell/taste
- Myalgias, Fatigue, Diarrhea, Abdominal Pain
- Exposure to COVID19, SNF resident, pending test

CLINICAL SIGNS/SYMPTOMS
- Fever in >75% of hospitalized cases at some point.
  - Almost 50% afebrile on admission
- Cough 60-80% dry/productive
- SOB 20-40%
- URI (HA, sore throat, rhinorrhea 4%)
- GI symptoms (diarrhea, nausea/vomiting) in <10%
  - Can be seen prior to respiratory symptoms
- Early symptoms: loss of taste and smell

LABS
- CBC with diff, CMP, procalcitonin, Ferritin, CPK, CRP, LDH, ESR, D-Dimer, Quantiferon, IL-6, blood type, troponin
- Look for leukopenia, lymphopenia, and transaminitis

LABS AND BIOMARKERS
- Median WBC 4.7, leukopenia in 30-45%
- Lymphopenia (absolute lymphocyte count <0.8)
- Platelets normal (slight decrease in 35%)
- AST/ALT increase in 4-22%
- CRP increase in 61-86%, ESR increase in up to 85%
- LDH >245 units/L
- Hgb decrease in 41-50%, Albumin decrease in 50-98%
- Procalcitonin: ≥ 0.5 in 5% overall, (14% if severe, 24% if ICU)
- Ferritin >300 ug/L
- D Dimer >1000ng/ml

MICROBIOLOGY
- Co-infection rates with other viruses and bacteria are unknown and reports vary.

IMAGING/OTHER
- CXR abnormal in 60% (77% if severe)
- Chest CT abnormal in 86% (95% if severe)
- Unilateral findings on CXR or CT in 14-25% (more so if mild or early)
- Most common: Bilateral ground glass opacities, patchy consolidations >50%, peripheral distribution >50%
- Nodules, cystic changes, effusions in <10%
The following is based on experimental data and meant to offer guidance for COVID-19 clinical decision making and does not replace clinical judgment.

**Table 1: Risk Factors For Severe COVID-19 Disease**

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Vital Signs</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt;65</td>
<td>Respiratory Rate &gt;24 breaths/min</td>
<td>Admission absolute lymphocyte count &lt;0.8</td>
</tr>
<tr>
<td>Pre-existing pulmonary disease</td>
<td>Heart rate &gt; 125 beats/min</td>
<td>CRP &gt;100 mg/L</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>SpO2 &lt;90% on room air</td>
<td>LDH &gt;245 units/L</td>
</tr>
<tr>
<td>Diabetes with A1c &gt;7.6%</td>
<td></td>
<td>CPK &gt; twice upper limit of normal</td>
</tr>
<tr>
<td>History of hypertension or cardiovascular disease</td>
<td>Elevated troponin</td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td></td>
<td>Ferritin &gt;300 ug/L</td>
</tr>
<tr>
<td>Use of biologics</td>
<td></td>
<td>D-dimer &gt;1000 ng/ml <em>elevated D-dimer does NOT always correlate to having Pulmonary Embolism so Do NOT get CT based on D dimer alone</em></td>
</tr>
<tr>
<td>History of transplant or other immunosuppression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All patients with HIV (regardless of CD4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adapted from Version 1 3/17/20 Massachusetts General Hospital COVID-19 Treatment Guidance

**Table 2: Suggested Experimental Treatment Algorithm Based On Clinical Severity**

All Experimental and off label use of treatments should be done in the setting of a Clinical Trial, or if not available, then local or collaborative registries to systematically evaluate the efficacy and safety of drugs to contribute to the knowledge base.

<table>
<thead>
<tr>
<th>Clinical Situation</th>
<th>Recommendation*</th>
<th>Notes/Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>All hospitalized patients</td>
<td>Statins: Continue if already prescribed. Consider starting a statin if no contraindication and for those who have a guideline indication.</td>
<td>Cardiovascular disease is a major risk factor for disease severity. If CPK&gt; 500 unit/L, consider not starting a statin. Avoid Statins if ALT &gt;3x upper limit of normal.</td>
</tr>
<tr>
<td>Mild disease with SpO2 &gt;90%, Upper respiratory tract infection (URTI), no risk factors</td>
<td>Supportive Care</td>
<td>See Table 1 for Risk Factors</td>
</tr>
<tr>
<td>Mild disease with SpO2 &gt;90% with risk factors for severe disease</td>
<td>Supportive care with very close monitoring If patient consents: convalescent plasma 1 unit for all symptomatic patients who are hospitalized</td>
<td>Do not recommend convalescent plasma for those who are hospitalized but asymptomatic Must obtain blood type to be given matched convalescent plasma from donor supply</td>
</tr>
<tr>
<td>Moderate or severe disease requiring supplemental 02</td>
<td>If patient consents: Convalescent plasma 1 unit is SpO2 &lt; 93 on RA -Dexamethasone 6mg q 24 + famotidine if ≥ 2L -Remdesivir (RDV) if available &amp; &gt;2L NC</td>
<td>Remdesivir supply limited based on government allocation nationwide.</td>
</tr>
</tbody>
</table>

