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

**CLINICAL SIGNS/SYMPOMTS**
- 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 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: Ground glass opacities, patchy consolidations >50%, peripheral distribution >50%
- Nodules, cystic changes, effusions in <10%

**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
- High risk international or US travel/exposure

**LABS**
- CBC with diff, CMP, procalcitonin, Ferritin, CPK, CRP, LDH, ESR, D-Dimer, +/- Troponin
- Look for leukopenia, lymphopenia, and transaminitis
- If going to ICU Quantiferon, IL-6, blood type, troponin

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

**MICROBIOLOGY**
- Check Flu if 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

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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>Sp02 &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></td>
<td>Elevated troponin</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. Refer to table 3 Medication chart.

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 Sp02 &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 Sp02 &gt;90% with risk factors for severe disease</td>
<td>Supportive care with very close monitoring.</td>
<td></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>
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</tr>
</thead>
<tbody>
<tr>
<td>Moderate or severe disease</td>
<td><strong>With guidance with Infectious Disease:</strong> Hydroxychloroquine (Plaquenil)**&lt;br&gt;<strong>In severe cases, may consider higher dose of hydroxychloroquine</strong>&lt;br&gt;<strong>if early in treatment course may consider Lopinavir/ritonavir (Kaletra) 400/100mg PO BID x 10-14 days</strong>&lt;br&gt;<strong>Consider Remdesivir (RDV) through compassionate use or clinical trial if available.</strong></td>
<td>Check EKG prior to initiation given risk of QT prolongation. Risk increased in patients on other QT prolonging agents. Keep Potassium&gt;4, Magnesium&gt;2 if concern for QT prolongation. For Hydroxychloroquine: assess for drug-drug interactions(e.g. azoles, anticoagulants, anti-epileptics). For protease inhibitors (e.g. Kaletra and darunavir): the main side effect is gastrointestinal intolerance. Monitor liver function. Safe in pregnancy.</td>
</tr>
<tr>
<td>For patients with severe disease and/or evidence of cytokine release syndrome</td>
<td>With ID approval, Tocilizumab can be considered&lt;br&gt;With ID approval, convalescent plasma can be considered</td>
<td>Must have IL-6 and quantiferon collected before giving Tocilizumab&lt;br&gt;Must obtain patient blood type to match donor for plasma</td>
</tr>
<tr>
<td>For certain refractory or progressively worsening patients in the ICU</td>
<td>With ID approval, interferon can be considered.</td>
<td>Can be combined with hydroxychloroquine, chloroquine, or Lopinavir/ritonavir</td>
</tr>
<tr>
<td>For patients with IgG&lt;400</td>
<td>With ID approval, consider IVIG at standard dose of 1gm/kg daily x 2 doses</td>
<td>IVIG has been suggested to have anti-inflammatory or immunomodulatory effects. However, there is little rationale for this use.</td>
</tr>
</tbody>
</table>

**OTHER CONTROVERSIAL MEDICATION**

<table>
<thead>
<tr>
<th>Renin angiotensin system blockers (ACE and ARBS)</th>
<th>The virus that causes COVID-19 uses the angiotensin-converting enzyme (ACE) 2 receptor to enter cells.&lt;br&gt;<strong>Hypothetical harm:</strong> can increase the expression of ACE2, there is concern that these medications may facilitate viral entry into cells.&lt;br&gt;<strong>Hypothetical benefit:</strong> may have protective effect against lung damage or may have paradoxical effect in terms of virus binding.</th>
<th>Currently, there is no clinical or epidemiological data to support this.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSAIDS</td>
<td>Avoid in hospitalized patients.</td>
<td>Controversial.</td>
</tr>
<tr>
<td>Steroids</td>
<td>See next table</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from Version 1 3/17/20 Massachusetts General Hospital COVID-19 Treatment Guidance
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 ARE RESTRICTED AND REQUIRE ID APPROVAL AND REQUIRE INFORMED CONSENT**