Continued next page ➔
The following is based on experimental data and meant to offer guidance for COVID-19 clinical decision making and does not replace clinical judgment.

<table>
<thead>
<tr>
<th>Clinical Situation</th>
<th>Recommendation</th>
<th>Notes/Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>For patients with severe disease and/or evidence of cytokine release syndrome</td>
<td>With ID approval, Tocilizumab can be considered in addition to other therapies for moderate or severe disease above</td>
<td>- Must have IL-6 and quantiferon collected before giving Tocilizumab.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Not often used due to concern of severe immunosuppression when giving both tocilizumab and steroids</td>
</tr>
</tbody>
</table>

**OTHER CONTROVERSIAL MEDICATIONS**

| Renin angiotensin system blockers (ACE and ARBS)                                   | The virus that causes COVID-19 uses the angiotensin-converting enzyme (ACE) 2 receptor to enter cells. | Currently, there is no clinical or epidemiological data to support this. |
|                                                                                  | Hypothetical harm: can increase the expression of ACE2, there is concern that these medications may facilitate viral entry into cells. | Consider continuing if patient was on PRIOR to admission and patient is not hypotensive |
|                                                                                  | Hypothetical benefit: may have protective effect against lung damage or may have paradoxical effect in terms of virus binding. |                                                                 |
| NSAIDS                                                                           | Avoid in hospitalized patients.                                                                   | Controversial.                                                                     |

Adapted from Version 1 3/17/20 Massachusetts General Hospital COVID-19 Treatment Guidance
COVID-19 MANAGEMENT RECOMMENDATIONS AND WHEN TO CONSULT INFECTIOUS DISEASE

Consult ID for the following scenarios:

- Positive COVID-19 test and concern for secondary infections
- Positive COVID-19 test in transplant or AIDS/immunocompromised patients
- Positive COVID-19 test in pregnant patients
- Remdesivir requires ID Approval prior to use. Approval of restricted medications is not necessarily a consult.

All isolation, transport, and personal protective equipment questions to be directed to Infection Prevention (available on tiger text as Infection Prevention Team) & 805-652-3383.

Most patients with moderate to severe disease are getting convalescent plasma, dexamethasone +/- remdesivir. Due to immunosuppression, tocilizumab is not routinely considered.

Step 1: LABS. Obtain the following labs: CBC with diff, CMP, procalcitonin, Ferritin, CPK, CRP, LDH, ESR, D-Dimer, Quantiferon, IL-6, blood type, troponin. If ICU status, get ABG.

Step 2: ROOM PREP. To prepare for COVID admission. Set up room with IPAD and all other necessary material. Secure a hygienist if available. Ensure safe transport from ED to room if applicable and notify patient, RN, PT/OT that PRONING & Incentive Spirometer need to be initiated ASAP. Notify ICU if patient is requiring >=6lpm.

Step 3: CONSENT. English and Spanish consent forms found at http://hospitals.vchca.org/medical-staff-services under inpatient clinical resources. Print out 2 copies of consent forms based on language request. 1 to give patient to read to stay in room (will be contaminated) and 1 to keep outside of room (clean copy) for physician and witness to sign if consent obtained (NEED 2 PEOPLE TO SIGN CONSENT FORM). Patient to be consented for all of the following regardless of plans: convalescent plasma, tocilizumab, remdesivir and dexamethasone (if using Spanish version, will need to write some in as ‘other’ & side effects need to be written in as well as Spanish consent form not yet updated). Remdesivir fact sheet in English and Spanish can be given to the patient if desired and if decision is made to start this medication, and if there is adequate supply.

ALL PAGES OF CONSENT FORMS MUST BE SCANNED INTO CERNER OR VIA CERNER CAPTURE BEFORE PROCEEDING

Step 4: PLASMA

If meet criteria for plasma (see table 3) and patient’s blood type is resulted and consents have been scanned in, you can order plasma (no longer need to enroll patient in Mayo Clinic registry)

- in Cerner orders, enter: CONVALESCENT, and select order set: ICU PRBC, FFP, cryoprecipitate, convalescent plasma STAT
- click the last box labeled: transfuse convalescent plasma, already active screen
- complete required fields, to give 1 (ONE) unit STAT (no longer need IND or authorizing MD, if this is required field, simply enter N/A in both fields)
- Next call blood bank at 652-6040 (vcmc) or 933-8607 (sph) and notify them of order, and that you need for (1) ONE UNIT convalescent plasma STAT. Infuse/premedicate like other blood products.

Step 5: STEROIDS. Investigate for risks of immunosuppression, h/o infection/TB/HIV. If not contraindicated, start dexamethasone IV or PO 6mg q daily with famotidine IV or PO 20mg BID for GI protection. If patient receiving dexamethasone, then likely not a good candidate for further immunosuppression with tocilizumab.

- Dexamethasone and famotidine duration is 10 days maximum but only if remains on oxygen

Step 6: REMDESIVIR/TOCILIZUMAB.

If patient admitted overnight, decision to give these medications can be made in am. Refer to Table 3 for criteria for remdesivir and discuss with attending prior to ordering.

- If treatment is indicated, needs restricted drug approval BEFORE giving first dose. Contact ID Pharmacist or ID Physician (Barger or Meshkaty) for approval. If approved, provider can order the medication and enter meets criteria in Cerner and include name of authorizing MD.
- Check with pharmacy about supply issues. If limited supply and multiple candidates, discuss with scarce resource committee
- For now, tocilizumab is not being given in conjunction with steroids except for special circumstances.


Step 8: ANTIBIOTICS. If procalcitonin >0.5, clinical worsening + high suspicion of bacterial superinfection, may consider azithromycin + ceftriaxone after discussion with attending. If going to ICU, obtain MRSA nares screen.

Step 9: FAMILY UPDATES. The most critical step is that the residents update family members daily since they are unable to visit their loved ones. Can use phone, ipads in room, etc
The following is based on experimental data and meant to offer guidance for COVID-19 clinical decision making and does not replace clinical judgment.

### Table 3: Experimental/Restricted Medication Chart for COVID-19 positive patients in no specific order.

**ALL DOSES OF MEDICATIONS REQUIRE INFORMED CONSENT TO BE SCANNED INTO CERNER PRIOR TO ADMINISTRATION**

<table>
<thead>
<tr>
<th>DRUG NAME</th>
<th>PROPOSED MECHANISM</th>
<th>BEST CANDIDATE</th>
<th>ADVERSE REACTIONS</th>
<th>DOSING GUIDELINES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Remdesivir</strong></td>
<td>Blocks RNA dependent polymerase</td>
<td>May be considered in: - hospitalized with confirmed COVID who are symptomatic - requiring &gt; 2 Liters per minute 02 nasal cannula to maintain Sp02 &gt;93% - Duration of symptoms ≤ 14 days from onset - CrCl &gt; 30mL/min. Not safe in HD LIMITED SUPPLY: Available via Emergency use authorization (EUA) OR through compassionate use in pregnancy and pediatric patients</td>
<td>Increased liver enzymes Hypotension during infusion Nausea/vomiting Reversible kidney injury Potential for drug-drug interactions. Do NOT use if ALT ≥ 5x Upper limit of normal prior to start Do NOT use if CrCl &lt; 30 or HD/PD</td>
<td>200 mg IV on day 1 then 100 mg IV daily X 5 days total May consider up to 10 days total if intubated Consider daily LFTS while on therapy to monitor for adverse effects</td>
</tr>
<tr>
<td><strong>Convalescent Plasma</strong></td>
<td>Antibodies develop in patients with prior infection who then recover from COVID-19, They donate their immunoglobulin-containing plasma which may suppress viremia</td>
<td>Severe or life threatening COVID-19 OR those at high risk of progression with: - dyspnea - RR &gt;30/min - Confirmed SARS-CoV-2 test - Sp02 &lt;93% on room air</td>
<td>Fever Allergic reaction including serum sickness Transfusion-related acute lung injury (TRALI) Transfusion associated circulatory overload (TACO)</td>
<td>Must order patient blood type first to ensure donor is cross matched PRIOR to ordering Convalescent plasma Recommended dose is 1(one) unit of plasma</td>
</tr>
<tr>
<td><strong>Dexamethasone</strong></td>
<td>Reduces inflammation</td>
<td>Based on preliminary data from the Randomized Evaluation of COVID-19 Therapy (RECOVERY) trial: those on supplemental 02 had mortality benefit, with greatest benefit in those on mechanical ventilation - requiring ≥ 2 L per minute supplemental 02 by nasal cannula to maintain Sp02 &gt; 93% - RECOVERY trial noted worse outcomes in patients who were NOT on 02. Would not use in ‘high risk’ patients at risk for worsening, unless they develop significant hypoxemia requiring at least 2L per minute 02 that is sustained (not transient hypoxemia) due to potential harm Safety and efficacy is unknown in pregnancy</td>
<td>- Elevated blood sugars - Reduces immune system and thus increases risk of reactivation of latent infections (e.g. hepatitis B virus, herpes viruses, strongyloidiasis, tuberculosis, others) - Moderate cytochrome p450 (CYP) 3A4 inducer with drug-drug interactions</td>
<td>6mg IV or PO daily x 10 days If going home on oxygen then continue to complete 10 days. If going home on room air, then discontinue dexamethasone on DC without full 10 day course.</td>
</tr>
</tbody>
</table>
The following is based on experimental data and meant to offer guidance for COVID-19 clinical decision making and does not replace clinical judgment.