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>DRUG NAME</th>
<th>PROPOSED MECHANISM</th>
<th>BEST CANDIDATE</th>
<th>ADVERSE REACTIONS</th>
<th>DOSING GUIDELINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydroxychloroquine</td>
<td>Blocks viral entry into cells. Impairs viral replication.</td>
<td>Patients with severe symptoms</td>
<td>QT prolongation</td>
<td>400 mg PO bid X 1 day then 200 mg PO bid X 4 days (Give with food to avoid GI upset)</td>
</tr>
<tr>
<td>(Plaquenil)</td>
<td>Immuno-modulator.</td>
<td></td>
<td>Nausea/vomiting</td>
<td>Higher doses may be recommended based on ID recommendations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hypoglycemia</td>
<td>Monitor QT interval and electrolytes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ocular toxicity</td>
<td>No longer recommended to give simultaneously with Azithromycin</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Headache</td>
<td></td>
</tr>
<tr>
<td>Lopinavir-Ritonavir</td>
<td>Protease inhibitor.</td>
<td>Patients with severe symptoms</td>
<td>Nausea/vomiting</td>
<td>400 mg/100 mg PO BID for 10 days</td>
</tr>
<tr>
<td>(Kaletra) Tablets and liquid</td>
<td></td>
<td></td>
<td>Diarrhea</td>
<td>(Tablets: 200 mg/50 mg)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Headache</td>
<td>(Liquid: 400 mg/100 mg per 5 mL)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hyperglycemia</td>
<td>Several drug interactions-consult pharmacy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>QT prolongation</td>
<td>Avoid use of Aторvastatin (increased levels) (Pravastatin preferred)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hepatotoxicity</td>
<td></td>
</tr>
<tr>
<td>Remdesivir</td>
<td>Blocks RNA dependent polymerase</td>
<td>Patients with severe symptoms only through compassionate use in pregnancy and pediatric patients, or clinical trials if available</td>
<td>Increased liver enzymes</td>
<td>200 mg IV on day 1 then 100 mg IV daily X 10 days (or per protocol)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phase III experimental drug</td>
<td>Potential for drug-drug interactions.</td>
<td></td>
</tr>
</tbody>
</table>

*Page | 10  VCMC/SPH COVID-19 Clinical Working Group, Subject to Change (do not rely on print version of this document—see http://hospitals.vchca.org/medical-staff-services)*
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</thead>
<tbody>
<tr>
<td>Tocilizumab (Actemra)</td>
<td>IL-6 inhibitor reduces IL-6 production which is a key cytokine produced in COVID-19 infections. No antiviral activity</td>
<td>Patients with severe/critical illness with rapidly worsening respiratory gas exchange and excessive inflammatory</td>
<td>GL perforation Anaphylaxis Hepatic failure Tuberculosis reactivation</td>
<td>400 mg IV X1 May consider an additional dose 8-12 hours later if continued clinical decompensation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May be considered for ICU patients if all criteria met:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. confirmed or high suspicion for COVID</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. ARDS or SpO2 &lt;90% on 4L or increasing 02 requirements over 24 hours PLUS 2 or more of the</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>following predictors for severe disease:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Elevated troponin w/o known cardiac disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- LDH &gt; 200 U/L</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- D-dimer &gt;1 mcg/L</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- CRP &gt;35 mg/L</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Ferritin &gt;500-600 ng/mL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Neutrophil-lymphocyte ratio &gt;4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- IL 6 &gt;10 pg/mL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Patient is NOT pregnant</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. ID approval required</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Informed consent obtained by patient or family member and have it documented in Cerner</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Order IL6 &amp; quantiferon prior to administration. If positive weigh risks/benefits.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Convalescent Plasma</td>
<td>Presumed mechanism is that antibodies develop in patients who have previously been infected and now recovered COVID-19 and can now donate their immunoglobulin-containing plasma which may suppress viremia</td>
<td>Patients with severe symptoms</td>
<td>Fever Allergic reaction including serum sickness Transfusion-related acute lung injury (TRALI) Transfusion associated circulatory overload (TACO)</td>
<td>Mayo Clinic Registry recommends 1 unit of plasma. May consider 2 units of plasma based on specific patient needs, as seen in JAMA article Must order blood type to ensure donor is crossmatched</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pending availability</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Needs emergency IND from FDA or approval through Mayo Clinic Registry</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

P a g e | 10 VCMC/SPH COVID-19 Clinical Working Group, Subject to Change (do not rely on print version of this document—see http://hospitals.vchca.org/medical-staff-services)
### Table 3: Experimental/Restricted Medication Chart for COVID-19 positive patients in no specific order.