**Table 3: Experimental/Restricted Medication Chart for COVID-19 positive patients in no specific order.**

ALL DOSES OF MEDICATIONS REQUIRE INFORMED CONSENT TO BE SCANNED INTO CERNER PRIOR TO ADMINISTRATION

<table>
<thead>
<tr>
<th>DRUG NAME</th>
<th>PROPOSED MECHANISM</th>
<th>BEST CANDIDATE</th>
<th>ADVERSE REACTIONS</th>
<th>DOSING GUIDELINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tocilizumab</td>
<td>IL-6 receptor antagonist. IL-6 level can be greatly elevated in severe COVID-19 infections.</td>
<td>Patients with severe/critical illness with rapidly worsening respiratory gas exchange and excessive inflammatory ****NOT ROUTINELY USED</td>
<td>GI perforation Anaphylaxis Hepatic failure Tuberculosis reactivation</td>
<td>400 mg IV X1</td>
</tr>
<tr>
<td>(Actemra)</td>
<td>No antiviral activity</td>
<td>May be considered for ICU patients if all criteria met: 1.confirmed or high suspicion for covid 2. ARDS or ARDS or Sp02 &lt;90% on 4L or increasing 02 requirements over 24 hours PLUS 2 or more of the following predictors for severe disease: - Elevated troponin w/out known cardiac disease - LDH &gt; 200 U/L - D-dimer &gt;1 mcg/L - CRP &gt;35 mg/L - Ferritin &gt;500-600 ng/mL - Neutrophil-lymphocyte ratio &gt;4 - IL 6 &gt;10 pg/mL 3. Patient is NOT pregnant 4. ID approval required 5. Informed consent obtained by patient or family member and have it documented in Cerner 6. Order IL6 &amp; quantiferon prior to administration. If positive weigh risks/benefits.</td>
<td>If patient getting dexamethasone then not likely a candidate for Tocilizumab.</td>
<td></td>
</tr>
<tr>
<td>Famotidine</td>
<td>Blocks dysfunctional mast cell activation and histamine release</td>
<td>- Recommend using simultaneously with dexamethasone for GI protection</td>
<td>Well tolerated Diarrhea or constipation in less than 5% of people</td>
<td>20 mg po or iv q12h</td>
</tr>
<tr>
<td>(Pepcid)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please refer to specialty specific documents on Medical Staff Office website

(Specific Link: http://hospitals.vchca.org/images/medical_staff/Department_Pearls_2020_8_17.pdf)

(Medical Staff Office Website: http://hospitals.vchca.org/medical-staff-services)
### Emergency Department, Hospitalist and Critical Care Management

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Notes</th>
</tr>
</thead>
</table>
| **Aerosolizing procedures: avoid if possible** | - **Procedures:** Intubation, extubation, bronchoscopy, upper endoscopy, colonoscopy, CPR, NG tube placement (surgical mask over patient's mouth may reduce aerosolization)
- **Respiratory therapy treatments:** nebulizer treatments, CPAP/BiPap, Metaneb, EZ Pap, high flow nasal cannula (HFNC) > 15 liters per minute, sputum induction (do not induce sputum for COVID), chest physiotherapy, Venturi mask with cool aerosol humidification, Oxymask, cough assist
- **Ventilator-related:** oscillatory ventilation, open suction of tracheostomy, tracheostomy change, manual ventilation (i.e. manual bag-valve mask ventilation prior to intubation), disconnecting patient from the ventilator, open suctioning of endotracheal tube, ventilator circuit manipulation
- **NOT considered high risk for aerosolization:** closed suctioning from endotracheal tube
- NP swab is to be performed with patient's mouth covered with surgical mask and provider in full PPE with N95* 
  o Room may be cleaned 10 minutes after performing NP swab |
| **Oxygen therapy** | - Flow rate that is nebulizing is controversial
  o Depends on oxygen delivery method and flow rate and if patient also wears a surgical mask
  ▪ Massachusetts General Hospital guideline on aerosolizing procedures states that HFNC > 15 liters/minute is aerosolizing and Venturi mask with cool humidification is aerosolizing
  ▪ Safe Airway Society of Australia/New Zealand recommends no non-rebreather pre-oxygenation and no nasal cannula during intubation for aerosolizing risk of both procedures
- **Non-rebreather (NRB) may be used but higher flow rates have more chance of aerosolization (consider low flow rates ~ 6 liters per minute if possible, via NRB); NRB considered a bridge to intubation** |
| **High Flow Nasal Cannula (HFNC)** | - HFNC has high potential to aerosolize, but is considered a mainstay of therapy to reduce morbidity and mortality:
  o Patient recommended to be in a negative pressure room, and all staff entering the room must have full PPE*.
  ▪ Door closed at all times if not negative pressure
  ▪ The patient should have a surgical mask on as much as tolerated and always with others in the room to reduce aerosolization, particularly for the duration of time needed for a full air exchange (45 minutes negative pressure room, 3.5 hours at VCMC or 1.5 hours at SPH)
  o As low flow as possible (lowest = 15 liters/minute) for theoretical decreased risk of aerosolization
- **Should be abandoned if the patient is progressively not improving (short trials only)**
- **P:F < 200 portends higher risk of HFNC failure per Wang et al study from Wuhan China** |
| **Adjunctive Respiratory Therapy Modalities** | - **Incentive Spirometer:** All patients should be encouraged to use incentive spirometer 10x/hour while awake
- **Self-Proning:** If any hypoxia, strongly promote self-proning for hypoxic patients (“adult tummy time”) on admission
  o Initial trial period of one hour on stomach supported by pillows
  o Encourage patient to adopt prone position as much as tolerated an able when in bed
  ▪ Goal is more time prone than supine
  ▪ Most patients not accustomed to sleeping on their stomach will take 48+ hours to acclimate
  ▪ STRONGLY Consider PT and OT consultation for patients with challenges |
The following is based on experimental data and meant to offer guidance for COVID-19 clinical decision making and does not replace clinical judgment.

* Full PPE = bouffant cap, eye protection, N95 with face shield over mask so N95 can be reused, gown and gloves; do not place surgical mask over N95 per CDC recommendations

**Emergency Department, Hospitalist and Critical Care Management (continued)**

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjunctive Respiratory Therapy Modalities (continued)</td>
<td>• <strong>Nebulizers vs. MDIs:</strong> non-intubated patients: use MDIs—nebulizer is aerosol generating and should be avoided intubated patients: utilize nebulizers via in-line Aerogen device (does not aerosolize)&lt;br&gt;• <strong>EZ Pap:</strong> also likely aerosolizes, but may be considered if the following criteria are ALL met:  o Patient requires pulmonary toilet in order to prevent respiratory deterioration and less-invasive methods (i.e. Incentive Spirometer) have been ineffective  o Patient is cooperative with all aspects of the treatment  o Must be in negative pressure room if using, all staff in full PPE*  o Mouthpiece is used with a good seal and good understanding to minimize aerosolization  o Use only for lung expansion; the nebulizer portion of the treatment is to be avoided  ▪ if wheeze present, consider MDIs separately  o Utilize flow rates of 6 liters or less to minimize aerosolization  o If employing EZPap, consider putting in-line viral filter  • <strong>Metanebs:</strong> aerosolize and should be avoided in COVID suspected or confirmed infected.</td>
</tr>
<tr>
<td>Non-invasive positive pressure ventilation (NIPPV): BiPap / CPAP</td>
<td>• ICU consult required for initiation of Non-Invasive Positive Pressure Ventilation (NIPPV): BiPap/CPAP  • It is strongly recommended to avoid NIPPV (BiPap/CPAP) in COVID suspected or confirmed infected due to both clinical worsening from positive pressure and inevitable leak around mask → aerosolization.  • Do not initiate NIPPV in patients with progressive respiratory failure  o Despite transient improvement that may be seen, NIPPV leads to inevitable progression of respiratory failure  • Rare exceptions to consider initiation of BiPap or CPAP in COVID suspected or confirmed infected include:  o Patients with a DNI order who have an acute indication for NIPPV  o Patients who use NIPPV chronically (e.g. obesity/hypoventilation, obstructive sleep apnea)  o Patients who present w/ COPD or CHF exacerbation that are expected to be rapidly reversible (e.g. 2 hour trial)  o Rarely extubation to NIPPV in patients at high risk for reintubation  • If using NIPPV:  o CPAP favored over Bipap if choosing to use NIPPV: less likely to aerosolize and high BiPap failure rate  o Must use non-invasive mode on Servo-i ventilator (dedicated exhalation limb that can be filtered) and not V-60 (no exhalation limb, exhalation out the mask → aerosolization)  o Must be in negative pressure room if available, with all staff in full PPE*  o Short trial (e.g. 6-8 hours only) w/plan to intubate patients unable to transition back to high flow nasal cannula</td>
</tr>
<tr>
<td>ICU Admission Criteria (updated 6/30/2020)</td>
<td>• Admit to ICU for: FiO2&gt;=50%, flow &gt;=40 liters per minute (high flow nasal cannula), persistent tachypnea &gt;30, persistent increased work of breathing not improved by prone positioning, OR need for NIPPV  • DNI patients do not need ICU level of care if there is no non-respiratory critical care need (i.e. pressors = ICU admit)  • ICU consultation required for &gt;= 6 liters O2 by nasal cannula</td>
</tr>
</tbody>
</table>