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<th>DOSING GUIDELINES</th>
</tr>
</thead>
</table>
| Methylprednisolone | Reduces inflammation | **Conflicting Data:**  
• **Do NOT give:**  
  ○ Concern for increase duration of viral shedding (SARS 2004)  
  ○ No impact on mortality (MERS, SARS)  
  ○ WHO Recommends against.  
  ○ Lancet article based on SARS/MERS/influenza does not recommend use.  
• **DO give:**  
  ○ Wu et al 3/13/20 JAMA: yes use, 40-80 mg IV methylprednisolone daily x 3-6 days. Finally, among the patients with ARDS, of those who received methylprednisolone treatment, 23 of 50 (46.0%) patients died, while of those who did not receive methylprednisolone treatment, 21 of 34 (61.8%) died. The administration of methylprednisolone appears to have reduced the risk of death in patients with ARDS (HR, 0.38; 95% CI, 0.20-0.72; \( P = .003 \)) | 40 mg to 80 mg IV daily x 3 to 6 days |

**Conclusions:**  
• Should not be used routinely.  
• If patients are extremely sick and in ARDS, steroids may be considered

Please refer to specialty specific documents on Medical Staff Office website ([http://hospitals.vchca.org/medical-staff-services](http://hospitals.vchca.org/medical-staff-services))
The following is based on experimental data and meant to offer guidance for COVID-19 clinical decision making and does not replace clinical judgment.

**When to consult Infectious Disease for confirmed or highly-suspected cases**

- High suspicion for COVID-19 with negative initial testing and acute respiratory failure
- Positive COVID-19 test in transplant or AIDS/immunocompromised patients
- Positive COVID-19 test in pregnant patients or pediatric (if available)
- Positive COVID-19 test and concern for secondary infections (ie. bacterial or fungal)
- Approval of restricted medications is not necessarily a consult.
- Anytime you have additional clinical concerns

### Emergency Department, Hospitalist and Critical Care Management

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aerosol generating procedures (AGPs): avoid if possible</strong> (see policy on Medical Staff Office website)</td>
<td>• Procedures: Intubation, extubation, bronchoscopy, upper endoscopy, colonoscopy, CPR, manual ventilation (i.e. manual bag-valve mask ventilation prior to intubation), airway surgery&lt;br&gt;• Respiratory therapy treatments: CPAP/BiPap, Metaneb, EZ Pap, high flow nasal cannula (HFNC) &gt; 15 liters per minute, nasal cannula at &gt;6 liters per minute, nebulizer treatments, sputum induction (do not induce sputum for COVID), chest physiotherapy (chest PT), Venturi mask with cool aerosol humidification, Oxymask, cough assist&lt;br&gt;• Ventilator-related: disconnection of patient from the ventilator, open suctioning of endotracheal tube or tracheostomy, ventilator circuit manipulation, tracheostomy change, oscillatory ventilation</td>
</tr>
<tr>
<td><strong>NOT considered high risk for aerosolization</strong></td>
<td>• Non-rebreather, facemask or face tent up to 15 liters flow per minute, humidified trach mask with up to 20 liters flow per minute, routine trach care (i.e. replacing trach mask, changing trach dressing), Venturi mask without humidification, coughing, suctioning of oropharynx, chest tube placement, closed suctioning from ET tube&lt;br&gt;• NP swab and NG tube placement are to be performed with patient’s mouth covered with surgical mask and provider in full PPE with N95 only for duration of the procedure; room may be cleaned 10 minutes after performing NP swab or NG tube placement</td>
</tr>
<tr>
<td><strong>Oxygen therapy</strong></td>
<td>• Goal oxygen saturation 94% or above&lt;br&gt;• Emphasize prone positioning to improve oxygenation&lt;br&gt;• Patient to wear surgical mask as much as tolerated, and always when staff enters room and when on potentially aerosalizing flow rates (nasal cannula &gt; 6 liters per minute or high flow nasal cannula &gt; 15 liters per minute, though low quality of evidence re: flow rate that aerosalizes)</td>
</tr>
<tr>
<td><strong>High Flow Nasal Cannula (HFNC)</strong></td>
<td>• HFNC has high potential to aerosalize, but may be considered if the following criteria are ALL met:&lt;br&gt;  o Patient must be in a negative pressure room, and all staff entering the room must have full PPE*&lt;br&gt;  o The patient should have a surgical mask on at all times 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) prior to staff entering the room&lt;br&gt;• Favor flow rate 15 liters per minute or less, for theoretical decreased risk of aerosolization, if possible&lt;br&gt;• Should be abandoned if the patient is progressively not improving (short trials only)&lt;br&gt;• P:F &lt; 200 portends higher risk of HFNC failure per Wang et al study from Wuhan China</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
Emergency Department, Hospitalist and Critical Care Management (continued)