* Full PPE = bouffant cap, eye protection, N95 with face shield over mask so N95 can be reused, gown and gloves; do not place surgical mask over N95 per CDC recommendations
## Therapy

### Decision to intubate
- High flow nasal cannula and prone positioning (see Adjunctive Respiratory Therapy modalities above) are mainstays of therapies to reduce morbidity and mortality of intubation
- NIPPV for progressive respiratory failure is a bridge to intubation; may be utilized to improve pre-oxygenation prior to intubation
- Intubation under semi-elective conditions much preferred to emergent intubation

### Intubation
- Very high risk for aerosolization. Negative pressure room required if available, door closed if unavailable
- Full PPE* and double-glove
- Least amount of people in room. Most experienced conductor. Least amount of attempts.
- Video laryngoscopy preferred. Disposable laryngoscope if needing direct laryngoscopy.
- Viral filter to BVM and exhalation port of ventilator
- Pre-oxygenate with non-rebreather (NRB): lower flow rates less likely to aerosolize
- Avoid bagging: Option #1: Facemask to ventilator set to CPAP; Option #2 Passive bag valve mask (BVM) with viral filter, PEEP valve, O2 flow—avoid actual bagging when patient not yet intubated if possible
- Rapid Sequence Intubation (RSI) preferred; ensure that patient is fully paralyzed and cannot cough
- Avoid unnecessary ETT confirmatory procedures. Calculate predicted ETT depth (MDCalc) or consider standard depths (~23 inches male, ~21 inches females). Ensure black line of ETT distal to cords
- Inflate cuff, ensure viral filter on bag valve mask (BVM) before bagging/connecting to ventilator

### Post-Intubation Management
- Before disconnecting ETT: sedate & paralyze patient → pause ventilator
  - Optional: Clamp ETT (plastic clamp preferred; if metal clamp, place lots of tape around the metal that will come in contact with the tube to reduce risk tube damage)
- Closed circuit suction, Lukens trap to collect sputum for testing (COVID sputum to Public Health more sensitive)
- Consider placing lines right after intubation to conserve PPE, reduce exposures
- Consider waiting 45min for CXR to allow for adequate air exchanges and reduce aerosolized particles

### Ventilator Management
- Ventilator management depends on “phenotype” of ARDS
  - **L Type** (Low elastance, normal compliance): consider 8mL/kg PBW for TV, start lower PEEP (~10 cm H2O), high FiO2, keep Plateau pressure <30 cmH2O
  - **H Type** (High elastance, low compliance): Follow ARDSnet lung protective protocol: high PEEP, low TV 6-8mL/kg PBW, Plateau pressure <30 cm H2O, keep PaO2>55mmHg; SpO2 88-92%; Consider early APRV (Airway Pressure Release Ventilation: high mean airway pressures) for H Type
- Consider early prone positioning after intubation for refractory hypoxia
- Intubated patients are on ventilator prolonged time (>10 days) with high incidence of late deterioration

*Full PPE = bouffant cap, eye protection, N95 with face shield over mask so N95 can be reused, gown and gloves; do not place surgical mask over N95 per CDC recommendations
The following is based on experimental data and meant to offer guidance for COVID-19 clinical decision making and does not replace clinical judgment.

**Emergency Department, Hospitalist and Critical Care Management (continued)**

### Prone Positioning

- **See Policy Stat, policy CC.27: Patient Prone Positioning in the ICU**
- **Decision to utilize Rotaprone bed vs. manual proning:**

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotaprone Bed</td>
<td>- Less kinking of ET tube when prone</td>
<td>- Cost of bed rental</td>
</tr>
<tr>
<td></td>
<td>- 3 staff needed for proning/supining</td>
<td>- Limited availability</td>
</tr>
<tr>
<td></td>
<td>'Therapy settings' allow frequent position changes when prone/supine</td>
<td>- Transportation delays</td>
</tr>
<tr>
<td>Manual Proning</td>
<td>- Always available if enough staff</td>
<td>- ET tube position when prone often leads to kinking</td>
</tr>
<tr>
<td></td>
<td>- Skin breakdown less than Rotaprone in limited local experience, though skin breakdown with manual position is also a risk</td>
<td>- Minimum 6 staff needed for proning/supining</td>
</tr>
<tr>
<td></td>
<td>- Less costly (no bed rental)</td>
<td>- ET tube clamped during proning/supine</td>
</tr>
</tbody>
</table>

- **Duration of prone positioning**
  - 16 hours prone followed by 8 hours supine is considered maximum duration of prone positioning
  - Longer duration 36 hours of prone positioning in small report safe and effective\(^1\); ICU Attending input required.

- **Paralytic vs. no paralytic during prone positioning**
  - Paralysis considered during manual proning/required if tube clamped-prevents re-expansion pulmonary edema
  - Patients being proned should be a RASS of -4 to -5; consider paralyzing on a case by case basis
    - Favor paralysis for refractory hypoxia, patient-ventilator dyssynchrony

- **Discontinuation of prone positioning**
  - No improvement seen with prone positioning -OR-
    - Patient improvement/no longer required: FiO2<=60%, PEEP <= 10 cm H2O, and driving pressure < 15 cm H2O

- **Tube Feeding when prone**
  - May continue at 25 ml/hour; resume one hour after position changes; higher rate supine
  - Reverse Trendelenberg position when prone may help reduce aspiration

- **Wound consultation recommended for patients undergoing prone positioning**

### Tracheostomy

- **May be considered in consultation with ENT at or after day 21 of intubation**

### Hematology Considerations

(See VCMC Hematology guideline via Med Staff Office website for more details)

- **High incidence of venous thromboembolism (VTE) in COVID-19 infection**
- **VTE prophylaxis recommendations per VCMC/SPH Hematology Guidelines:**
  - Hospitalized, not in ICU: standard pharmacologic VTE prophylaxis
  - ICU-level patients: higher prophylactic dose is off-label but reasonable consensus amongst specialists and other hospital protocols; higher dose should be continued for entire hospitalization even if stepped down

<table>
<thead>
<tr>
<th>ICU Patient VTE Prophylaxis Dosing</th>
<th>VTE Dosing Weight Adjustment</th>
<th>CrCl &gt;= 30 mL/min</th>
<th>CrCl &lt; 30 mL/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Enoxaparin 40 mg BID</td>
<td>UFH 7,500 units q 8 hours</td>
<td></td>
</tr>
<tr>
<td>Obese (&gt;= 120 kg or BMI &gt;= 35)</td>
<td>Enoxaparin 0.5 mg/kg BID (max dose 100 mg BID)</td>
<td>UFH 10,000 units q 8 hours</td>
<td></td>
</tr>
<tr>
<td>Low Body Weight (&lt; 60 kg)</td>
<td>Enoxaparin 30 mg BID</td>
<td>UFH 7,500 units q 8 hours</td>
<td></td>
</tr>
</tbody>
</table>

Emergency Department, Hospitalist and Critical Care Management (continued)