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Notes</th>
</tr>
</thead>
</table>
| **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”)  
  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  
  • **Nebulizers vs. MDIs:** 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)  
  • **EZ Pap:** 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  
  • **Metanebs:** aerosolize and should be avoided in COVID suspected or confirmed infected. |
| **Non-invasive positive pressure ventilation (NIPPV): BiPap / CPAP** | • Generally, should avoid—inevitable leak around mask → aerosolization. Case-by-case with ICU consult.  
  o If using NIPPV, 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 using, all staff in full PPE*  
  • CPAP favored over Bipap if choosing to use NIPPV: less likely to aerosolize and high BiPap failure rate |
| **Decision to intubate** | • **Strongly recommend ICU Consultation for O2 requirement of more than 4-6 liters of oxygen per minute**  
  • Encourage early self-proning as described above in Adjunctive Respiratory Therapy Modalities  
  • Consider trial of high flow nasal cannula vs. CPAP in negative pressure room (or negative pressure tent or COVID ward if negative pressure room unavailable) with very close monitoring (i.e. q 15 minutes) to assess for response  
  o Favorable response: improved hypoxia, decreased respiratory rate, improvement in accessory muscle use  
  ▪ “Happy hypoxic”: continue close monitoring for any deterioration  
  o Unfavorable response: refractory hypoxia, increased work of breathing, nasal flaring, abdominal breathing, ill-appearing → consider early intubation  
  o May choose to first intubate ill-appearing patients with high work of breathing and high inflammatory markers instead of HFNC or CPAP trial  
  • Intubation under semi-elective conditions much preferred to emergent intubation |

*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.

### Intubation

- 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
- Video laryngoscopy preferred. Disposable laryngoscope if needing direct laryngoscopy.
- Inflated cuff, ensure viral filter on bag valve mask (BVM) before bagging/connecting to ventilator

### Post-Intubation Respiratory / Critical Care 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 waiting 45 min for CXR to allow for adequate air exchanges and reduce aerosolized particles
- 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 ARDS net 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
- Prone positioning has been shown to help if no improvement after 12-24 hr
  - Recommend prone positioning 12-16 hours per day if it is initiated
- Consider placing lines right after intubation to conserve PPE, reduce exposures
- Consider high incidence of myocardial suppression/shock
- D-Dimer elevation early considered measure of disease severity; consider avoiding early CT pulmonary angiogram for both fluid load and renal considerations
  - Consider possible increased risk of late pulmonary embolism (27% incidence in a Dutch ICU study of 184 ventilated ICU patients, lower incidence reported elsewhere); recommendations from American Society of Hematology: [https://www.hematology.org/covid-19/covid-19-and-vte-anticoagulation](https://www.hematology.org/covid-19/covid-19-and-vte-anticoagulation)
- Conservative fluid strategy strongly recommended

* 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
### Miscellaneous Critical Care Considerations

- Intubated patients are on ventilator prolonged time (>10 days) with high incidence of late deterioration
- Consider early discussion regarding DNR status for shock, ARDS, intubated patients
- Early Palliative Care Consult
- Code blue considerations
  - Minimize number of staff entering the room to only essential
  - Consider placing ETT prior to chest compressions to avoid aerosolization
  - Consider plastic drape over patient’s face to minimize aerosolization during code if not yet intubated

### Environmental

- Considered mostly droplet precautions other than high risk situations (see top of table on page 7 for aerosol generating procedures)
- Maintain airborne precautions: intubated patients (in case of accidental disconnection, filter changes, etc.)
- Surface survival times: 72 hours plastics, 48 hours steel, 24 hours cardboard, 4 hours copper

* 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

### References:
3. Effective Treatment of Severe COVID-19 Patients with Tocilizumab, Chinese article from "Respiratory and Critical Care Medicine" 2020. [https://www.ashp.org/Pharmacy-Practice/Resource-Centers/Coronavirus](https://www.ashp.org/Pharmacy-Practice/Resource-Centers/Coronavirus)
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. FDA Hydroxychloroquine Fact Sheet: [https://www.fda.gov/media/136538/download](https://www.fda.gov/media/136538/download)
10. FDA Chloroquine Fact Sheet: [https://www.fda.gov/media/136536/download](https://www.fda.gov/media/136536/download)
12. Massachusetts General Hospital Guideline on aerosol generating procedures and prone positioning
13. Additional references listed on the following documents:
   a. Google Drive (https://drive.google.com/drive/folders/1CIZAOpL_s8_mHjhKlQtm5HnP7KIXTdtG)
   b. Google Doc (https://docs.google.com/document/d/149cSAUSj6VAOfdYsQrLEXszV1VbHhQ9GlV8cdGmcFAU/edit)