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hematology Considerations</strong></td>
<td>• D-Dimer elevation early considered measure of disease severity; consider avoiding early CT pulmonary angiogram for both fluid load and renal considerations&lt;br&gt;o Consider possible increased risk of late pulmonary embolism (27% incidence in a Dutch ICU study of 184 ventilated ICU patients, lower incidence reported elsewhere)&lt;br&gt;• Consider precipitous increase in D-dimer differential = cytokine storm vs. DIC vs. thromboembolism</td>
</tr>
<tr>
<td><strong>Cardiology Considerations</strong></td>
<td>• Consider high incidence of myocardial suppression/shock&lt;br&gt;• Conservative fluid strategy strongly recommended</td>
</tr>
<tr>
<td><strong>Code Blue / Palliative Care Considerations</strong></td>
<td>• Consider early discussion regarding DNR status for shock, ARDS, intubated patients&lt;br&gt;• Early Palliative Care Consult&lt;br&gt;• Code blue considerations&lt;br&gt;o Minimize number of staff entering the room to only essential&lt;br&gt;o Consider placing ETT prior to chest compressions to avoid aerosolization&lt;br&gt;• Consider plastic drape over patient's face to minimize aerosolization during code if not yet intubated</td>
</tr>
<tr>
<td><strong>Environmental/Isolation Precautions Considerations</strong></td>
<td>• Considered mostly droplet precautions other than high risk situations (see top of table on page 7 for aerosol generating procedures)&lt;br&gt;• Maintain airborne precautions: intubated patients (in case of accidental disconnection, filter changes, etc.)&lt;br&gt;• Discontinue droplet precautions + contact precautions only after patient considered to be non-infectious&lt;br&gt;o <a href="http://hospitals.vchca.org/images/medical_staff/Discontinuation_of_Transmission_2020_7.24_002.pdf">http://hospitals.vchca.org/images/medical_staff/Discontinuation_of_Transmission_2020_7.24_002.pdf</a>&lt;br&gt;o Must be discussed with Infection Prevention (Tiger Text or 805 652-3383) prior to discontinuation&lt;br&gt;• Surface survival times: 72 hours plastics, 48 hours steel, 24 hours cardboard, 4 hours copper</td>
</tr>
<tr>
<td><strong>Discharge Considerations</strong></td>
<td>• All discharges to be discussed with Public Health for clearance for those still on isolation (PH phone numbers: Monday - Friday, 8:00 am - 5:00 pm: <strong>(805) 981-5201</strong>, After-hours, weekends, and holidays: <strong>(805) 214-7057</strong>)&lt;br&gt;• Home oxygen may be considered for patients who are otherwise improving but cannot come off of oxygen&lt;br&gt;o Note that patients going to motel for homeless individuals cannot go to the motel if requiring oxygen&lt;br&gt;• Discharge VTE prophylaxis may be considered on a case-by-case basis, per Hematology Recommendations:&lt;br&gt;o Not all discharged patients need to be on VTE prophylaxis; more data is needed.&lt;br&gt;o Consider the individual patient's VTE risk factors, including reduced mobility, bleeding risk, feasibility, etc..&lt;br&gt;o Utilize the modified IMPROVE score (MARINER trial) and offer post discharge outpatient VTE prophylaxis when patients have a score of 4 or more, or score of 2 to 3 with D-dimer &gt;2x ULN during the hospitalization:&lt;br&gt;• VTE prophylaxis would consist of Rivaroxaban 10mg daily 31 to 39 days</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Modified Improve Score</th>
<th>Risk Factor</th>
<th>Risk Score</th>
<th>Risk Factor</th>
<th>Risk Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Previous VTE</td>
<td>3</td>
<td>ICU/CCU stay (including high flow nasal cannula)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Known thrombophilia (eg Factor V Leiden)</td>
<td>2</td>
<td>Complete immobilization &gt;= 1 day</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Lower limb paralysis/paresis</td>
<td>2</td>
<td>Age &gt;= 60</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>History of cancer within 5 years (excluding non-melanoma skin cancer)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Modified Improve Score**

- VTE prophylaxis would consist of Rivaroxaban 10mg daily 31 to 39 days
The following is based on experimental data and meant to offer guidance for COVID-19 clinical decision making and does not replace clinical judgment.

References:
3. Effective Treatment of Severe COVID-19 Patients with Tocilizumab, Chinese article from "Respiratory and Critical Care Medicine" 2020.
5. UW Medicine Interim Treatment Guidelines for SARS-CoV-2 Infection/COVID 19 Version 1.3 3/17/20
6. UCSF Inpatient Adult COVID 19 Interim Management Guidelines V.1 3/19/20
9. Massachusetts General Hospital Guideline on aerosol generating procedures and prone positioning
10. Additional references listed on the following documents:
   a. Google Drive (https://drive.google.com/drive/folders/1CIZAOpL_s8_mHJhKIQtm5Hn7KIXTdtG)
   b. Google Doc (https://docs.google.com/document/d/149cSAUSj6VA0fdYIY5qRLE5xszV1VHhQ9Glv8cdGmcFAU/edit)